



العلمي والبحث العالي التعليم وزارة  
العلمي والتقويم الإشراف جهاز  
الأكاديمي والاعتماد الجودة ضمان دائرة  
قسم الاعتماد

# دليل وصف البرنامج الأكاديمي والمقرر الدراسي

2026-2025

## المقدمة:

يُعد البرنامج التعليمي بمثابة حزمة منسقة ومنظمة من المقررات الدراسية التي تشتمل على إجراءات وخبرات تنظم بشكل مفردات دراسية الغرض الأساس منها بناء وصقل مهارات الخريجين مما يجعلهم مؤهلين لتلبية متطلبات سوق العمل يتم مراجعته وتقييمه سنوياً عبر إجراءات وبرامج التدقيق الداخلي أو الخارجي مثل برنامج الممتحن الخارجي.

يقدم وصف البرنامج الأكاديمي ملخص موجز للسمات الرئيسة للبرنامج ومقرراته مبيناً المهارات التي يتم العمل على اكسابها للطلبة مبنية على وفق اهداف البرنامج الأكاديمي وتتجلى أهمية هذا الوصف لكونه يمثل الحجر الأساس في الحصول على الاعتماد البرامجي ويشترك في كتابته الملاكات التدريسية بإشراف اللجان العلمية في الأقسام العلمية.

ويتضمن هذا الدليل بنسخته الثانية وصفاً للبرنامج الأكاديمي بعد تحديث مفردات وفقرات الدليل السابق في ضوء مستجدات وتطورات النظام التعليمي في العراق والذي تضمن وصف البرنامج الأكاديمي بشكلها التقليدي نظام (سنوي، فصلي) فضلاً عن اعتماد وصف البرنامج الأكاديمي المعمم بموجب كتاب دائرة الدراسات ت م 3/2906 في 3/5/2023 فيما يخص البرامج التي تعتمد مسار بولونيا أساساً لعملها. وفي هذا المجال لا يسعنا إلا أن نوكد على أهمية كتابة وصف البرامج الأكاديمية والمقررات الدراسية لضمان حسن سير العملية التعليمية.

## مفاهيم ومصطلحات:

### وصف البرنامج الأكاديمي:

يوفر وصف البرنامج الأكاديمي إيجازاً مقتضباً لرؤيته ورسالته وأهدافه متضمناً وصفاً دقيقاً لمخرجات التعلم المستهدفة على وفق استراتيجيات تعلم محددة.

وصف المقرر: يوفر إيجازاً مقتضباً لأهم خصائص المقرر ومخرجات التعلم المتوقعة من الطالب تحقيقها مبرهنماً عما إذا كان قد حقق الاستفادة القصوى من فرص التعلم المتاحة. ويكون مشتق من وصف البرنامج.

رؤية البرنامج: صورة طموحة لمستقبل البرنامج الأكاديمي ليكون برنامجاً متطوراً وملهماً ومحفزاً وواقعياً وقابلاً للتطبيق.

رسالة البرنامج: توضح الأهداف والأنشطة اللازمة لتحقيقها بشكل موجز كما يحدد مسارات تطور البرنامج واتجاهاته.

اهداف البرنامج: هي عبارات تصف ما ينوي البرنامج الأكاديمي تحقيقه خلال فترة زمنية محددة وتكون قابلة للقياس والملاحظة.

هيكلية المنهج: كافة المقررات الدراسية / المواد الدراسية التي يتضمنها البرنامج الأكاديمي على وفق نظام التعلم المعتمد (فصلي، سنوي، مسار بولونيا) سواء كانت متطلب (وزارة، جامعة، كلية وقسم علمي) مع عدد الوحدات الدراسية.

مخرجات التعلم: مجموعة متوافقة من المعارف والمهارات والقيم التي اكتسبها الطالب بعد انتهاء البرنامج الأكاديمي بنجاح ويجب أن يُحدد مخرجات التعلم لكل مقرر بالشكل الذي يحقق اهداف البرنامج.

استراتيجيات التعلم والتعليم: بأنها الاستراتيجيات المستخدمة من قبل عضو هيئة التدريس لتطوير تعليم وتعلم الطالب وهي خطط يتم إتباعها للوصول إلى أهداف التعلم. أي تصف جميع الأنشطة الصفية واللاصفية لتحقيق نتائج التعلم للبرنامج.

## نموذج وصف البرنامج الأكاديمي

اسم الجامعة جامعة الموصل  
الكلية المعهد: كلية الهندسة  
القسم العلمي: الهندسة الكهربائية  
اسم البرنامج الأكاديمي أو المهني بكالوريوس الهندسة الكهربائية / قدرة ومكان  
اسم الشهادة النهائية بكالوريوس علوم في الهندسة الكهربائية / قدرة ومكان.  
النظام الدراسي: كورسات + مسار بولونيا  
تاريخ اعداد الوصف: 2026/ /  
تاريخ ملء الملف: 2026/ /



التوقيع:  
اسم رئيس القسم: أ.د. عمر شرف الدين يحيى  
التاريخ:

التوقيع:  
اسم المعاون العلمي: أ.م.د. ايمن طالب حميد  
التاريخ:

دقق الملف من قبل  
شعبة ضمان الجودة والأداء الجامعي  
اسم مدير شعبة ضمان الجودة والأداء الجامعي: ٢٠١٠. شاربهان عبد الرحمن  
التاريخ  
التوقيع

مصادقة السيد العميد  
٢٠١٠. د. عمر محمد حميد  
Seal of the University of Mosul, Faculty of Engineering, Department of Electrical Engineering

| 1. رؤية البرنامج                                                                         |
|------------------------------------------------------------------------------------------|
| أن يكون قسما متميزا في التعليم والبحث العلمي وخدمة المجتمع في مجالات الهندسة الكهربائية. |

| 2. رسالة البرنامج                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| توفير برامج تعليمية تتميز بالعمق في مجالات التخصص مع الشمول في الأسس الهندسية. ونشر المعرفة الهندسية والمساهمة في تطويرها في مجال الاختصاص. بالإضافة الى خدمة المشاريع الصناعية والمختصين في عموم قطاعات المجتمع. |

| 3. اهداف البرنامج                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. إعداد كوادر هندسية كفؤة في اختصاص هندسة القدرة والمكائن وكذلك إعداد كوادر هندسية متخصصة من حملة الشهادات الأولية ولنفس التخصصات أعلاه لكي تساهم في النهضة التنموية والعمرانية الشاملة في القطر.</li> <li>2. المساهمة في تقديم الخدمات والاستشارات الأكاديمية والعلمية والعملية والتطبيقية لكافة قطاعات الدولة العام والمختلط والخاص من خلال اتفاقيات التعاون وكذلك من خلال المكتب الاستشاري لكلية الهندسة.</li> <li>3. إعداد البحوث التي تعمل وتساهم على حل المشاكل والمعوقات الهندسية والصناعية التي تواجه المنشآت والمشاريع الصناعية في القطر.</li> <li>4. المساهمة في نشر وتطوير المعرفة الهندسية ونقل آخر المستجدات في مجالات الهندسة الكهربائية والإلكترونية إلى المهندسين في حقول العمل المختلفة من خلال إقامة دورات التعليم المستمر والدورات التدريبية وكذلك من خلال نشر البحوث العلمية في المجالات العلمية المتخصصة المحلية والعالمية.</li> <li>5. تطوير الكوادر التدريسية عن طريق إيفاد قسم من التدريسيين في إفادات علمية للمشاركة في المؤتمرات والندوات او ورش العمل المشتركة مع مؤسسات العربية والعالمية او الدولية وكذلك عن طريق منح اجازات التفرغ للعمل في الجامعات خارج القطر مما يساعد في تبادل وتنمية الخبرات.</li> <li>6. المشاركة في تنظيم وإقامة المؤتمرات والندوات وورش العمل والحلقات النقاشية العلمية داخل وخارج القطر.</li> </ol> |

| 4. الاعتماد البرامجي                                                       |
|----------------------------------------------------------------------------|
| البرنامج في طور المراجعة من قبل مجلس الوطني لاعتماد لتعليم الهندسي (ICAEE) |

| 5. المؤثرات الخارجية الأخرى |
|-----------------------------|
| لا يوجد                     |

| 6. هيكلية البرنامج |              |             |                |           |
|--------------------|--------------|-------------|----------------|-----------|
| هيكل البرنامج      | عدد المقررات | وحدة دراسية | النسبة المئوية | ملاحظات * |
| متطلبات المؤسسة    | 8            | 16          | 7.2 %          |           |
| متطلبات الكلية     | 6            | 36          | 16.3 %         |           |
| متطلبات القسم      | 46           | 168         | 76.5 %         |           |
| التدريب الصيفي     | 1            | لا يوجد     |                |           |
| أخرى               |              |             |                |           |

\* ممكن ان تتضمن الملاحظات فيما اذا كان المقرر أساسى او اختياري .

## 1. وصف البرنامج

مسار بولونيا / كلية الهندسة / جامعة الموصل / المستوى الاول للعام الدراسي 2025-2026 / قسم الهندسة الكهربائية / الفصل الأول

**Semester 1 | 30 ECTS | 1 ECTS = 25 hrs**

| Code    | Module                             | اسم المادة باللغة العربية | SSWL | USSWL | ECTS | Type | Pre-request |
|---------|------------------------------------|---------------------------|------|-------|------|------|-------------|
| EE101   | Basics of Electrical Engineering I | اسس الهندسة الكهربائية I  | 93   | 107   | 8.00 | C    | ----        |
| EE102   | Mathematics I                      | الرياضيات I               | 63   | 87    | 6.00 | B    | ----        |
| EE103   | Engineering drawing                | الرسم الهندسي             | 63   | 37    | 4.00 | S    | ----        |
| EE104   | Physics I                          | الفيزياء I                | 33   | 67    | 4.00 | B    | ----        |
| EE105   | Mechanics Engineering              | الهندسة الميكانيكية       | 33   | 42    | 3.00 | S    | ----        |
| UOM1031 | Computer 1                         | الحاسوب 1                 | 63   | 12    | 3.00 | B    | ----        |
| UOM1011 | Arabic Language 1                  | اللغة العربية 1           | 33   | 17    | 2.00 | B    | ----        |

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**Semester 2 | 30 ECTS | 1 ECTS = 25 hrs**

| Code  | Module                              | اسم المادة باللغة العربية | SSWL | USSWL | ECTS | Type | Pre-request |
|-------|-------------------------------------|---------------------------|------|-------|------|------|-------------|
| EE108 | Basics of Electrical Engineering II | اسس الهندسة الكهربائية II | 93   | 107   | 8.00 | C    | ----        |

|         |                            |                           |    |    |      |   |      |
|---------|----------------------------|---------------------------|----|----|------|---|------|
| EE109   | Mathematics II             | الرياضيات II              | 63 | 87 | 6.00 | B | ---- |
| EE110   | Computer Programming       | برمجة الحاسوب             | 63 | 87 | 6.00 | B | ---- |
| EE111   | Digital Techniques         | التقنيات الرقمية          | 48 | 27 | 3.00 | C | ---- |
| EE112   | Physics II                 | الفيزياء II               | 48 | 27 | 3.00 | B | ---- |
| UOM1040 | Democracy and Human Rights | الديمقراطية وحقوق الانسان | 33 | 17 | 2.00 | B | ---- |
| UOM1021 | English Language 1         | اللغة الانكليزية 1        | 33 | 17 | 2.00 | B | ---- |

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**Semester 3 | 30 ECTS | 1 ECTS = 25 hrs**

| Code    | Module                                 | اسم المادة باللغة العربية    | SSWL | USSWL | ECTS | Type | Pre-request |
|---------|----------------------------------------|------------------------------|------|-------|------|------|-------------|
| EEPM201 | Electrical Circuits Analysis I         | تحليل الدوائر الكهربائية I   | 93   | 32    | 5.00 | C    | ----        |
| EEPM202 | Mathematics III                        | الرياضيات III                | 78   | 47    | 5.00 | B    | ----        |
| EEPM203 | Electromagnetic Fields                 | المجالات الكهرومغناطيسية     | 63   | 37    | 4.00 | C    | ----        |
| EEPM204 | Electrical Transformers                | المحولات الكهربائية          | 63   | 62    | 5.00 | C    | ----        |
| EEPM205 | Electronics Principles                 | مبادئ الالكترونيات           | 48   | 52    | 4.00 | B    | ----        |
| EEPM206 | Electrical Engineering Lab. I          | مختبرات الهندسة الكهربائية I | 33   | 42    | 3.00 | C    | ----        |
| UOM2050 | The crimes of the Baath regime in Iraq | جرائم نظام البعث في العراق   | 33   | 17    | 2.00 | B    | ----        |
| UOM2012 | Arabic Language 2                      | اللغة العربية 2              | 33   | 17    | 2.00 | B    | ----        |

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**Semester 4 | 30 ECTS | 1 ECTS = 25 hrs**

| Code    | Module                          | اسم المادة باللغة العربية   | SSWL | USSWL | ECTS | Type | Pre-request |
|---------|---------------------------------|-----------------------------|------|-------|------|------|-------------|
| EEPM208 | Electrical Circuits Analysis II | تحليل الدوائر الكهربائية II | 93   | 32    | 5.00 | C    | ----        |
| EEPM209 | Mathematics IV                  | الرياضيات IV                | 78   | 47    | 5.00 | B    | ----        |
| EEPM210 | DC Machines                     | مكائن التيار                | 63   | 62    | 5.00 | C    | ----        |

|         |                                |                               |    |    |      |   |      |
|---------|--------------------------------|-------------------------------|----|----|------|---|------|
|         |                                | المستمر                       |    |    |      |   |      |
| EEPM211 | Distribution Systems           | نظم التوزيع                   | 63 | 62 | 5.00 | B | ---- |
| EEPM212 | Renewable Energies sciences    | علوم الطاقات المتجددة         | 33 | 17 | 2.00 | C | ---- |
| EEPM213 | Electrical Engineering Lab. II | مختبرات الهندسة الكهربائية II | 33 | 42 | 3.00 | C | ---- |
| UOM2022 | English language 2             | اللغة الانكليزية 2            | 33 | 17 | 2.00 | B | ---- |
| UOM2032 | Computer 2                     | الحاسوب 2                     | 63 | 12 | 3.00 | B | ---- |

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**Semester 5 | 30 ECTS | 1 ECTS = 25 hrs**

| Code    | Module                    | اسم المادة باللغة العربية | SSWL | USSWL | ECTS | Type | Pre-request |
|---------|---------------------------|---------------------------|------|-------|------|------|-------------|
| EEPM301 | Mathematical Analysis     | التحليلات الرياضية        | 63   | 37    | 4.00 | B    | ----        |
| EEPM302 | Transmission Systems      | نظم النقل                 | 78   | 72    | 6.00 | C    | ----        |
| EEPM303 | AC Machines               | مكائن التيار المتردد      | 78   | 72    | 6.00 | C    | ----        |
| EEPM304 | Electrical Measurements   | القياسات الكهربائية       | 63   | 37    | 4.00 | B    | ----        |
| EEPM305 | Power Electronics I       | إلكترونيات القدرة I       | 63   | 87    | 6.00 | C    | ----        |
| EEPM306 | Power and Machines Lab. I | مختبرات القدرة والمكائن I | 63   | 37    | 4.00 | C    | ----        |

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**Semester 6 | 30 ECTS | 1 ECTS = 25 hrs**

| Code    | Module                     | اسم المادة (باللغة العربية) | SSWL | USSWL | ECTS | Type | Pre-request |
|---------|----------------------------|-----------------------------|------|-------|------|------|-------------|
| EEPM307 | Numerical Analysis         | التحليلات العددية           | 63   | 37    | 4.00 | B    | ----        |
| EEPM308 | Generation Systems         | نظم التوليد                 | 63   | 62    | 5.00 | C    | ----        |
| EEPM309 | Electrical Machines Drives | مسرقات المكائن الكهربائية   | 78   | 47    | 5.00 | C    | ----        |

|         |                                       |                              |    |    |      |   |      |
|---------|---------------------------------------|------------------------------|----|----|------|---|------|
| EEPM310 | Power Electronics II                  | إلكترونيات القدرة II         | 63 | 87 | 6.00 | C | ---- |
| EEPM311 | Programmable controllers              | متحكمات مبرمجة               | 33 | 17 | 2.00 | C | ---- |
| EEPM312 | Power and Machines Lab. II            | مختبرات القدرة والمكائن II   | 63 | 37 | 4.00 | C | ---- |
| EEPM313 | Engineering Project Design & Planning | تصميم وتخطيط المشروع الهندسي | 33 | 17 | 2.00 | C |      |
| EEPM314 | English language 3                    | اللغة الانكليزية 3           | 33 | 17 | 2.00 | S | ---- |

ملاحظة : الطالب مطالب بإكمال التدريب الصيفي بعد نهاية الفصل الثاني للمستوى الثالث

النظام الفصلي / كلية الهندسة / جامعة الموصل / المستوى الرابع للعام الدراسي 2025-2026 / قسم الهندسة الكهربائية / قدرة ومكائن/ الفصل الاول

| Code    | Module                                                     | اسم المادة<br>(باللغة العربية)                 | Theoretical | Practical | Applied | Units |
|---------|------------------------------------------------------------|------------------------------------------------|-------------|-----------|---------|-------|
| EEP 407 | Control systems I                                          | نظم السيطرة I                                  | 2           |           | 1       | 3     |
| EEP 401 | Power System Analysis I                                    | I تحليل نظم القدرة                             | 2           |           | 1       | 3     |
| EEP 402 | Power System Protection I                                  | نظم حماية القدرة I                             | 2           |           | 1       | 2     |
| EEP 404 | High Voltage Engineering I                                 | هندسة الضغط العالي I                           | 2           |           | 1       | 2     |
| EEP 403 | Special Electrical Machines I                              | مكائن كهربائية خاصة I                          | 2           |           |         | 3     |
| EEP 406 | Electrical Power Generation Stations<br>(Elective Subject) | محطات توليد القدرة الكهربائية<br>مادة اختيارية | 2           |           | 1       | 2     |
| EEP 408 | Power and Machines Lab. III                                | مختبرات القدرة والمكائن III                    |             | 4         |         | 2     |

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| Code    | Module             | اسم المادة<br>(باللغة العربية) | Theoretical | Practical | Applied | Units |
|---------|--------------------|--------------------------------|-------------|-----------|---------|-------|
| EEP 417 | Control systems II | نظم السيطرة II                 | 2           |           | 2       | 3     |

|         |                                |                               |   |   |   |   |
|---------|--------------------------------|-------------------------------|---|---|---|---|
| EEP 411 | Power System Analysis II       | II تحليل نظم<br>القدرة        | 2 |   | 1 | 3 |
| EEP 412 | Power System Protection II     | II نظم حماية القدرة           | 2 |   | 1 | 2 |
| EEP 414 | High Voltage Engineering II    | هندسة الضغط<br>II العالي      | 2 |   |   | 2 |
| EEP 413 | Special Electrical Machines II | II مكائن كهربائية<br>خاصة     | 2 |   | 1 | 3 |
| EEP 418 | Power and Machines Lab. IV     | مختبرات القدرة<br>IV والمكائن |   | 4 |   | 2 |
| EEP 415 | Graduation Project             | مشروع التخرج                  | 2 |   | 1 | 2 |
| EEC 420 | Physics III                    | III الفيزياء                  | 3 |   |   | 3 |
| EEC 421 | Chemistry                      | الكيمياء                      | 3 |   |   | 3 |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 7. مخرجات التعلم المتوقعة للبرنامج وفق متطلبات مجلس الاعتماد البرامي العراقي الهندسي هي سبع مخرجات:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
| 1. القدرة على تحديد وصياغة وحل المشكلات الهندسية في مجال هندسة القدرة والمكائن من خلال تطبيق مبادئ الهندسة والعلوم والرياضيات.<br>2. القدرة على تطبيق عملية التصميم الهندسي لإنتاج حلول تلي الاحتياجات المحددة مع مراعاة الصحة والسلامة العامة، والعوامل العالمية والثقافية والاجتماعية والبيئية والاقتصادية وغيرها من العوامل بما يتناسب مع التخصص.<br>3. القدرة على تطوير وإجراء التجارب المناسبة، وتحليل البيانات وتفسيرها، واستخدام الحكم الهندسي لاستخلاص النتائج.<br>4. القدرة على التواصل بشكل فعال مع مجموعة واسعة من الجماهير.<br>5. القدرة على التعرف على المسؤوليات الأخلاقية والمهنية في المواقف الهندسية، وإصدار أحكام مستنيرة، والتي يجب أن تأخذ في الاعتبار تأثير الحلول الهندسية في السياقات العالمية والاقتصادية والبيئية والمجتمعية.<br>6. القدرة على إدراك الحاجة المستمرة لاكتساب معرفة جديدة، واختيار استراتيجيات التعلم المناسبة، وتطبيق هذه المعرفة.<br>7. القدرة على العمل بفعالية كعضو أو قائد لفريق يحدد الأهداف، ويخطط للمهام، ويفي بالمواعيد النهائية، ويخلق بيئة تعاونية وشاملة. |  |
| <b>الأهداف المعرفية</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
| مخرج التعلم الاول (GO1): القدرة على تحديد وصياغة وحل المشكلات الهندسية في مجال هندسة القدرة والمكائن من خلال تطبيق مبادئ الهندسة والعلوم والرياضيات.<br>مخرج التعلم الثاني (GO2): القدرة على تطبيق عملية التصميم الهندسي لإنتاج حلول تلي الاحتياجات المحددة مع مراعاة الصحة والسلامة العامة، والعوامل العالمية والثقافية والاجتماعية والبيئية والاقتصادية وغيرها من العوامل بما يتناسب مع التخصص.<br>مخرج التعلم الثالث (GO3): القدرة على تطوير وإجراء التجارب المناسبة، وتحليل البيانات وتفسيرها، واستخدام الحكم الهندسي لاستخلاص النتائج.<br>مخرج التعلم السادس (GO6): القدرة على إدراك الحاجة المستمرة لاكتساب معرفة جديدة، واختيار استراتيجيات التعلم المناسبة، وتطبيق هذه المعرفة                                                                                                                                                                                                                                                                                                                        |  |
| <b>المهارات</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| مخرج التعلم الرابع (GO4): قدرة القدرة على التواصل بشكل فعال مع مجموعة واسعة من الجماهير.<br>مخرج التعلم السابع (GO7): القدرة على العمل بفعالية كعضو أو قائد لفريق يحدد الأهداف، ويخطط للمهام، ويفي بالمواعيد النهائية، ويخلق بيئة تعاونية وشاملة.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| <b>القيم</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
| مخرج التعلم الخامس (GO5): القدرة على التعرف على المسؤوليات الأخلاقية والمهنية في المواقف الهندسية، وإصدار أحكام مستنيرة، والتي يجب أن تأخذ في الاعتبار تأثير الحلول الهندسية في السياقات العالمية والاقتصادية والبيئية والمجتمعية.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |

## 9. استراتيجيات التعليم والتعلم

- شرح المادة العلمية للطلاب بشكل تفصيلي.
- 2- مشاركة الطلاب في حل المسائل الرياضية
- 3- مناقشة وحوار حول مفردات متعلقة بالموضوع

## 10. طرائق التقييم

الامتحانات الأسبوعية والشهرية واليومية وامتحان نهاية السنة.

## 11. الهيئة التدريسية

### أعضاء هيئة التدريس

| اعداد الهيئة التدريسية |      | المتطلبات/المهارات الخاصة<br>(ان وجدت ) |  | التخصص              |                     | الرتبة العلمية |
|------------------------|------|-----------------------------------------|--|---------------------|---------------------|----------------|
| محاضر                  | ملاك |                                         |  | الدقيق              | عام                 |                |
|                        | 1    |                                         |  | هندسة الحالة الصلبة | إلكترونيات واتصالات | أستاذ          |
|                        | 2    |                                         |  | قدرة ومكائن         | قدرة ومكائن         | أستاذ          |
|                        | 1    |                                         |  | إلكترونيات القدرة   | قدرة ومكائن         | أستاذ          |
|                        | 1    |                                         |  | سيطرة آلية          | قدرة ومكائن         | أستاذ مساعد    |
|                        | 2    |                                         |  | هندسة الاتصالات     | إلكترونيات واتصالات | أستاذ مساعد    |
|                        | 3    |                                         |  | إلكترونيات القدرة   | قدرة ومكائن         | أستاذ مساعد    |
|                        | 2    |                                         |  | هندسة القدرة        | قدرة ومكائن         | أستاذ مساعد    |
|                        | 1    |                                         |  | قدرة ومكائن         | قدرة ومكائن         | أستاذ مساعد    |

|             |                                  |                  |  |  |   |  |
|-------------|----------------------------------|------------------|--|--|---|--|
| أستاذ مساعد | إلكترونيات واتصالات              | تكنولوجيا النانو |  |  | 1 |  |
| مدرس        | إلكترونيات واتصالات              | هندسة الاتصالات  |  |  | 3 |  |
| مدرس        | قدرة ومكائن                      | هندسة القدرة     |  |  | 9 |  |
| مدرس        | قدرة ومكائن                      |                  |  |  | 1 |  |
| مدرس        | إلكترونيات واتصالات              |                  |  |  | 5 |  |
| مدرس        | إلكترونيات واتصالات              |                  |  |  | 1 |  |
| مدرس مساعد  | إلكترونيات واتصالات              |                  |  |  | 2 |  |
| مدرس مساعد  | هندسة القدرة والمكائن            |                  |  |  | 5 |  |
| مدرس مساعد  | محطات ومنظومات القدرة الكهربائية |                  |  |  | 1 |  |
| مدرس مساعد  | إلكترونيات واتصالات              |                  |  |  | 1 |  |

| التطوير المهني                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| توجيه أعضاء هيئة التدريس الجدد                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p>البرنامج الأكاديمي لقسم الهندسة الكهرباء مصمم لتعزيز المعرفة والمهارات الشاملة لأعضاء هيئة التدريس الجدد في مجالات تعليمية متنوعة. يبدأ البرنامج بالتركيز على تزويد أعضاء هيئة التدريس بالقدرة الأساسية على إدارة مهامهم بفعالية ثم يتقدم ليشمل العمليات والإجراءات الضرورية لضمان تحقيق نتائج التعليم المستهدفة بنجاح في برامج متنوعة.</p> <p>لتحقيق هذه الأهداف، يتضمن البرنامج المكونات الرئيسية التالية:</p> <ul style="list-style-type: none"> <li>• دورات تعليمية: يشارك أعضاء هيئة التدريس الجدد في دورات تعليمية تهدف إلى تحسين جودة عملية التعليم. تغطي هذه الدورات مجموعة من المواضيع، بما في ذلك: تدريب على أساليب التدريس: تعليم استراتيجيات فعالة لجذب انتباه الطلاب وتقديم محتوى الدورة.</li> <li>• الاتجاهات الحديثة في تدريس الجامعات: استكشاف النهج الابتكاري في التعليم والتعلم في التعليم العالي.</li> <li>• تقييم الطلاب: دورات وورش علمية للأعضاء الجدد حول عملية تقييم أداء الطلاب وفهمهم.</li> <li>• إعداد الاختبارات: استراتيجيات لإعداد اختبارات عادلة.</li> <li>• سياسات الجامعة: تعرف على القوانين واللوائح والتعليمات ومنصات التعليم الإلكتروني ذات الصلة.</li> <li>• التقييم المستمر: يخضع أعضاء هيئة التدريس، سواء كانوا بدوام كامل أو جزئي، لتقييم مستمر لتحديد المجالات التي يحتاجون إلى تطويرها طوال حياتهم الوظيفية التعليمية. يساعد هذا العملية في ضمان أن أعضاء هيئة التدريس يعملون بشكل مستمر على التحسين والتكيف لتلبية احتياجات الطلاب والجامعة المتطورة.</li> <li>• فرص التطوير المهني: يتم تشجيع أعضاء هيئة التدريس على المشاركة في دورات تطوير هيئة التدريس التي تقدمها القسم أو وحدة التعليم المستمر في الجامعة. توفر هذه الدورات فرصاً لأعضاء هيئة التدريس لتحسين مهاراتهم والبقاء على اطلاع بالاتجاهات في التعليم والتعلم، والتعاون مع الزملاء.</li> </ul> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p>التطوير المهني لأعضاء هيئة التدريس</p> <p>لدى هيئة التدريس في قسم الهندسة الكهربائية روابط مع الوزارات الرئيسية في العراق: وزارة التعليم العالي والبحث العلمي، ووزارة الكهرباء والاتصالات والبلديات الصحة وغيرها . وقد نظمت في القسم العديد من الندوات خلال الأعوام الماضية بإشراف وزارة التعليم العالي والبحث العلمي. وكانت موضوعات الندوات هي التحديات في معالجة مشاكل نقص الطاقة الموصل والعراق. وتزود هذه الروابط أعضاء هيئة التدريس بالخبرات العملية.</p> <p>وفي هذا السياق فقد نظمت لجنة التعليم المستمر بقسم هندسة السدود والموارد المائية محاضرات وورش عمل لأعضاء هيئة التدريس في مختلف المجالات خلال السنوات الأكاديمية الثلاثة الماضية وكما يلي:</p> <p>✓ تطوير أساليب التعليم والتعلم الإلكتروني/9</p> <p>✓ المنشورات العلمية/ 44</p> <p>✓ الاعتماد الأكاديمي/ 2</p> <p>✓ ندوات متنوعة في مجال هندسة السدود والموارد المائية/ 1</p> <p>✓ المشاركة في المؤتمرات والندوات وورش العمل والدورات التدريبية خارج العراق/ 4</p> <p>المشاركة في المؤتمرات والندوات وورش العمل والدورات التدريبية داخل العراق/ 37</p>                                                                                                                                                                                                                                                                                      |
| <p>12. معيار القبول</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <p>يتم تحديد الطاقة الاستيعابية لقسم الهندسة الكهربائية ضمن خطة القبول وحسب طاقة القسم في القبول، حيث تحدد اللجنة العلمية العدد المطلوب استيعابه من الطلبة الجدد ثم ترسل الى العمادة ومن ثم الجامعة ومن ثم الوزارة للحصول على الموافقات الرسمية. ليكون مؤهلاً للالتحاق بقسم الهندسة الكهربائية على مستوى الدراسة الجامعية، يجب على المتقدمين تلبية بعض الشروط. يشرف على عملية القبول وزارة التعليم العالي والبحث العلمي، التي تدير وتخصص تلقائياً قبول الطلاب للمؤسسات الحكومية والكليات بناءً على درجاتهم في المدرسة الثانوية. وفيما يلي بعض الشروط الرئيسية لقبول الطلاب:</p> <p>أ- الجنسية العراقية وسنة الميلاد: يجب على المتقدمين أن يكونوا من حملة الجنسية العراقية.</p> <p>ب- شهادة الثانوية العراقية: يحتاج المتقدمون إلى امتلاك شهادة صادرة عن مدرسة ثانوية عراقية معتمدة من وزارة التربية.</p> <p>ج- الشهادة الطبية: يجب على المتقدمين تقديم شهادة طبية للتأكد من أنهم يستوفون الشروط الصحية اللازمة.</p> <p>د- الالتحاق بدوام كامل: يجب على المتقدمين الالتزام بأن يكونوا طلاباً بدوام كامل، مكرسين وقتهم وجهودهم لدراساتهم في القسم.</p> <p>هـ- عدم قبول الاستمرار في الدراسة في كلية أخرى. ف- الطلاب غير العراقيين (القادمين) الذين حصلوا على شهادة من مدرسة ثانوية عراقية يتم قبولهم وفقاً للقبول المركزي.</p> <p>ج- قبول 10% من أفضل خريجي المعاهد التقنية.</p> <p>ح- قبول الطلاب الموهوبين.</p> |

### 13. أهم مصادر المعلومات عن البرنامج

1. دليل الجامعة

2. الموقع الإلكتروني للكلية:

<https://uomosul.edu.iq/engineering>

### 14. خطة تطوير البرنامج

- لتعزيز جودة التعليم، ورفع نتائج الخريجين، وتلبية الكفاءات المطلوبة، قرر مجلس القسم اعتماد "نظام بولونيا للتعليم". يتضمن هذا النظام نظام الانتقال والتراكم الأوروبي للوحدات الدراسية (ECTS) بدلاً من النظام المعتمد، وذلك تماشيًا مع التزام القسم بالتحسين المستمر. سيتم تنفيذ النظام الجديد اعتبارًا من العام الأكاديمي 2025-2026. من المتوقع أن يحقق اعتماد عملية بولونيا عدة فوائد:
- التعلم الموجه باتجاه الطالب: يضع النظام الطلاب في صلب عملية التعلم، مما يعزز النظام التعليمي بشكل عام.
  - زيادة التفاعل الصفّي: يعزز التفاعل المستمر بين التدريسين والطلاب بيئة تعليمية أكثر ديناميكية.
  - التركيز على المهارات المهنية والعملية: يوضع التركيز على اكتساب المهارات العملية ذات الصلة بالتطوير المهني.
  - فرصة للتعلم المستمر: سيكون للطلاب فرصة للتعلم والتقييم والملاحظات المستمرة.
  - تقييم الأداء نصف السنوي: يتيح النظام تقييم أداء الطلاب مرتين في السنة، مما يوفر ملاحظات أكثر شمولاً.
- تعميق فهم المواضيع: من المتوقع أن يساهم النظام في تعميق فهم الطلاب للمواضيع.

| ملخص مهارات البرنامج/ المستوى الاول |             |                                     |                           |                   |         |     |     |     |          |     |       |
|-------------------------------------|-------------|-------------------------------------|---------------------------|-------------------|---------|-----|-----|-----|----------|-----|-------|
| مخرجات التعلم المطلوبة من البرنامج  |             |                                     |                           |                   |         |     |     |     |          |     |       |
| Year/Level                          | Course Code | Course Name                         | اسم المادة باللغة العربي  | Basic or optional | المعرفة |     |     |     | المهارات |     | القيم |
|                                     |             |                                     |                           |                   | GO1     | GO2 | GO3 | GO6 | GO4      | GO7 | GO5   |
| 1                                   | EE101       | Basics of Electrical Engineering I  | اسس الهندسة الكهربائية I  | Core              | ✓       |     |     |     |          |     |       |
|                                     | EE102       | Mathematics I                       | الرياضيات I               | Basic             | ✓       |     |     |     |          |     |       |
|                                     | EE103       | Engineering drawing                 | الرسم الهندسي             | Support           | ✓       |     |     |     |          |     |       |
|                                     | EE104       | Physics I                           | الفيزياء I                | Basic             | ✓       |     |     |     |          |     |       |
|                                     | EE105       | Mechanics Engineering               | الهندسة الميكانيكية       | Support           | ✓       |     |     |     |          |     |       |
|                                     | UOM1031     | Computer 1                          | الحاسوب 1                 | Basic             | ✓       |     |     | ✓   |          |     |       |
|                                     | UOM1011     | Arabic Language 1                   | اللغة العربية 1           | Basic             | ✓       |     |     |     |          |     |       |
|                                     | EE108       | Basics of Electrical Engineering II | اسس الهندسة الكهربائية II | Core              | ✓       |     |     |     |          |     |       |
|                                     | EE109       | Mathematics II                      | الرياضيات II              | Basic             | ✓       |     |     |     |          |     |       |
|                                     | EE110       | Computer programming                | برمجة الحاسوب             | Basic             | ✓       |     |     | ✓   |          |     |       |
|                                     | EE111       | Digital Techniques                  | التقنيات الرقمية          | Core              | ✓       |     |     |     |          |     |       |
|                                     | EE112       | Physics II                          | الفيزياء II               | Basic             | ✓       |     |     |     |          |     |       |
|                                     | UOM1040     | Democracy and human rights          | الديمقراطية وحقوق الانسان | Basic             | ✓       |     |     |     |          |     |       |
|                                     | UOM1021     | English language 1                  |                           | Basic             | ✓       |     |     |     | ✓        |     |       |

| ملخص مهارات البرنامج/ المستوى الثاني |             |                                        |                                    |                   |         |     |     |     |          |     |       |
|--------------------------------------|-------------|----------------------------------------|------------------------------------|-------------------|---------|-----|-----|-----|----------|-----|-------|
|                                      |             |                                        | مخرجات التعلم المطلوبة من البرنامج |                   |         |     |     |     |          |     |       |
| Year/Level                           | Course Code | Course Name                            | اسم المادة باللغة العربي           | Basic or optional | المعرفة |     |     |     | المهارات |     | القيم |
|                                      |             |                                        |                                    |                   | GO1     | GO2 | GO3 | GO6 | GO4      | GO7 | GO5   |
| 2                                    | EEPM201     | Electrical Circuits Analysis I         | تحليل الدوائر الكهربائية I         | Core              | ✓       |     |     |     |          |     |       |
|                                      | EEPM202     | Mathematics III                        | الرياضيات III                      | Basic             | ✓       |     |     |     |          |     |       |
|                                      | EEPM203     | Electromagnetic Fields                 | المجالات الكهرومغناطيسية           | Core              | ✓       |     |     |     |          |     |       |
|                                      | EEPM204     | Electrical Transformers                | المحولات الكهربائية                | Core              | ✓       |     |     |     |          |     |       |
|                                      | EEPM205     | Electronics Principles                 | مبادئ الالكترونيات                 | Basic             | ✓       |     |     |     |          |     |       |
|                                      | EEPM206     | Electrical Engineering Lab. I          | مختبرات الهندسة الكهربائية I       | Core              | ✓       |     | ✓   |     |          | ✓   |       |
|                                      | UOM2050     | The crimes of the Baath regime in Iraq | جرائم نظام البعث في العراق         | Basic             | ✓       |     |     |     |          |     |       |
|                                      | UOM2012     | Arabic Language 2                      | اللغة العربية 2                    | Basic             | ✓       |     |     |     |          |     |       |
|                                      | EEPM208     | Electrical Circuits Analysis II        | تحليل الدوائر الكهربائية II        | Core              | ✓       |     |     |     |          |     |       |
|                                      | EEPM209     | Mathematics IV                         | الرياضيات IV                       | Basic             | ✓       |     |     |     |          |     |       |
|                                      | EEPM210     | DC Machines                            | مكائن التيار المستمر               | Core              | ✓       |     |     |     |          |     |       |
|                                      | EEPM211     | Distribution Systems                   | نظم التوزيع                        | Basic             | ✓       |     |     |     |          |     |       |
|                                      | EEPM212     | Renewable Energies sciences            | علوم الطاقات المتجددة              | Core              | ✓       |     |     |     |          |     |       |
|                                      | EEPM213     | Electrical Engineering Lab. II         | مختبرات الهندسة الكهربائية II      | Core              | ✓       |     | ✓   |     |          | ✓   |       |
|                                      | UOM2022     | English language 2                     | اللغة الانكليزية 2                 | Basic             | ✓       |     |     |     | ✓        |     |       |
|                                      | UOM2032     | Computer 2                             | الحاسوب 2                          | Basic             | ✓       |     |     | ✓   |          |     |       |

| ملخص مهارات البرنامج/ المستوى الثالث |             |                                       |                              |                                    |         |     |     |     |          |     |       |
|--------------------------------------|-------------|---------------------------------------|------------------------------|------------------------------------|---------|-----|-----|-----|----------|-----|-------|
|                                      |             |                                       |                              | مخرجات التعلم المطلوبة من البرنامج |         |     |     |     |          |     |       |
| Year/Level                           | Course Code | Course Name                           | اسم المادة باللغة العربي     | Basic or optional                  | المعرفة |     |     |     | المهارات |     | القيم |
|                                      |             |                                       |                              |                                    | GO1     | GO2 | GO3 | GO6 | GO4      | GO7 | GO5   |
| 3                                    | EEPM301     | Mathematics Analysis                  | التحليلات الرياضية           | Basic                              | ✓       |     |     |     |          |     |       |
|                                      | EEPM302     | Transmission Systems                  | نظم النقل                    | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEPM303     | AC Machines                           | مكائن التيار المتناوب        | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEPM304     | Electrical Measurements               | القياسات الكهربائية          | Basic                              | ✓       |     |     |     |          |     |       |
|                                      | EEPM305     | Power Electronics I                   | الالكترونيات القدرة I        | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEPM306     | Power and Machines Lab. I             | مختبرات القدرة والمكائن I    | Core                               | ✓       |     | ✓   |     |          | ✓   |       |
|                                      | EEPM307     | Numerical Analysis                    | التحليلات العددية            | Basic                              | ✓       |     |     |     |          |     |       |
|                                      | EEPM308     | Generation Systems                    | نظم التوليد                  | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEPM309     | Electrical Machines Drives            | مسوقات المكائن الكهربائية    | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEPM310     | Power Electronics II                  | الالكترونيات القدرة II       | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEPM311     | Programmable controllers              | متحكمات مبرمجة               | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEPM312     | Power and Machines Lab. II            | مختبرات القدرة والمكائن II   | Core                               | ✓       |     | ✓   |     |          | ✓   |       |
|                                      | EEPM313     | Engineering Project Design & Planning | تصميم وتخطيط المشروع الهندسي | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEPM314     | English language 3                    | اللغة الانكليزية 3           | Support                            | ✓       |     |     |     | ✓        |     |       |

| ملخص مهارات البرنامج/ المستوى الرابع |             |                                                         |                                                |                                    |         |     |     |     |          |     |       |
|--------------------------------------|-------------|---------------------------------------------------------|------------------------------------------------|------------------------------------|---------|-----|-----|-----|----------|-----|-------|
|                                      |             |                                                         |                                                | مخرجات التعلم المطلوبة من البرنامج |         |     |     |     |          |     |       |
| Year/Level                           | Course Code | Course Name                                             | اسم المادة باللغة العربي                       | Basic or optional                  | المعرفة |     |     |     | المهارات |     | القيم |
|                                      |             |                                                         |                                                |                                    | GO1     | GO2 | GO3 | GO6 | GO4      | GO7 | GO5   |
| 4                                    | EEP 407     | Control systems I                                       | نظم السيطرة I                                  | Core                               | ✓       | ✓   |     |     |          |     |       |
|                                      | EEP 401     | Power System Analysis                                   | I تحليل نظم القدرة                             | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEP 411     | Power System Protection                                 | نظم حماية القدرة                               | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEP 404     | High Voltage Engineering I                              | هندسة الضغط العالي II                          | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEP 403     | Special Electrical Machines I                           | مكائن كهربائية خاصة I                          | Core                               | ✓       |     | ✓   |     |          | ✓   |       |
|                                      | EEP 406     | Electrical Power Generation Stations (Elective Subject) | محطات توليد القدرة الكهربائية<br>مادة اختيارية | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEP 408     | Power and Machines Lab. III                             | مختبرات القدرة والمكائن III                    | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEP 417     | Control systems II                                      | نظم السيطرة II                                 | Support                            | ✓       | ✓   |     |     |          |     |       |
|                                      | EEP 411     | Power System Analysis I I                               | II تحليل نظم القدرة                            | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEP 412     | Power System Protection II                              | نظم حماية القدرة II                            | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEP 414     | High Voltage Engineering II                             | هندسة الضغط العالي II                          | Core                               | ✓       |     | ✓   |     |          | ✓   |       |
|                                      | EEP 413     | Special Electrical Machines II                          | مكائن كهربائية خاصة II                         | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEP 418     | Power and Machines Lab. IV                              | مختبرات القدرة IV والمكائن                     | Core                               | ✓       |     |     |     |          |     |       |
|                                      | EEP 415     | Graduation Project                                      | مشروع التخرج                                   | Core                               | ✓       |     |     |     | ✓        | ✓   |       |
|                                      | EEP 420     | Physics III                                             | الفيزياء III                                   | Core                               | ✓       |     |     |     |          |     |       |

|  |         |           |          |      |   |  |  |  |  |  |  |
|--|---------|-----------|----------|------|---|--|--|--|--|--|--|
|  | EEP 421 | Chemistry | الكيمياء | Core | ✓ |  |  |  |  |  |  |
|--|---------|-----------|----------|------|---|--|--|--|--|--|--|

Ministry of Higher Education and  
FORM



نموذج وصف المادة الدراسية n 1

| Module Information                 |                                                                |                               |                                                                                                                                                                                                                                                     |
|------------------------------------|----------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                                                |                               |                                                                                                                                                                                                                                                     |
| Module Title                       | Basics of Electrical Engineering I<br>اسس الهندسة الكهربائية I |                               | Module Delivery                                                                                                                                                                                                                                     |
| Module Type                        | Core                                                           |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | EE101                                                          |                               |                                                                                                                                                                                                                                                     |
| ECTS Credits                       | 8                                                              |                               |                                                                                                                                                                                                                                                     |
| SWL (hr./sem)                      | 200                                                            |                               |                                                                                                                                                                                                                                                     |
| Module Level                       | UGI                                                            | Semester of Delivery          |                                                                                                                                                                                                                                                     |
| Administering Department           | 2 - (Electrical Engineering)                                   | College                       | UoM2 - (Engineering)                                                                                                                                                                                                                                |
| Module Leader                      | اسم رئيس القسم                                                 | e-mail                        | البريد الالكتروني لرئيس القسم                                                                                                                                                                                                                       |
| Module Leader's Acad. Title        | لقبه العلمي                                                    | Module Leader's Qualification | الشهادة                                                                                                                                                                                                                                             |
| Module Tutor                       | Dr. Omar Muwafaq Mahmood                                       | e-mail                        | omer_alymousif@uomosul.edu.iq                                                                                                                                                                                                                       |
| Peer Reviewer Name                 | اسم مُراجع الملف                                               | e-mail                        | بريده الالكتروني                                                                                                                                                                                                                                    |
| Scientific Committee Approval Date | 01/06/2023                                                     | Version Number                | 1.0                                                                                                                                                                                                                                                 |

| Relation with other Modules                              |                                                                                     |          |  |
|----------------------------------------------------------|-------------------------------------------------------------------------------------|----------|--|
| العلاقة مع المواد الدراسية الأخرى                        |                                                                                     |          |  |
| Prerequisite module                                      | None                                                                                | Semester |  |
| Co-requisites module                                     | None                                                                                | Semester |  |
| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                     |          |  |
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                     |          |  |
|                                                          | 1. To develop problem solving skills and understanding of DC circuit theory through |          |  |

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | the application of techniques.<br>2. To understand voltage, current and power from a given DC circuit.<br>3. This course deals with the basic concept of DC electrical circuits.<br>4. This is the basic subject for all DC electrical and electronic circuits.<br>5. To understand Kirchhoff's current and voltage Laws problems.<br>6. To perform mesh and Nodal analysis.<br>7. To perform Thevenin and superposition theory.                                                                                                                                                                                                                |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 1. Recognize how electricity works in electrical circuits.<br>2. List the various terms associated with electrical circuits.<br>3. Summarize what is meant by a basic electric circuit.<br>4. Describe electrical voltage, current and power.<br>5. Define Ohm's law.<br>6. Identify the basic circuit passive and active elements and their applications.<br>7. Discuss the various properties of resistors.<br>8. Explain the two Kirchhoff's laws used in circuit analysis.<br>9. Explain the Analysis Methods used in Electrical Circuits.                                                                                                  |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | Indicative content includes the following.<br><br><b><u>Part A - Circuit Components and values</u></b><br><br>DC circuits, Current and voltage definitions, Passive sign convention and circuit elements, Resistive networks, real and ideal elements, voltage and current sources. [9 hrs.]<br>Lab. [6 hrs.]<br><br>Revision problem and tutorial classes [6 hrs.]<br>Quizzes [1 hr.]<br><b><u>Part B- Circuit reduction</u></b><br><br>combining sources, Combining resistive elements in series and parallel, delta and star transformation. [12 hrs.]<br>Revision problem and tutorial classes [8 hrs.]<br>Lab. [8 hrs.]<br>Quizzes [1 hr.] |
|                                                                  | <b><u>Part C- Circuit Theory</u></b><br><br>Kirchhoff's laws and Ohm's law. Introduction to mesh and nodal analysis, Introduction to Thevenin and Norton theory, maximum power transfer, introduction to superposition theory. [24 hrs.]<br><br>Revision problem and tutorial classes [16 hrs.]<br>Lab. [16 hrs.]<br>Quizzes [1 hr.]                                                                                                                                                                                                                                                                                                            |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |

| <b>Student Workload (SWL)</b> |
|-------------------------------|
|-------------------------------|

| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا                                        |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 123 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 8 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 77  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 200 |                                                                           |   |

| Module Evaluation           |                     |             |                  |            |                           |
|-----------------------------|---------------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية       |                     |             |                  |            |                           |
|                             |                     | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b> | <b>Quizzes</b>      | 1           | 10% (10)         | 4,8,12     | LO #1, 5, 8 and 9         |
|                             | <b>Assignments</b>  | 10          | 5% (5)           | 2 to 12    | LO #1, 2, 4, 6 7, 8 and 9 |
|                             | <b>Lab.</b>         | 2           | 30% (12)         | Continuous | All                       |
|                             | <b>Report</b>       | 0           | 0% (0)           | ----       | ----                      |
| <b>Summative assessment</b> | <b>Midterm Exam</b> | 2 hr.       | 10% (10)         | 7          | LO # 1-5                  |
|                             | <b>Final Exam</b>   | 3hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                     |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                                                                                                                                                   |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| المناهج الاسبوعي النظري         |                                                                                                                                                                                                                                                                                   |
|                                 | Material Covered                                                                                                                                                                                                                                                                  |
| <b>Week 1</b>                   | Basic Concept & Units: Electricity & atomic structure of substance, current and current density, current flow, electric circuit, E.M. F & potential difference                                                                                                                    |
| <b>Week 2</b>                   | international system of unit, abbreviation for multiples & sub-multiples, quantities derived from SI units, units of force-energy-torque and power, relation between energy and heat, electric units, efficiency & percentage efficiency, electromechanical equivalent of element |
| <b>Week 3</b>                   | Ohm's law, resistivity & conductivity                                                                                                                                                                                                                                             |
| <b>Week 4</b>                   | temperature affect, internal resistance of a source, open circuit & short circuit                                                                                                                                                                                                 |
| <b>Week 5</b>                   | equivalent resistance: Series-parallel-circulating current method-floating source method & grouping of E.M.F. sources, double subscript                                                                                                                                           |
| <b>Week 6</b>                   | power calculation in D.C circuit                                                                                                                                                                                                                                                  |
| <b>Week 7</b>                   | Kirchhoff's laws: KVL-KCL                                                                                                                                                                                                                                                         |
| <b>Week 8</b>                   | Mid-term Exam                                                                                                                                                                                                                                                                     |
| <b>Week 9</b>                   | introduction to network theorems, types of source: independent and dependent voltage and current sources and their transformation                                                                                                                                                 |
| <b>Week 10</b>                  | Maxwell's circulating currents (mesh analysis)                                                                                                                                                                                                                                    |
| <b>Week 11</b>                  | nodal analysis                                                                                                                                                                                                                                                                    |
| <b>Week 12</b>                  | superposition theorem                                                                                                                                                                                                                                                             |
| <b>Week 13</b>                  | Thevenin's theorem and Norton's theorem                                                                                                                                                                                                                                           |
| <b>Week 14</b>                  | maximum power transfer theorem                                                                                                                                                                                                                                                    |
| <b>Week 15</b>                  | millman theorem, substitution theorem and reciprocity theorem                                                                                                                                                                                                                     |
| <b>Week 16</b>                  | <b>Preparatory week before the final Exam</b>                                                                                                                                                                                                                                     |

| Delivery Plan (Weekly Lab. Syllabus) |                                                                                                              |         |           |                           |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------|---------|-----------|---------------------------|
| المنهاج الاسبوعي للمختبر             |                                                                                                              |         |           |                           |
|                                      | Material Covered                                                                                             |         |           |                           |
| Week 1                               | Lab 1: Introduction to lab. components                                                                       |         |           |                           |
| Week 2                               | Lab 2: Introduction to AVO meter (analog and digital)                                                        |         |           |                           |
| Week 3                               | Lab 3: Introduction to resistance measurements (practical and color code)                                    |         |           |                           |
| Week 4                               | Lab 4: resistance temperature affect, internal resistance of a source, open circuit & short circuit          |         |           |                           |
| Week 5                               | Lab 5: ohm’s Law                                                                                             |         |           |                           |
| Week 6                               | Lab 6: series and parallel resistance                                                                        |         |           |                           |
| Week 7                               | Lab 7: resistance delta and star transformation                                                              |         |           |                           |
| Week 8                               | Lab 8: Kirchhoff's Voltage Law                                                                               |         |           |                           |
| Week 9                               | Lab 9: Kirchhoff's Current Law                                                                               |         |           |                           |
| Week 10                              | Lab 10: implementation of Maxwell’s circulating currents (mesh analysis)                                     |         |           |                           |
| Week 11                              | Lab 11: implementation of Nodal analysis                                                                     |         |           |                           |
| Week 12                              | Lab 12: implementation of Superposition theorem                                                              |         |           |                           |
| Week 13                              | Lab 13: implementation of Thevenin’s / Norton's Theorem                                                      |         |           |                           |
| Week 14                              | Lab 14: implementation of maximum power transfer theorem                                                     |         |           |                           |
| Week 15                              | Lab 15: DC power measurements (methods and instrumentations)                                                 |         |           |                           |
| Learning and Teaching Resources      |                                                                                                              |         |           |                           |
| مصادر التعلم والتدريس                |                                                                                                              |         |           |                           |
|                                      | Text                                                                                                         |         |           | Available in the Library? |
| Required Texts                       | Engineering Circuit Analysis 7th Edition<br>by William Hayt , Jack Kemmerly , Steven Durbin                  |         |           | Yes                       |
| Recommended Texts                    | Schaum's Outline of Basic Circuit Analysis, Second Edition (Schaum's Outlines) 2nd Edition, by John O'Malley |         |           | No                        |
| Websites                             | DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2017.                                   |         |           |                           |
| Grading Scheme                       |                                                                                                              |         |           |                           |
| مخطط الدرجات                         |                                                                                                              |         |           |                           |
| Group                                | Grade                                                                                                        | التقدير | Marks (%) | Definition                |

|                                     |                         |                     |          |                                       |
|-------------------------------------|-------------------------|---------------------|----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100 | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89  | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79  | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69  | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59  | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)  | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)   | Considerable amount of work required  |
|                                     |                         |                     |          |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| Module Information                        |                               |                                                                                                                                                                                                                                                     |                         |
|-------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| معلومات المادة الدراسية                   |                               |                                                                                                                                                                                                                                                     |                         |
| <b>Module Title</b>                       | Mathematics I<br>I الرياضيات  |                                                                                                                                                                                                                                                     | <b>Module Delivery</b>  |
| <b>Module Type</b>                        | Basic                         | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                         |
| <b>Module Code</b>                        | EE102                         |                                                                                                                                                                                                                                                     |                         |
| <b>ECTS Credits</b>                       | 6                             |                                                                                                                                                                                                                                                     |                         |
| <b>SWL (hr./sem)</b>                      | 150                           |                                                                                                                                                                                                                                                     |                         |
| <b>Module Level</b>                       | UGI                           | <b>Semester of Delivery</b>                                                                                                                                                                                                                         | 1                       |
| <b>Administering Department</b>           | 2 - (Electrical Engineering)  | <b>College</b>                                                                                                                                                                                                                                      | UoM2 - (Engineering)    |
| <b>Module Leader</b>                      | أ.م.د. عمر شرف الدين          | <b>e-mail</b>                                                                                                                                                                                                                                       |                         |
| <b>Module Leader's Acad. Title</b>        | لقبه العلمي                   | <b>Module Leader's Qualification</b>                                                                                                                                                                                                                | الشهادة                 |
| <b>Module Tutor</b>                       | Dr. Mohammed Abdulmalek Ahmed | <b>e-mail</b>                                                                                                                                                                                                                                       | Ahmedm86@uomosul.edu.iq |
| <b>Peer Reviewer Name</b>                 |                               | <b>e-mail</b>                                                                                                                                                                                                                                       |                         |
| <b>Scientific Committee Approval Date</b> | 29/03/2026                    | <b>Version Number</b>                                                                                                                                                                                                                               | 1.0                     |

| Relation with other Modules       |      |                 |  |
|-----------------------------------|------|-----------------|--|
| العلاقة مع المواد الدراسية الأخرى |      |                 |  |
| <b>Prerequisite module</b>        | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>       | None | <b>Semester</b> |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>8. Student be able to solve simultaneous linear equations and inequalities involving the square root and modulus function.</li> <li>9. know addition and double-angle formulas for trigonometric functions and use them to express values of trigonometric functions in the surds form.</li> <li>10. Student be able to recognize odd, even, periodic, increasing, decreasing functions.</li> <li>11. understand the operation of composition of functions and the concept of functional inverse.</li> <li>12. recognize linear, quadratic, power, polynomial, algebraic, rational, trigonometric, exponential, hyperbolic and logarithmic functions and sketch their graphs.</li> <li>13. be able to calculate limits by substitution and by eliminating zero denominators.</li> <li>14. know derivatives of power, trigonometric, exponential, hyperbolic, logarithmic and inverse trigonometric functions.</li> <li>15. know the basic rules of differentiation and use them to find derivatives of products and quotients.</li> <li>16. know the chain rule and use it to find derivatives of composite functions.</li> </ol> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>On completion of this course students will be expected to</p> <ol style="list-style-type: none"> <li>10. be able to solve algebraic equations and inequalities involving the square root and modulus function.</li> <li>11. understand the difference between equations and identities, and be able to prove simple identities and inequalities.</li> <li>12. know addition and double-angle formulas for trigonometric functions and use them to express values of trigonometric functions in the surds form.</li> <li>13. be able to recognize odd, even, periodic, increasing, decreasing functions.</li> <li>14. understand the operation of composition of functions and the concept of functional inverse.</li> <li>15. to able to recognize linear, quadratic, power, polynomial, algebraic, rational, trigonometric, exponential, hyperbolic and logarithmic functions and sketch their graphs.</li> </ol>                                                                                                                                                                                                                                                    |
|                                                                             | <ol style="list-style-type: none"> <li>16. be able to calculate limits by substitution and by eliminating zero denominators.</li> <li>17. be able to calculate limits at infinity of rational functions.</li> <li>18. know derivatives of power, trigonometric, exponential, hyperbolic, logarithmic and inverse trigonometric functions.</li> <li>19. know the basic rules of differentiation and use them to find derivatives of products and quotients.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | 20. know the chain rule and use it to find derivatives of composite functions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Indicative Contents</b><br>المحتويات الإرشادية | <p>Indicative content includes the following.</p> <p><b><u>Part A – Matrices</u></b></p> <p>Basic Definitions, Addition, Subtraction and Multiplication, Determinants, The Inverse of a 3 x 3 Matrix, Cramers Rule, Solve equations by Matrices: Gaussian Elimination. the method of finding the inverse of a square matrix, solution of simultaneous linear equations by matrix method. [8 hrs.]</p> <p>Revision problem and tutorial classes [2 hrs.]<br/>Quizzes [1 hr.]</p> <p><b><u>Part B - Coordinates and Graphs in the Plane</u></b></p> <p>Directions and Quadrants, Distance between Points, Graphs of Equations, Intercepts and More about Graphing, Slope and Equations for Lines: Slope of Non-vertical Lines, Lines that are Parallel or Perpendicular, Point – Slope Equations, Slope – Intercept Equations, Functions and their Graphs, Domains and Ranges are Often Intervals, Even Functions and Odd Functions, Functions Defined in Pieces, Shifts, Circles, and Parabolas: How to Shift a Graph, Equations for Circles in the Plane, Equations for Parabolas, A Review of Trigonometric Functions: Radian Measure, The Six Basic Trigonometric Functions, Calculating Sines and Cosines, Graphs of Trigonometric Functions, Limits and Continuity: Limits, Examples of Limits, The Sandwich Theorem and ( )/ , Limits Involving Infinity, Continuous Functions.. [14 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]<br/>Quizzes [2 hr.]</p> <p><b><u>Part C- Derivatives</u></b></p> <p>Slopes, Tangent Lines, and Derivatives, Defining Slopes and Tangent Lines, The Derivative of a function, The Slope of Lines, Differentiation Rules: Integer Powers, Multiples, Sums, and Differences, Second and Higher Order Derivatives, Negative Integer Powers of x, Velocity, Speed, and Other Rate of Change: Velocity, Speed, Acceleration, Derivatives of Trigonometric Functions: The Derivative of the Sine, The Derivative of the Cosine, The Derivative of the Other Basic Functions, The Chain Rule: Integer Powers of Differentiable Functions, Derivative Formulas that Include the Chain Rule, Implicit Differentiation and Fractional Powers: Lenses, Tangents, and Normal Lines, Using Implicit Differentiation to Find Derivatives of Higher Order, Fractional Powers of Differentiable Functions, Linear Approximations and Differentials. [24 hrs.]</p> <p>Revision problem and tutorial classes [6 hrs.]<br/>Quizzes [2 hr.]</p> |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |

| Student Workload (SWL)                      |     |                                          |   |
|---------------------------------------------|-----|------------------------------------------|---|
| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا     |     |                                          |   |
| Structured SWL (h/sem)                      | 63  | Structured SWL (h/w)                     | 4 |
| الحمل الدراسي المنتظم للطالب خلال الفصل     |     | الحمل الدراسي المنتظم للطالب أسبوعيا     |   |
| Unstructured SWL (h/sem)                    | 87  | Unstructured SWL (h/w)                   | 6 |
| الحمل الدراسي غير المنتظم للطالب خلال الفصل |     | الحمل الدراسي غير المنتظم للطالب أسبوعيا |   |
| Total SWL (h/sem)                           | 150 |                                          |   |
| الحمل الدراسي الكلي للطالب خلال الفصل       |     |                                          |   |

| Module Evaluation     |              |             |                  |          |                           |
|-----------------------|--------------|-------------|------------------|----------|---------------------------|
| تقييم المادة الدراسية |              |             |                  |          |                           |
|                       |              | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes      | 3           | 15% (15)         | 4,8,12   | LO #2, 5, 8, 9 and 11     |
|                       | Assignments  | 1           | 5% (5)           | 7        | LO #2, 3, 4, 5 and 6      |
|                       | Homework     | 3           | 12% (12)         | 4,8,10   | LO #2-3, 4-7 and 8-9      |
|                       | Report       | 1           | 8% (8)           | 8        |                           |
| Summative assessment  | Midterm Exam | 1.5 hr      | 10% (10)         | 7        | LO # 1-9                  |
|                       | Final Exam   | 3hr         | 50% (50)         | 16       | All                       |
| Total assessment      |              |             | 100% (100 Marks) |          |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                                                                                                             |
|                                 | Material Covered                                                                                                                                                            |
| Week 1                          | <b>Matrices:</b> Basic Definitions, Addition, Subtraction and Multiplication, Determinants, The Inverse of a 3 x 3 Matrix, Creamers Rule.                                   |
| Week 2                          | <b>Solve equations by Matrices:</b> Gaussian Elimination. the method of finding the inverse of a square matrix, solution of simultaneous linear equations by matrix method. |
| Week 3                          | <b>Coordinates and Graphs in the Plane:</b> Directions and Quadrants, Distance between Points, Graphs of Equations, Intercepts and More about Graphing.                     |
| Week 4                          | <b>Slope and Equations for Lines:</b> Slope of Non-vertical Lines, Lines that are Parallel or                                                                               |

|         |                                                                                                                                                                      |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | Perpendicular, Point – Slope Equations, Slope – Intercept Equations.                                                                                                 |
| Week 5  | <b>Functions and their Graphs:</b> Domains and Ranges are Often Intervals, Even Functions and Odd Functions, Functions Defined in Pieces.                            |
| Week 6  | <b>Shifts, Circles, and Parabolas:</b> How to Shift a Graph, Equations for Circles in the Plane, Equations for Parabolas.                                            |
| Week 7  | <b>A Review of Trigonometric Functions:</b> Radian Measure, The Six Basic Trigonometric Functions, Calculating Sines and Cosines, Graphs of Trigonometric Functions. |
| Week 8  | <b>Limits and Continuity:</b> Limits, Examples of Limits, The Sandwich Theorem and ( )/ , Limits Involving Infinity, Continuous Functions.                           |
| Week 9  | <b>Derivatives:</b> Slopes, Tangent Lines, and Derivatives, Defining Slopes and Tangent Lines The Derivative of a function, The Slope of Lines.                      |
| Week 10 | <b>Differentiation Rules:</b> Integer Powers, Multiples, Sums, and Differences<br>Second and Higher Order Derivatives, Negative Integer Powers of x.                 |
| Week 11 | <b>Velocity, Speed, and Other Rate of Change:</b> Velocity, Speed, Acceleration                                                                                      |
| Week 12 | <b>Derivatives of Trigonometric Functions:</b> The Derivative of the Sine, The Derivative of the Cosine, The Derivative of the Other Basic Functions.                |
| Week 13 | <b>The Chain Rule:</b> Integer Powers of Differentiable Functions, Derivative Formulas that Include the Chain Rule.                                                  |
| Week 14 | <b>Implicit Differentiation:</b> Lenses, Tangents, and Normal Lines<br>Using Implicit Differentiation to Find Derivatives of Higher Order.                           |
| Week 15 | <b>Fractional Powers:</b> Fractional Powers of Differentiable Functions, Linear Approximations and Differentials.                                                    |
| Week 16 | <b>Preparatory week before the final Exam</b>                                                                                                                        |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                        | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Calculus, Thirteenth Edition, by George B. Thomas,                                          | Yes                       |
| <b>Recommended Texts</b> | Calculus, Mathematics for Engineers and Technologists, 2002, by Huw Fox and Bill Bolton.    | No                        |
| <b>Websites</b>          | Khan Academy math ( <a href="https://www.khanacademy.org">https://www.khanacademy.org</a> ) |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

|                                           |                                             |                                                                                                                                                                                                                                          |
|-------------------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Title</b>                       | <b>Engineering Drawing</b><br>الرسم الهندسي | <b>Module Delivery</b>                                                                                                                                                                                                                   |
| <b>Module Type</b>                        | <b>Support</b>                              | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| <b>Module Code</b>                        | <b>EE103</b>                                |                                                                                                                                                                                                                                          |
| <b>ECTS Credits</b>                       | <b>4</b>                                    |                                                                                                                                                                                                                                          |
| <b>SWL (hr./sem)</b>                      | <b>100</b>                                  |                                                                                                                                                                                                                                          |
| <b>Module Level</b>                       | UGI                                         | <b>Semester of Delivery</b>                                                                                                                                                                                                              |
| <b>Administering Department</b>           | 2 - (Electrical Engineering)                | <b>College</b> UoM2 - (Engineering)                                                                                                                                                                                                      |
| <b>Module Leader</b>                      | اسم رئيس القسم                              | <b>e-mail</b> البريد الالكتروني لرئيس القسم                                                                                                                                                                                              |
| <b>Module Leader's Acad. Title</b>        | لقبه العلمي                                 | <b>Module Leader's Qualification</b> الشهادة                                                                                                                                                                                             |
| <b>Module Tutor</b>                       | Sura Mohammad Adil Alhayali                 | <b>e-mail</b> sura_alhayali@uomosul.edu.iq                                                                                                                                                                                               |
| <b>Peer Reviewer Name</b>                 | اسم مُراجع الملف                            | <b>e-mail</b> بريده الالكتروني                                                                                                                                                                                                           |
| <b>Scientific Committee Approval Date</b> | 24/03/2026                                  | <b>Version Number</b> 1.0                                                                                                                                                                                                                |

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

**Module Aims, Learning Outcomes and Indicative Contents**

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                    |                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b> | 17. To develop the engineer's ability to imagine projections and their models.<br>18. Engineering drawing exercises hand movement to complete quick sketches.<br>19. This course deals with theory of Orthographic Projection.<br>20. This is the basic subject for isometric drawing. |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية                                                       | <p>21. To teach students engineering drawings using AutoCAD program, and this includes both theoretical lectures and Lab.</p> <p>22. To help students to use AutoCAD for engineering drawings efficiently in their designs &amp; projects.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>21. Absorbing all the engineering characteristics of an object or a product in a clear manner.</p> <p>22. Know the tools used in engineering drawing and how to use them correctly</p> <p>23. understand and apply the basics of engineering processes.</p> <p>24. Conclude projections and isometric for each geometric figure and recognize its dimensions.</p> <p>25. students will be able to use AutoCAD commands to make drawings</p> <p>26. create &amp; insert symbols, dimension in a drawing, create blocks, and plot drawings with certain scales.</p>                                                                                                                                                                                                                                                         |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><b><u>Part A – tools, lines, scale, Engineering processes (part 1) &amp; getting started, view commands</u></b></p> <p>Introduction to engineering drawing, learn about engineering tools and how to use them. Types of pens, Billboard layout and address field preparation, Types of lines [3 hrs.]</p> <p>Classwork 1. [2 hrs.]</p> <p>Defining the drawing scale and its types, apply and draw engineering processes [3 hrs.]</p> <p>Classwork 2. [2 hrs.]</p> <p>Lab: Getting started, view Commands [10 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part B- Engineering processes (part 2) , Orthographic Projection (part 1) &amp; Drawing , modify I Commands</u></b></p> <p>Draw tangents, Types of projections resulting from vertical projection. [6 hrs.]</p> |
|                                                                             | <p>Classwork 3. [2 hrs.] , Classwork 4. [2 hrs.]</p> <p>Lab: Drawing Commands, modify I Commands [10 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part C- Orthographic Projection (part 2) , Isometric Drawing &amp; Modify II, Dimensions , text Commands</u></b></p> <p>Arrangement and drawing of projections, draw the isometrically axis, Imagine and draw the isometrically body [8 hrs.]</p> <p>Classwork 5. [2 hrs.] , Classwork 6. [2 hrs.]</p> <p>Lab: Modify II Commands, Dimension Commands, Text Commands [8 hrs.]</p> <p>Quizzes [1 hr.]</p>                                                                                                                                                                                                                                                                      |
| <b>Learning and Teaching Strategies</b>                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## استراتيجيات التعلم والتعليم

### Strategies

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 37  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 2 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |   |

### Module Evaluation

تقييم المادة الدراسية

|                             |                          | Time/Number | (Marks)          | Weight | Week Due | Relevant Learning Outcome |
|-----------------------------|--------------------------|-------------|------------------|--------|----------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>           | 2           | 2×4=8            | 8%     |          | LO #1, 5, 8 and 9         |
|                             | <b>Assignments (H.W)</b> | 4           | 4×2=8            | 8%     |          | LO #1, 2, 4, 6 7, 8 and 9 |
|                             | <b>Assignments (C.W)</b> | 2           | 2×2=4            | 4%     |          |                           |
|                             | <b>Lab.</b>              | 4           | 4×5=20           | 20%    |          | All                       |
|                             | <b>Report</b>            | 0           | 0                | 0%     |          | ----                      |
| <b>Summative assessment</b> | <b>Midterm Exam</b>      | 2 hr        | 10               | 10%    |          | LO # 1-5                  |
|                             | <b>Final Exam</b>        | 3hr         | 50               | 50%    |          | All                       |
| <b>Total assessment</b>     |                          |             | 100% (100 Marks) |        |          |                           |

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|               | Material Covered                                                                                                            |
|---------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b> | Introduction and definition of engineering drawing, learn about engineering tools, Types of pens used, Drawing board layout |
| <b>Week 2</b> | Types of lines in engineering drawing, Defining the drawing scale and its types                                             |
| <b>Week 3</b> | Classwork 1                                                                                                                 |
| <b>Week 4</b> | Engineering processes (part 1): Teaching students how to apply and draw line relationships                                  |

|                |                                                                                            |
|----------------|--------------------------------------------------------------------------------------------|
| <b>Week 5</b>  | Classwork 2                                                                                |
| <b>Week 6</b>  | Engineering processes (part 2): Making tangents, reverse curves                            |
| <b>Week 7</b>  | Classwork 3                                                                                |
| <b>Week 8</b>  | Mid-term Exam                                                                              |
| <b>Week 9</b>  | Orthographic Projection (part 1): theory of Orthographic Projection, combination of views  |
| <b>Week 10</b> | Classwork 4                                                                                |
| <b>Week 11</b> | Orthographic Projection (part 1): Arrangement and drawing of projections                   |
| <b>Week 12</b> | Classwork 5                                                                                |
| <b>Week 13</b> | Isometric Drawing, I: draw the isometrically axis, Imagine and draw the isometrically body |
| <b>Week 14</b> | Classwork 6                                                                                |
| <b>Week 15</b> | Isometric Drawing II: isometric circles                                                    |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                              |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المناهج الاسبوعي للمختبر |                                                                  |
|-------------------------------------------------------------------------|------------------------------------------------------------------|
|                                                                         | <b>Material Covered</b>                                          |
| <b>Week 1</b>                                                           | Lab 1: start a new drawing, user Interface, units, limits        |
| <b>Week 2</b>                                                           | Lab 2: grid, snap, absolute & relative coordinate system, ortho. |
| <b>Week 3</b>                                                           | Lab 3: zoom, pan, osnap, polar tracking                          |
| <b>Week 4</b>                                                           | Lab 4: pline, pedit, selecting object, erase                     |
| <b>Week 5</b>                                                           | Lab 5: ltype, ltscale.                                           |
| <b>Week 6</b>                                                           | Lab 6: line, arc, circle, ellipse                                |

|                |                                           |
|----------------|-------------------------------------------|
| <b>Week 7</b>  | Lab 7: polygon, rectangle                 |
| <b>Week 8</b>  | Lab 8: copy, move, mirror, trim, rotate   |
| <b>Week 9</b>  | Lab 9: scale, undo, redo, stretch, divide |
| <b>Week 10</b> | Lab 10: extend, offset.                   |
| <b>Week 11</b> | Lab 11: array, Lweight , Measure          |
| <b>Week 12</b> | Lab 12: Fillet , Chamfer, Explode         |
| <b>Week 13</b> | Lab 13: Text, Mtext, Area                 |
| <b>Week 14</b> | Lab 14: Dimensions & Leaders, color       |
| <b>Week 15</b> | Lab 15: Block, plot.                      |

| Learning and Teaching Resources |                                                                                                                                |                           |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                |                           |
|                                 | Text                                                                                                                           | Available in the Library? |
| <b>Required Texts</b>           | Engineering Drawing and Graphic Technology ,<br>By French & Vierk , Steven Durbin , Twelve Edition                             | No                        |
|                                 | كتاب الرسم الهندسي المساعد<br>تأليف : أ.م. ثامر محمد نوري & م. سري عبد الرزاق مجيد , 2021                                      |                           |
| <b>Recommended Texts</b>        | كتاب الرسم الهندسي<br>تأليف : الأستاذ عبد الرسول الخفاف , 1986                                                                 | No                        |
|                                 | الرسم المعماري والهندسي بمساعدة الحاسوب<br>تأليف : د. عماد هاني العلاف , 2018                                                  | No                        |
|                                 | اساسيات الرسم الهندسي<br>تأليف : احمد نظام محمد الحيايلى , 2022                                                                | No                        |
|                                 |                                                                                                                                |                           |
| <b>Websites</b>                 | : دروس تعليم اوتوكاد 2014<br><a href="https://www.dailymotion.com/video/x31bg6x">https://www.dailymotion.com/video/x31bg6x</a> |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

|                                           |                                |                                                                                                                                                                                                                                                                                    |
|-------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Title</b>                       | <b>Physics I</b><br>الفيزياء I | <b>Module Delivery</b>                                                                                                                                                                                                                                                             |
| <b>Module Type</b>                        | <b>Basic</b>                   | <input checked="" type="checkbox"/> <b>Theory</b><br><input type="checkbox"/> <b>Lecture</b><br><input type="checkbox"/> <b>Lab</b><br><input checked="" type="checkbox"/> <b>Tutorial</b><br><input type="checkbox"/> <b>Practical</b><br><input type="checkbox"/> <b>Seminar</b> |
| <b>Module Code</b>                        | <b>EE104</b>                   |                                                                                                                                                                                                                                                                                    |
| <b>ECTS Credits</b>                       | <b>4</b>                       |                                                                                                                                                                                                                                                                                    |
| <b>SWL (hr./sem)</b>                      | <b>100</b>                     |                                                                                                                                                                                                                                                                                    |
| <b>Module Level</b>                       | 1                              | <b>Semester of Delivery</b> 1                                                                                                                                                                                                                                                      |
| <b>Administering Department</b>           | (Electrical Engineering)       | <b>College</b> (Engineering)                                                                                                                                                                                                                                                       |
| <b>Module Leader</b>                      | Dr. Omar Sh. Alyozbak          | <b>e-mail</b> o.yehya@uomosul.edu.iq                                                                                                                                                                                                                                               |
| <b>Module Leader's Acad. Title</b>        | Asst. Prof                     | <b>Module Leader's Qualification</b> Doctor                                                                                                                                                                                                                                        |
| <b>Module Tutor</b>                       | Mr. Ahmad Abduljabbar Ismael   | <b>e-mail</b> a.a.ismail@uomosul.edu.iq                                                                                                                                                                                                                                            |
| <b>Peer Reviewer Name</b>                 | Mr. Omar Turath                | <b>e-mail</b> omartawfeeq_1981@uomosul.edu.iq                                                                                                                                                                                                                                      |
| <b>Scientific Committee Approval Date</b> | 29/11/2025                     | <b>Version Number</b> 1.0                                                                                                                                                                                                                                                          |

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

**Module Aims, Learning Outcomes and Indicative Contents**

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|  |                                                                                                                                                                                                                                                                                                                                                  |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>23. To understand many principles and units and their abbreviations correctly in the physics, such as State SI units, determine whether a physical quantity is a vector or a scalar, and distinguish between kinematic and kinetic energy.</p> <p>24. To understand Differentiate between static and kinetic friction, and solve friction</p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>problems; State and apply Hooke's law for ideal springs; Define work, and calculate the work done by a constant force in one and two dimensions.</p> <p>25. This course deals with Define, calculate, and distinguish between distance and displacement, average and instantaneous speed and velocity, and average and instantaneous acceleration; State, explain, and apply Newton's three laws of motion.</p> <p>26. This course deals with the basic concept of the State the work–energy theorem, and use it to solve problems; Apply the principle of conservation of mechanical energy to solve simple problems in mechanics; Calculate both kinetic and potential energy; Calculate the power.</p> <p>27. To develop problem, solve problems using Newton's law of universal gravitation and calculate the gravitation for different locations (i.e., Earth, Moon, Sun and etc.); Derive the equation of continuity for fluids.</p> <p>28. To perform and analysis of heat transfer through the facades of the buildings; Define and describe the flow of heat through a material by direct molecular contact (conduction); Derive the equation of heat transfer by conduction.</p> <p>29. To understand energy level and atomic structure through energy-band theory of materials; Internal structure of materials of materials including metals, insulators and semiconductors; Electrical conduction and characteristics of the all materials such as conductivity, Mobility, energy distribution of electrons, Fermi levels, work function, and electronic emission.</p> <p>30. To perform current-voltage characteristics, charge control description for all types of both the diode and transistors.</p> <p>31. To model small signal and large signal of the active electronic devices such as DC load line and AC load line concept.</p> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>27. Determine whether a physical quantity is a vector or a scalar; State, explain, and apply Newton's three laws of motion; State and apply Hooke's law for ideal springs; State the work–energy theorem, and use it to solve problems; Express Newton's laws in terms of rates of change of linear momentum; Calculate the pressure and density of fluid at different depth.</p> <p>28. Define and describe the Bohr model of an atom; Define electron, proton, neutron, and nucleus; Explain electron shells and orbits; Explain insulators, conductors, and semiconductors and how they differ; Define valence band and conduction band Compare a semiconductor atom to a conductor atom.</p> <p>29. Understanding of the fundamental concepts of current and voltage; Explain the of electrical circuit element and its objects; Define Ohm's Law; Define Power and Energy; Calculate Power and Energy.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                             | <p>30. Describe Analysis the Electric Circuits in Parallel and Series connection; Define Kirchhoff's law; Analysis the Electric Circuits using Kirchhoff's law; Solve problems using Kirchhoff's law; Explain the electrical symbol for a diode; Define bias and its effect on the depletion region; Define barrier potential and its effects; Several Diode Applications.</p> <p>31. Discuss the various properties of diodes and transistors.</p> <p>32. Explain the homo-junction and Hetero-junction materials such as PN junction diodes, PNP transistors, and NPN transistors.</p> <p>33. Explain the other types of semiconductor diodes: Varactor diode, tunnel diode, photodiode and photovoltaic (solar) cell, Light emitting diode, metal electronic.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p><b><u>Part A - Introduction to physics</u></b></p> <p>Physics quantities, Length, mass and time; Kinematics; Position, Displacement and Distance; Speed, Velocity and Acceleration; Forces and motion; Mass and gravity force; Newton's three laws of motion. Spring forces and Hooke's law; Friction forces; Uniform circular motion; Work; Kinetic and Potential Energy; The work-kinetic energy theorem; Conservation of total mechanical energy; and Power. Linear momentum; Momentum and kinetic energy; Rate of change of linear momentum and Newton's laws; Law of conservation of linear momentum; Impulse; and Simple Harmonic Motion. [8 hrs.]</p> <p>Revision problem and tutorial classes [2 hrs.]<br/>Quizzes [1 hr.]</p> <p><b><u>Part B- Atoms:</u></b></p> <p>Atoms Structure; Atomic Energy Level; and Materials Used in Electronics. Current and Voltage; electrical circuit; and Ohm's Law. Power and Energy; and Parallel and Series Networks. Kirchhoff's Law. [8 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part C- Diode Circuit Applications:</u></b></p> <p>p-n junction in equilibrium, current-voltage characteristics, charge-control description of a diode, Transition and diffusion capacitance's, diode switching times, diode models, small-signal model and load line concept, and introduction to Hetero-junctions and double Hetero-junctions Rectifiers, Zener diodes voltage regulators, clipping circuits, clamping circuits and wave form generation. Other Types of Semiconductor Diodes: Varactor diode, tunnel diode, photodiode</p> |
|                                                              | <p>and photovoltaic (solar) cell, Light emitting diode, metal electronic. Transistors Principle of Operation and type, Transistor biasing circuits, Application Circuit. [8 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]<br/>Quizzes [1 hr.]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                          |                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p> | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراشي المنتظم للطالب خلال الفصل       | 33  | <b>Structured SWL (h/w)</b><br>الحمل الدراشي المنتظم للطالب أسبوعيا       | 2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراشي غير المنتظم للطالب خلال الفصل | 67  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراشي غير المنتظم للطالب أسبوعيا | 3 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراشي الكلي للطالب خلال الفصل              | 100 |                                                                           |   |

### Module Evaluation

#### تقييم المادة الدراسية

|                                 |                           | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning<br>Outcome |
|---------------------------------|---------------------------|-----------------|------------------|------------|------------------------------|
| <b>Formative<br/>assessment</b> | <b>Quizzes</b>            | 3               | 15 % (15)        | Continuous | LO #1, 4, 6 and 7            |
|                                 | <b>Assignments</b>        | 3               | 12% (12)         | Continuous | LO #1, 2, 3, 4, 5 and 7      |
|                                 | <b>Onsite Assignments</b> | 1               | 5% (5)           | Continuous | -----                        |
|                                 | <b>Report</b>             | 1               | 8% (8)           | Continuous | All                          |
| <b>Summative<br/>assessment</b> | <b>Midterm Exam</b>       | 2 hr.           | 10% (10)         | 7          | LO # 4-7                     |
|                                 | <b>Final Exam</b>         | 3hr             | 50% (50)         | 15         | All                          |
| <b>Total assessment</b>         |                           |                 | 100% (100 Marks) |            |                              |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|               | Material Covered                                                                                                                                                                                                                                        |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b> | Introduction to physics; Standards of length, mass and time; Scalar and Vector quantities; Kinematics; Position, Displacement and Distance; Speed, Velocity and Acceleration; Forces and motion; Mass and gravity force; Newton's three laws of motion. |
| <b>Week 2</b> | Spring forces and Hooke's law; Friction forces; Uniform circular motion; Work; Kinetic and Potential Energy; The work-kinetic energy theorem; Conservation of total mechanical energy; and Power.                                                       |
| <b>Week 3</b> | Linear momentum; Momentum and kinetic energy; Rate of change of linear momentum and Newton's laws; Law of conservation of linear momentum; Impulse; and Simple Harmonic Motion.                                                                         |

|                |                                                                                                                                                                                                                                                                    |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 4</b>  | Universal gravitation; Newton's law of universal gravitation; Free-fall acceleration and the gravitational force; and Solve problems using Newton's law of universal gravitation and calculate the gravitation for different locations.                            |
| <b>Week 5</b>  | Fluid mechanics; Pressure and density of fluid at different depth; Hydrostatic pressure; Pascal's principle and the operation of a hydraulic lift; Buoyant forces and Archimedes's principle; the equation of continuity for fluids; and the Bernoulli's equation. |
| <b>Week 6</b>  | Basic of Architectural Physics; and Solar Radiation.                                                                                                                                                                                                               |
| <b>Week 7</b>  | Basic of Architectural Physics; and Solar Radiation.                                                                                                                                                                                                               |
| <b>Week 8</b>  | Sound; Noise; Sound Intensity                                                                                                                                                                                                                                      |
| <b>Week 9</b>  | Sound Insulation; and Thermal Behavior of Materials                                                                                                                                                                                                                |
| <b>Week 10</b> | Atoms Structure; Atomic Energy Level; and Materials Used in Electronics.                                                                                                                                                                                           |
| <b>Week 11</b> | Current and Voltage; electrical circuit; and Ohm's Law.                                                                                                                                                                                                            |
| <b>Week 12</b> | Introduction of Diodes, current-voltage characteristics of diode. Forward and reverse biasing of diodes, Temperature effects for diode characteristics.                                                                                                            |
| <b>Week 13</b> | Diode Circuit Applications: Rectifiers, clipping circuits, clamping circuits.                                                                                                                                                                                      |
| <b>Week 14</b> | Zener diodes voltage regulators, and wave form generation. Varactor diode, tunnel diode, photodiode and photovoltaic (solar) cell, Light emitting diode, metal electronic.                                                                                         |
| <b>Week 15</b> | Introduction of transistors, Principle of Operation and type. Current-Voltage characteristics of transistors, DC Load line with state Q-Point. Transistors biasing circuits.                                                                                       |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                                                                                                                                      |

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

|                          | <b>Text</b>                                                                                                                                                   | <b>Available in the Library?</b> |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>Required Texts</b>    | Floyd, Thomas L. Electronics Fundamentals: Circuits, Devices and Applications (Floyd Electronics Fundamentals Series). Prentice-Hall, Inc., 2006.             | Yes                              |
| <b>Recommended Texts</b> | Donald A. Neamen. (2003). "SEMICONDUCTOR PHYSICS AND DEVICES". 3rd Edition, ISBN 0-07-232107-05, USA. (can be downloaded from the Course web page/classroom). | Yes                              |

|          |                                                                                                   |
|----------|---------------------------------------------------------------------------------------------------|
| Websites | .Nashelsky, L., & Boylestad, R. L. (2021). Electronic Devices and Circuit Theory Eleventh Edition |
|----------|---------------------------------------------------------------------------------------------------|

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                  |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |

## نموذج وصف المادة الدراسية

| Module Information                 |                                              |                      |                                                                                                                                                                                                                               |                            |
|------------------------------------|----------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| معلومات المادة الدراسية            |                                              |                      |                                                                                                                                                                                                                               |                            |
| Module Title                       | Mechanics Engineering<br>الهندسة الميكانيكية |                      | Module Delivery                                                                                                                                                                                                               |                            |
| Module Type                        | Support                                      |                      | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                            |
| Module Code                        | EE105                                        |                      |                                                                                                                                                                                                                               |                            |
| ECTS Credits                       | 4                                            |                      |                                                                                                                                                                                                                               |                            |
| SWL (hr./sem)                      | 100                                          |                      |                                                                                                                                                                                                                               |                            |
| Module Level                       | UGI                                          | Semester of Delivery |                                                                                                                                                                                                                               | 1                          |
| Administering Department           | 2 - (Electrical Engineering)                 | College              | UoM2 - (Engineering)                                                                                                                                                                                                          |                            |
| Module Leader                      | Dr. Mohammed Tariq Yaseen                    |                      | e-mail                                                                                                                                                                                                                        | mtyaseen@uomosul.edu.iq    |
| Module Leader's Acad. Title        | Assist. Prof.                                |                      | Module Leader's Qualification                                                                                                                                                                                                 | Doctor                     |
| Module Tutor                       | Dr. ammar younis Ibrahim                     |                      | e-mail                                                                                                                                                                                                                        | drammar2020@uomosul.edu.iq |
| Peer Reviewer Name                 | اسم مُراجع الملف                             | e-mail               | بريده الالكتروني                                                                                                                                                                                                              |                            |
| Scientific Committee Approval Date | 08/06/2023                                   | Version Number       | 1.0                                                                                                                                                                                                                           |                            |

| Relation with other Modules                              |                                                                                                                                                                                                                                                       |          |  |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--|
| العلاقة مع المواد الدراسية الأخرى                        |                                                                                                                                                                                                                                                       |          |  |
| Prerequisite module                                      | None                                                                                                                                                                                                                                                  | Semester |  |
| Co-requisites module                                     | None                                                                                                                                                                                                                                                  | Semester |  |
| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                                                                                       |          |  |
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                       |          |  |
|                                                          | 32. The module aims of Mechanical and Thermodynamics typically include providing students with a comprehensive understanding of the principles and applications of mechanical engineering and thermodynamics. The specific aims may vary depending on |          |  |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>the educational institution or course, but here are some common objectives:</p> <p>33. Understanding Fundamental Concepts: The module aims to introduce students to the fundamental concepts and principles of mechanical engineering and thermodynamics. This includes topics such as mechanics, kinematics, dynamics, energy, heat transfer, and thermodynamic processes.</p> <p>34. Analytical and Problem-Solving Skills: The module aims to develop students' analytical and problem-solving skills related to mechanical and thermodynamic systems. This involves teaching them how to apply mathematical and scientific principles to solve engineering problems, analyze mechanical systems, and evaluate thermodynamic processes.</p> <p>35. Thermodynamic Systems: The module aims to familiarize students with the behavior of thermodynamic systems and their applications. This includes studying topics such as the laws of thermodynamics, properties of pure substances, gas laws, energy conversion processes, power cycles, and refrigeration cycles.</p> <p>36. Heat Transfer: The module aims to teach students about the principles of heat transfer and its applications in engineering. This involves studying modes of heat transfer, including conduction, convection, and radiation, as well as heat exchangers, thermal insulation, and heat transfer analysis in various systems.</p> <p>37. Mechanical Systems and Dynamics: The module aims to provide students with an understanding of mechanical systems and their dynamics. This includes topics such as statics, dynamics, forces, motion, and mechanical components like gears, bearings, and linkages.</p> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>Mechanical Engineering:</p> <p>34. Apply fundamental principles of mechanics to analyze and solve engineering problems.</p> <p>35. analyze mechanical components and systems considering factors such as strength, stiffness, and safety.</p> <p>36. knowledge of thermodynamics and fluid mechanics to analyze energy conversion systems.</p> <p>Thermodynamics:</p> <p>37. Understand the basic concepts and laws of thermodynamics, including energy, entropy, and the First and Second Laws of Thermodynamics.</p> <p>38. Apply thermodynamic principles to analyze and solve problems related to heat transfer, work, and energy conversion.</p> <p>39. Analyze thermal systems, including power cycles, refrigeration cycles, and heat exchangers.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                             | <p>40. Apply thermodynamic principles to analyze combustion processes and internal combustion engines.</p> <p>41. Apply thermodynamic principles to analyze renewable energy systems, such as solar and wind power systems.</p> <p>42. Understand the impact of thermodynamics on environmental sustainability and energy efficiency.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                             | <p>Indicative content includes the following.</p> <p><b><u>Part A</u></b></p> <p>Static: Force system, Units system, Forces + Components, Resultant, Moment and Couples, Equilibrium, Centroid, Moment of Inertia, Friction. Revision problem and tutorial classes. [15 hr.]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                      | <p>Revision problem and tutorial classes [5 hrs.]</p> <p>Quizzes [1 hr.] <b>Part B</b></p> <p>Dynamics: Rectilinear motion, Curvilinear motion, Projectile, Circular motion, Acceleration Components (Rectangular Comp., Normal Tangential Comp.), Kinetic -2nd Law of Newton. [15 hrs.]</p> <p>Revision problem and tutorial classes [5 hrs.]</p> <p>Quizzes [1 hr.] <b>Part C</b></p> <p>Thermodynamics: Properties of Substance, Pressure and Temperature, Work and Energy, Ideal Gas, First Law of Thermodynamics, 2nd Law of Thermodynamics. Hook's law. [15 hr.]</p> <p>Revision problem and tutorial classes [5 hrs.]</p> <p>Revision problem and tutorial classes [6 hrs.]</p> <p>Quizzes [1 hr.]</p> |
| <p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p><b>Strategies</b></p>                                                          | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p>                                                                                                                                                                                                                                                                                                           |

| Student Workload (SWL)                                                         |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا                                        |     |                                                                           |   |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 37  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 2 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |   |

| Module Evaluation           |                     |                 |                  |            |                           |
|-----------------------------|---------------------|-----------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية       |                     |                 |                  |            |                           |
|                             |                     | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b> | <b>Quizzes</b>      | 2               | 10% (10)         | 5,10       | LO #1, 4, 6 and 7         |
|                             | <b>Assignments</b>  | 5               | 5% (5)           | 2 to 13    | LO #1, 2, 3, 4, 5 and 7   |
|                             | <b>Projects</b>     | 0               | 0% (0)           | ----       | -----                     |
|                             | <b>Report</b>       | 2               | 25% (25)         | Continuous | All                       |
| <b>Summative assessment</b> | <b>Midterm Exam</b> | 2 hr.           | 10% (10)         | 8          | LO # 4-8                  |
|                             | <b>Final Exam</b>   | 3hr             | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                     |                 | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                                      |                           |
|---------------------------------|----------------------------------------------------------------------|---------------------------|
| المنهاج الاسبوعي النظري         |                                                                      |                           |
|                                 | Material Covered                                                     |                           |
| Week 1                          | Static: Force system                                                 |                           |
| Week 2                          | Units system, Forces and Components                                  |                           |
| Week 3                          | Resultant, Moment and Couples                                        |                           |
| Week 4                          | Equilibrium and Centroid                                             |                           |
| Week 5                          | Moment of Inertia and Friction                                       |                           |
| Week 6                          | Dynamics: Rectilinear motion                                         |                           |
| Week 7                          | Curvilinear motion, Projectile and Circular motion                   |                           |
| Week 8                          | Midterm Exam                                                         |                           |
| Week 9                          | Acceleration Components (Rectangular Comp., Normal Tangential Comp.) |                           |
| Week 10                         | Kinetic - 2nd Law of Newton                                          |                           |
| Week 11                         | Thermodynamics: Properties of Substance and Pressure and Temperature |                           |
| Week 12                         | Work and Energy and Ideal Gas                                        |                           |
| Week 13                         | First Law of Thermodynamics                                          |                           |
| Week 14                         | 2nd Law of Thermodynamics                                            |                           |
| Week 15                         | Hook's law                                                           |                           |
| Week 16                         | Preparatory week before the final Exam                               |                           |
| Learning and Teaching Resources |                                                                      |                           |
| مصادر التعلم والتدريس           |                                                                      |                           |
|                                 | Text                                                                 | Available in the Library? |
| Required Texts                  |                                                                      |                           |
| Recommended Texts               |                                                                      |                           |
| Websites                        |                                                                      |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

|                                           |                                      |                             |                                                                                                                                                                                                                                                                                    |                          |     |
|-------------------------------------------|--------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----|
| <b>Module Title</b>                       | <b>Computer 1</b><br>الحاسوب 1       |                             | <b>Module Delivery</b>                                                                                                                                                                                                                                                             |                          |     |
| <b>Module Type</b>                        | <b>Basic</b>                         |                             | <input checked="" type="checkbox"/> <b>Theory</b><br><input type="checkbox"/> <b>Lecture</b><br><input checked="" type="checkbox"/> <b>Lab</b><br><input type="checkbox"/> <b>Tutorial</b><br><input type="checkbox"/> <b>Practical</b><br><input type="checkbox"/> <b>Seminar</b> |                          |     |
| <b>Module Code</b>                        | <b>UOM1031</b>                       |                             |                                                                                                                                                                                                                                                                                    |                          |     |
| <b>ECTS Credits</b>                       | 3                                    |                             |                                                                                                                                                                                                                                                                                    |                          |     |
| <b>SWL (hr./sem)</b>                      | 75                                   |                             |                                                                                                                                                                                                                                                                                    |                          |     |
| <b>Module Level</b>                       | First Level                          | <b>Semester of Delivery</b> |                                                                                                                                                                                                                                                                                    |                          | One |
| <b>Administering Department</b>           | Department of Electrical Engineering | <b>College</b>              | Engineering                                                                                                                                                                                                                                                                        |                          |     |
| <b>Module Leader</b>                      | Dr. Omar Sh. Alyozbak                |                             | <b>e-mail</b>                                                                                                                                                                                                                                                                      | o.yehya@uomosul.edu.iq   |     |
| <b>Module Leader's Acad. Title</b>        | Head of Department                   |                             | <b>Module Leader's Qualification</b>                                                                                                                                                                                                                                               | PhD                      |     |
| <b>Module Tutor</b>                       | Aws Thamir Mayouf                    |                             | <b>e-mail</b>                                                                                                                                                                                                                                                                      | awsthamir@uomosul.edu.iq |     |
| <b>Peer Reviewer Name</b>                 |                                      |                             | <b>e-mail</b>                                                                                                                                                                                                                                                                      |                          |     |
| <b>Scientific Committee Approval Date</b> |                                      |                             | <b>Version Number</b>                                                                                                                                                                                                                                                              | 1.1                      |     |

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

**Module Aims, Learning Outcomes and Indicative Contents**

| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | The module aims to prepare students to work with computers. It also teaches students the fundamentals of computers and their components. Students will learn about computer operating systems, with a focus on Windows. Students will also learn how to use Microsoft Office applications: Word, Excel, and PowerPoint.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. The ability to identify, analyze, and solve complex engineering problems based on the principles of engineering, science, and mathematics.</li> <li>2. The ability to acquire and apply new knowledge using appropriate learning strategies.</li> <li>3. The ability to participate in and work professionally and ethically on multidisciplinary teams and projects. Students who pass this module are expected to learn the following topics: <ol style="list-style-type: none"> <li>1. Computers and operating systems</li> <li>2. Software and hardware interaction</li> <li>3. Windows File Management</li> <li>4. Operating System Customization</li> <li>5. Computer Hardware</li> <li>6. Monthly Lab Exam</li> <li>7. Exploring Microsoft Office</li> <li>8. Getting Started with MS Word Essentials</li> <li>9. Editing and Formatting Documents</li> <li>10. Getting Started with MS Excel Essentials</li> <li>11. Organizing and Enhancing Worksheets</li> <li>12. Creating Formulas and Charting Data</li> <li>13. Getting Started with MS PowerPoint Essentials</li> <li>11. Organizing and Enhancing Slides</li> <li>12. Creating Presentations</li> </ol> </li> </ol> |
|                                                                  | Computers and Operating System [6 hr]<br>Software and Hardware Interaction [6 hr]<br>Windows File Management [3 hr] Operating System Customization [3 hr] Computer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Indicative Contents</b><br>المحتويات الإرشادية | Hardware [3 hr]<br>Exploring Microsoft Office [1.5 hr]<br><br>Getting Started with MS Word Essentials [1.5 hr] Editing and Formatting Documents [3 hr] Getting Started with MS Excel Essentials [3 hr] Organizing and Enhancing Worksheets [3 hr] Creating Formulas and Charting Data [3 hr]<br>Getting Started with MS PowerPoint Essentials [3 hr] Organizing and Enhancing Slides [1.5 hr]<br>Creating Presentations [1.5 hr] |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>The main strategy for teaching this module is to encourage student participation in laboratory activities and refine and expand their critical thinking skills. This will be achieved through classes, laboratory work, and external research involving computer technology that interests students.</p> <p>1. Lectures:</p> <ul style="list-style-type: none"> <li>Structured lectures introduce fundamental concepts and practical applications.</li> <li>Emphasis is placed on fundamental understanding, practical application, and actual use of the software.</li> </ul> <p>2. Problem-solving sessions</p> <ul style="list-style-type: none"> <li>Guided tutorials focus on solving real problems related to the software.</li> <li>Students practice the fundamentals of the software.</li> </ul> |
|                   | <ul style="list-style-type: none"> <li>Active student participation is encouraged through in-class discussions.</li> </ul> <p>3. Project-Based Learning:</p> <ul style="list-style-type: none"> <li>Individual or group mini-projects involve the practical use of the software.</li> </ul> <p>4. Self-Directed Learning:</p> <ul style="list-style-type: none"> <li>Students are encouraged to engage in independent study through textbooks, research papers, and online resources.</li> <li>Homework assignments and reading tasks support a deeper understanding.</li> </ul> <p>5. Continuous Feedback:</p> <ul style="list-style-type: none"> <li>Regular formative feedback is provided through assignments, quizzes, labs, and reports.</li> </ul>                                                    |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Student Workload (SWL)

| الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا                                        |    |                                                                           |     |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|-----|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 63 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4.2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 12 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 0.8 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 75 |                                                                           |     |

## Module Evaluation

### تقييم المادة الدراسية

|                      |             | Time/Number | Weight (Marks) | Week Due  | Relevant Learning Outcome |
|----------------------|-------------|-------------|----------------|-----------|---------------------------|
| Formative assessment | Quizzes     | 2           | 10% (10)       | 4, 11     | LO#Q1: 1-2, Q2: 7-9       |
|                      | Assignments | 2           | 5% (5)         | 3, 10     | LO#A1: 1-2, A2: 7-9       |
|                      | Lab         | 10          | 20% (20)       | CONTINUES | All                       |

|                      |              |        |            |    |          |
|----------------------|--------------|--------|------------|----|----------|
|                      | Report       | 1      | 5% (5)     | 14 | All      |
| Summative assessment | Midterm Exam | 2 hrs. | 10% (10)   | 9  | LO # 1-5 |
|                      | Final Exam   | 3 hrs. | 50% (50)   |    |          |
| Total assessment     |              |        | 100% (100) |    |          |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|        | Material Covered                             |
|--------|----------------------------------------------|
| Week 1 | Computers and Operating System               |
| Week 2 | Computers and Operating System (continue)    |
| Week 3 | Software and Hardware Interaction            |
| Week 4 | Software and Hardware Interaction (continue) |
| Week 5 | Windows File Management                      |
| Week 6 | Operating System Customization               |
| Week 7 | Computer Hardware                            |

|                |                                                                        |
|----------------|------------------------------------------------------------------------|
| <b>Week 8</b>  | Exploring Microsoft Office and Getting Started with MS Word Essentials |
| <b>Week 9</b>  | Mid-Term Exam                                                          |
| <b>Week 10</b> | Editing and Formatting Documents                                       |
| <b>Week 11</b> | Getting Started with MS Excel Essentials                               |
| <b>Week 12</b> | Organizing and Enhancing Worksheets                                    |
| <b>Week 13</b> | Creating Formulas and Charting Data                                    |
| <b>Week 14</b> | Getting Started with MS PowerPoint Essentials                          |
| <b>Week 15</b> | Organizing and Enhancing Slides and Creating Presentations             |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                          |

### Delivery Plan (Weekly Syllabus)

المناهج الاسبوعي للمختبر

|                | <b>Material Covered</b>                                                |
|----------------|------------------------------------------------------------------------|
| <b>Week 1</b>  | Computers and Operating System                                         |
| <b>Week 2</b>  | Computers and Operating System (continue)                              |
| <b>Week 3</b>  | Software and Hardware Interaction                                      |
| <b>Week 4</b>  | Software and Hardware Interaction (continue)                           |
| <b>Week 5</b>  | Windows File Management                                                |
| <b>Week 6</b>  | Operating System Customization                                         |
| <b>Week 7</b>  | Computer Hardware                                                      |
| <b>Week 8</b>  | Exploring Microsoft Office and Getting Started with MS Word Essentials |
| <b>Week 9</b>  | Mid-Term Exam                                                          |
| <b>Week 10</b> | Editing and Formatting Documents                                       |

|                |                                                            |
|----------------|------------------------------------------------------------|
| <b>Week 11</b> | Getting Started with MS Excel Essentials                   |
| <b>Week 12</b> | Organizing and Enhancing Worksheets                        |
| <b>Week 13</b> | Creating Formulas and Charting Data                        |
| <b>Week 14</b> | Getting Started with MS PowerPoint Essentials              |
| <b>Week 15</b> | Organizing and Enhancing Slides and Creating Presentations |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                 | Available in the Library? |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | 2015 Computer Literacy BASICS: A Comprehensive Guide to IC3<br>Connie Morrison, Dolores Wells, Lisa Ruffolo<br>Cengage Learning.<br>ISBN: 128576658X | Available as PDF          |
| <b>Recommended Texts</b> | IC3 GS5 Certification Guide Using Windows 10 & Office 2016                                                                                           |                           |
| <b>Websites</b>          | <b>Google Classroom</b>                                                                                                                              |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

| Module Information                               |                                      |                                          |                                                                                                                                                                                                                                          |
|--------------------------------------------------|--------------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية                          |                                      |                                          |                                                                                                                                                                                                                                          |
| <b>Module Title</b><br>اسم المنهج                | Arabic Language 1<br>اللغة العربية 1 |                                          | <b>Module Delivery</b>                                                                                                                                                                                                                   |
| <b>Module Type</b><br>نوع المنهج                 | Basic                                |                                          | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input checked="" type="checkbox"/> Seminar |
| <b>Module Code</b><br>رمز المنهج                 | UOM1011                              |                                          |                                                                                                                                                                                                                                          |
| <b>ECTS Credits</b><br>عدد الوحدات               | 2                                    |                                          |                                                                                                                                                                                                                                          |
| <b>SWL (hr/sem)</b><br>الحمل الكلي               | 50                                   |                                          |                                                                                                                                                                                                                                          |
| <b>Module Level / المستوى</b>                    | 1                                    | <b>Semester of Delivery / المنهج سحب</b> |                                                                                                                                                                                                                                          |
| <b>Administering Department</b><br>القسم الإداري | ENV8                                 | <b>College</b><br>الكلية                 | ENG4                                                                                                                                                                                                                                     |
| <b>Module Leader</b><br>اسم التدريسي             |                                      | <b>e-mail</b><br>البريد الالكتروني       |                                                                                                                                                                                                                                          |
| <b>Module Leader's Acad. Title</b>               |                                      | <b>Module Leader's Qualification</b>     |                                                                                                                                                                                                                                          |
| <b>Module Tutor</b>                              |                                      | <b>e-mail</b>                            |                                                                                                                                                                                                                                          |
| <b>Peer Reviewer Name</b>                        | -----                                | <b>e-mail</b>                            | E-mail                                                                                                                                                                                                                                   |
| <b>Scientific Committee Approval Date</b>        | 26/11/2023                           | <b>Version Number</b>                    | 2.0                                                                                                                                                                                                                                      |

## Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                      |         |          |  |
|----------------------|---------|----------|--|
| Prerequisite module  | لا يوجد | Semester |  |
| Co-requisites module | لا يوجد | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module Objectives<br>أهداف المادة الدراسية                | <p>الهدف من هذا الفصل الدراسي هو تعريف الطلاب بالموضوعات الرئيسية لمادة اللغة العربية. سيغطي الفصل الدراسي المتطلبات الأساسية لتعاريف اللغة العربية، قواعد نحوية للأزمنة، تنمية القدرات النحوية لصيغ المفرد والجمع والممنوع من الجرد، بالإضافة إلى البلاغة والتطبيق. وفي نهاية الفصل، سيكون لدى الطلاب معرفة واسعة بالمفاهيم وسيتم تحقيق ذلك من خلال المحاضرات النظرية والدروس والواجبات البتية والتقارير ذات الصلة بالمواضيع المطروقة.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Module Learning Outcomes<br>مخرجات التعلم للمادة الدراسية | <p><b>:CLO1</b><br/>تعريف الطالب بألفاظ اللغة العربية الصحيحة وتراكيبها وأساليبها السليمة بطريقة مشوقة وجذابة.</p> <p><b>:CLO2</b><br/>أن يستغل الطالب وقت فراغه بالقراءة والاطلاع والرجوع إلى المكتبة.</p> <p><b>:CLO3</b><br/>تمكين الطالب من القراءة الصحيحة، وأن يكتسب القدرة على استعمال اللغة استعمالاً صحيحاً في الاتصال مع الآخرين.</p> <p><b>:CLO4</b><br/>تنمية الذوق الأدبي لدى الطالب حتى يدرك النواحي الجمالية في أساليب الكلام ومعانيه وصورة.</p> <p><b>:CLO5</b><br/>تنمية قدرة ومهارة الطالب الإملائية والخطية بحيث يستطيع الكتابة الصحيحة للكاتب والمخاطبات الرسمية.</p> <p><b>:CLO6</b><br/>تمكين الطالب على كتابة التقارير العملية والنظرية والعروض التقديمية بلغة عربية واضحة وصحيحة.</p> <p><b>:CLO7</b><br/>القدرة على اكتساب وتطبيق المعرفة الجديدة واستخدام استراتيجيات تعليم مناسبة.</p> <p><b>:CLO8</b><br/>القدرة على المشاركة والعمل بمهنية وأخلاقية للعمل في فرق متعددة التخصصات.</p> |
| Indicative Contents                                       | <p>(الجزء الأول: مقدمة عن اللغة العربية (4 ساعات)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| المحتويات الإرشادية                                       | <p>مقدمة عن اللغة العربية [ع] ١</p> <p>تعريف اللغة العربية [ع] ٢ وم [m] ٣</p> <p>الجزء الثاني: قواعد نحوية وتشمل: (6 ساعات)</p> <p>الفعل [ف] ٤</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>* الفعل <math>k_{rw}</math></p> <p>* الأفعال الخمسة</p> <p>الجزء الثالث: تنمية القواعد النحوية وتشمل: (6 ساعات)</p> <p>* المذكر والمؤنث السالم (<math>k</math> والجمع)</p> <p>* التعجب</p> <p>* الممذكع من الآف</p> <p>* المجرى والمعد</p> <p>الجزء الرابع: البلاغة والتطبيق (8 ساعات)</p> <p>* الاستعارة</p> <p>* الجناس</p> <p>* الطاق</p> <p>* [—]ء</p> <p>الجزء الخامس: قواعد املائية: (3 ساعات)</p> <p>سوف يتم تعريف الطالب عن الأخطاء الاملائية الشائعة وطرق تجنبها بالإضافة الى كتابة المخاطبات الادرية.</p> <p>الجزء السادس: قواعد العد والمعدود: (3 ساعات)</p> <p>تعريف الطالب بقواعد واحكام العد والمعدود فى اللغة العربية.</p> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                             |                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Strategies<br>الاستراتيجيات | توسيع مدارك الطلاب لمادة اللغة العربية، والإلمام بالمفاهيم الأساسية للغة العربية والبلاغة، والقدرة على التمييز بين الأزمنة. يحتوي هذه الفصل على العديد من المكونات التي تشمل دراسة المحاضرات والبرامج التعليمية والمناقشة والواجبات المنزلية ومنصات التعلم الإلكتروني. سيتم تدريس الدورة باللغة العربية، ويجب تقديم جميع المهام الإلزامية في غضون المواعيد النهائية للقبول في الامتحان. |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراشي للطلاب محسوب لـ ١٥ اسبوعا

|                                                                         |    |                                                                    |     |
|-------------------------------------------------------------------------|----|--------------------------------------------------------------------|-----|
| Structured SWL (h/sem)<br>الحمل الدراشي المنتظم للطلاب خلال الفصل       | 33 | Structured SWL (h/w)<br>الحمل الدراشي المنتظم للطلاب أسبوعيا       | 2.2 |
| Unstructured SWL (h/sem)<br>الحمل الدراشي غير المنتظم للطلاب خلال الفصل | 17 | Unstructured SWL (h/w)<br>الحمل الدراشي غير المنتظم للطلاب أسبوعيا | 1.1 |
| Total SWL (h/sem)                                                       | 50 |                                                                    |     |
| الحمل الدراشي الكلي للطلاب خلال الفصل                                   |    |                                                                    |     |

## Module Evaluation

### تقييم المادة الدراسية

| Relevant Learning Outcome | Week Due | Weight (Marks) | Time/Number |
|---------------------------|----------|----------------|-------------|
|                           |          |                |             |

|                                                 |                                               |       |                  |              |                      |
|-------------------------------------------------|-----------------------------------------------|-------|------------------|--------------|----------------------|
| <b>Formative Assessment</b><br>التقويم التكويني | <b>Quizzes</b><br>الكويز                      | 3     | 6% (18)          | 4, 9, and 13 | All                  |
|                                                 | <b>H.W Assignments</b><br>الواجبات البيتية    | 2     | 4% (8)           | 5, 11        | CLO4, CLO5, and CLO6 |
|                                                 | <b>Seminars</b><br>السمنار                    | 1     | 6% (6)           | 12           | All                  |
|                                                 | <b>On-site Assignment</b><br>واجبات داخل الصف | 2     | 4% (8)           | 6, 10        | CLO4, CLO5, and CLO6 |
| <b>Summative Assessment</b><br>التقويم التلخيصي | <b>Midterm Exam</b><br>امتحان نصف الفصل       | 2 hrs | 10% (10)         | 7            | All                  |
|                                                 | <b>Final Exam</b><br>الامتحان النهائي         | 3 hrs | 50% (50)         | 16           | All                  |
| <b>Total Assessment / النهائي التقويم</b>       |                                               |       | 100% (100 Marks) |              |                      |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|               | <b>Material Covered / المغطاة المواضيع</b>                          |
|---------------|---------------------------------------------------------------------|
| <b>Week 1</b> | مقدمة عن اللغة العربية وتعريف اللغة العربية ومميزاتها               |
| <b>Week 2</b> | قواعد نحوية: الفعل الماضي                                           |
| <b>Week 3</b> | قواعد نحوية: الفعل المضارع                                          |
| <b>Week 4</b> | قواعد نحوية: الأفعال الخمسة                                         |
| <b>Week 5</b> | تنمية القواعد النحوية: المثنى والجمع (المذكر السالم والمؤنث السالم) |
| <b>Week 6</b> | تنمية القواعد النحوية: التعجب، الممنوع من الصرف والمجرد والمزيد     |
| <b>Week 7</b> | الامتحان الفصلي                                                     |
| <b>Week 8</b> | البلاغة والتطبيق: الاستعارة                                         |

|         |                            |
|---------|----------------------------|
| Week 9  | البلاغة والتطبيق: الجنس    |
| Week 10 | البلاغة والتطبيق: الطباق   |
| Week 11 | البلاغة والتطبيق: التشبيه  |
| Week 12 | الأخطاء الاملائية          |
| Week 13 | المخاطبات الإدارية         |
| Week 14 | قواعد واحكام العد والمعدود |
| Week 15 | قواعد واحكام العد والمعدود |
| Week 16 | الامتحان النهائي           |

### Delivery Plan (Weekly Lab. Syllabus)

|        | Material Covered / المغطاة المواضيع |
|--------|-------------------------------------|
| Week 1 | لا يوجد                             |
| Week 2 | لا يوجد                             |
| Week 3 | لا يوجد                             |
| Week 4 | لا يوجد                             |
| Week 5 | لا يوجد                             |
| Week 6 | لا يوجد                             |
| Week 7 | لا يوجد                             |

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

|                                              | Text<br>الاسم                         | Available in the Library?<br>هل متوفر في المكتبة؟ |
|----------------------------------------------|---------------------------------------|---------------------------------------------------|
| <b>Required Texts</b><br>المنهج المطلوب      | جامع الدروس العربية / مصطفى الغلاييني | نعم                                               |
| <b>Recommended Texts</b><br>المنهج الموصى به | النحو الوافي / عباس حسن               | نعم                                               |

|                             |                  |                                                                                                                                                           |          |                                       |
|-----------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------|
| Websites                    |                  |                                                                                                                                                           |          |                                       |
| المواقع الالكترونية         |                  | <a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a> |          |                                       |
| Grading Scheme              |                  |                                                                                                                                                           |          |                                       |
| مخطط الدرجات                |                  |                                                                                                                                                           |          |                                       |
| Group                       | Grade            | التقدير                                                                                                                                                   | Marks %  | Definition                            |
| Success Group<br>(50 - 100) | A - Excellent    | امتياز                                                                                                                                                    | 90 - 100 | Outstanding Performance               |
|                             | B - Very Good    | جيد جدا                                                                                                                                                   | 80 - 89  | Above average with some errors        |
|                             | C - Good         | جيد                                                                                                                                                       | 70 - 79  | Sound work with notable errors        |
|                             | D - Satisfactory | متوسط                                                                                                                                                     | 60 - 69  | Fair but with major shortcomings      |
|                             | E - Sufficient   | مقبول                                                                                                                                                     | 50 - 59  | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)      | FX – Fail        | (راسب) قيد المعالجة                                                                                                                                       | (45-49)  | More work required but credit awarded |
|                             | F – Fail         | راسب                                                                                                                                                      | (0-44)   | Considerable amount of work required  |
|                             |                  |                                                                                                                                                           |          |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                                                          |                              |                                                                                                                                                                                                                                                     |                               |
|------------------------------------------------------|--------------------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| <b>Module Title</b>                                  | <b>Basics of Electrical Engineering II</b><br>اساس الهندسة الكهربائية II |                              | <b>Module Delivery</b>                                                                                                                                                                                                                              |                               |
| <b>Module Type</b>                                   | <b>Core</b>                                                              |                              | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                               |
| <b>Module Code</b>                                   | <b>EE108</b>                                                             |                              |                                                                                                                                                                                                                                                     |                               |
| <b>ECTS Credits</b>                                  | <b>8</b>                                                                 |                              |                                                                                                                                                                                                                                                     |                               |
| <b>SWL (hr./sem)</b>                                 | <b>200</b>                                                               |                              |                                                                                                                                                                                                                                                     |                               |
| <b>Module Level</b>                                  |                                                                          | UGI                          | <b>Semester of Delivery</b>                                                                                                                                                                                                                         | 2                             |
| <b>Administering Department</b>                      |                                                                          | 2 - (Electrical Engineering) | <b>College</b>                                                                                                                                                                                                                                      | UoM2 - (Engineering)          |
| <b>Module Leader</b>                                 | اسم رئيس القسم                                                           |                              | <b>e-mail</b>                                                                                                                                                                                                                                       | البريد الالكتروني لرئيس القسم |
| <b>Module Leader's Acad. Title</b>                   |                                                                          | لقبه العلمي                  | <b>Module Leader's Qualification</b>                                                                                                                                                                                                                | الشهادة                       |
| <b>Module Tutor</b>                                  | Dr. Omar Muwafaq Mahmood                                                 |                              | <b>e-mail</b>                                                                                                                                                                                                                                       | omer_alyouusif@uomosul.edu.iq |
| <b>Peer Reviewer Name</b>                            |                                                                          | اسم مُراجع الملف             | <b>e-mail</b>                                                                                                                                                                                                                                       | بريده الالكتروني              |
| <b>Scientific Committee Approval Date</b>            |                                                                          | 01/06/2023                   | <b>Version Number</b>                                                                                                                                                                                                                               | 1.0                           |

| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |      |                 |  |
|-------------------------------------------------------------------------|------|-----------------|--|
| <b>Prerequisite module</b>                                              | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>                                             | None | <b>Semester</b> |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>38. To develop problem solving skills and understanding of AC circuit theory through the application of techniques.</p> <p>39. To understand voltage, current and power from a given AC circuit.</p> <p>40. This course deals with the basic concept of AC electrical circuits.</p> <p>41. This is the basic subject for all AC electrical and electronic circuits.</p> <p>42. To understand Kirchhoff's current and voltage Laws problems.</p> <p>43. To perform mesh and Nodal analysis.</p> <p>44. To perform Thevenin and superposition theory.</p> <p>45. To understand the resonant circuits.</p>                |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>43. Recognize how electricity works in electrical circuits.</p> <p>44. List the various terms associated with electrical circuits.</p> <p>45. Summarize what is meant by a basic AC electric circuit.</p> <p>46. Describe electrical AC voltage, current and power.</p> <p>47. Define Ohm's law in AC circuits.</p> <p>48. Identify the basic circuit passive and active elements and their applications.</p> <p>49. Discuss the various properties of impedance.</p> <p>50. Explain the two Kirchhoff's laws used in AC circuit analysis.</p> <p>51. Explain the Analysis Methods used in AC Electrical Circuits.</p> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><b><u>Part A - Circuit Components and values</u></b></p> <p>AC circuits, Current and voltage definitions, circuit elements, impedance networks, real and ideal elements, voltage and current sources. [9 hrs.]</p> <p>Lab. [6 hrs.]</p> <p>Revision problem and tutorial classes [6 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part B- Circuit reduction</u></b></p> <p>combining sources, Combining impedances elements in series and parallel, delta and star transformation. [12 hrs.]</p>                                                                         |
|                                                                             | <p>Revision problem and tutorial classes [8 hrs.]</p> <p>Lab. [8 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part C- Circuit Theory</u></b></p> <p>Kirchhoff's laws and Ohm's law. Introduction to mesh and nodal analysis, Introduction to Thevenin and Norton theory, maximum power transfer, introduction to superposition theory, the resonant circuits. [24 hrs.]</p> <p>Revision problem and tutorial classes [16 hrs.]</p> <p>Lab. [16 hrs.]</p> <p>Quizzes [1 hr.]</p>                                                                                                                                              |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 123 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 8 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 77  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 200 |                                                                           |   |

## Module Evaluation

### تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks) | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|----------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 1           | 10% (10)       | 4,8,12     | LO #1, 5, 8 and 9         |
|                             | <b>Assignments</b>     | 10          | 5% (5)         | 2 to 12    | LO #1, 2, 4, 6 7, 8 and 9 |
|                             | <b>Projects / Lab.</b> | 2           | 25% (25)       | Continuous | All                       |
|                             | <b>Report</b>          | 0           | 0% (0)         | ----       | ----                      |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr.       | 10% (10)       | 7          | LO # 1-5                  |
|                             | <b>Final Exam</b>      | 3hr         | 50% (50)       | 16         | All                       |

|                         |                  |  |  |
|-------------------------|------------------|--|--|
| <b>Total assessment</b> | 100% (100 Marks) |  |  |
|-------------------------|------------------|--|--|

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                   |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                           |
| <b>Week 1</b>                                                     | Basic Concept & Units in AC circuits, waveforms of AC sources                                                                     |
| <b>Week 2</b>                                                     | Average and RMS values, Form Factor, Crest Factor                                                                                 |
| <b>Week 3</b>                                                     | Ohm's law, impedance and admittance calculations                                                                                  |
| <b>Week 4</b>                                                     | equivalent impedance: Series-parallel and delta – star transformation                                                             |
| <b>Week 5</b>                                                     | power calculation in A.C circuit and power factor                                                                                 |
| <b>Week 6</b>                                                     | Kirchhoff's laws: KVL-KCL                                                                                                         |
| <b>Week 7</b>                                                     | Phasor diagram                                                                                                                    |
| <b>Week 8</b>                                                     | Mid-term Exam                                                                                                                     |
| <b>Week 9</b>                                                     | introduction to network theorems, types of source: independent and dependent voltage and current sources and their transformation |
| <b>Week 10</b>                                                    | Maxwell's circulating currents (mesh analysis)                                                                                    |
| <b>Week 11</b>                                                    | nodal analysis                                                                                                                    |
| <b>Week 12</b>                                                    | superposition theorem                                                                                                             |
| <b>Week 13</b>                                                    | Thevenin's theorem and Norton's theorem                                                                                           |
| <b>Week 14</b>                                                    | maximum power transfer theorem                                                                                                    |
| <b>Week 15</b>                                                    | Resonant circuits                                                                                                                 |
| <b>Week 16</b>                                                    | <b>Preparatory week before the final Exam</b>                                                                                     |

## Delivery Plan (Weekly Lab. Syllabus)

المناهج الاسبوعي للمختبر

|                | Material Covered                                                         |
|----------------|--------------------------------------------------------------------------|
| <b>Week 1</b>  | Lab 1: Introduction to lab. components                                   |
| <b>Week 2</b>  | Lab 2: Introduction to AVO meter (using in AC circuits) and oscilloscope |
| <b>Week 3</b>  | Lab 3: Introduction to AC function generator                             |
| <b>Week 4</b>  | Lab 4: ohm's Law application in AC circuit                               |
| <b>Week 5</b>  | Lab 5: series and parallel impedance, delta and star transformation      |
| <b>Week 6</b>  | Lab 6: Kirchhoff's Voltage Law                                           |
| <b>Week 7</b>  | Lab 7: Kirchhoff's Current Law                                           |
| <b>Week 8</b>  | Lab 8: implementation of Maxwell's circulating currents (mesh analysis)  |
| <b>Week 9</b>  | Lab 9: implementation of Nodal analysis                                  |
| <b>Week 10</b> | Lab 10: implementation of Superposition theorem                          |
| <b>Week 11</b> | Lab 11: implementation of Thevenin's / Norton's Theorem                  |
| <b>Week 12</b> | Lab 12: implementation of maximum power transfer theorem                 |
| <b>Week 13</b> | Lab 13: AC power measurements (methods and instrumentations)             |
| <b>Week 14</b> | Lab 14: power factor measurements                                        |
| <b>Week 15</b> | Lab 15: resonance circuits validation                                    |

## Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                         | Available in the Library? |
|--------------------------|--------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Engineering Circuit Analysis 7th Edition<br>by William Hayt , Jack Kemmerly , Steven Durbin                  | Yes                       |
| <b>Recommended Texts</b> | Schaum's Outline of Basic Circuit Analysis, Second Edition (Schaum's Outlines) 2nd Edition, by John O'Malley | No                        |
| <b>Websites</b>          | AC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2017.                                   |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

|                                    |                                |                              |                               |                                                                                                                                                                                                                                                                                                        |         |
|------------------------------------|--------------------------------|------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Module Title                       | Mathematics II<br>الرياضيات II |                              |                               | Module Delivery                                                                                                                                                                                                                                                                                        |         |
| Module Type                        | Basic                          |                              |                               | <div><input checked="" type="checkbox"/> Theory</div> <div><input checked="" type="checkbox"/> Lecture</div> <div><input type="checkbox"/> Lab</div> <div><input checked="" type="checkbox"/> Tutorial</div> <div><input type="checkbox"/> Practical</div> <div><input type="checkbox"/> Seminar</div> |         |
| Module Code                        | EE109                          |                              |                               |                                                                                                                                                                                                                                                                                                        |         |
| ECTS Credits                       | 6                              |                              |                               |                                                                                                                                                                                                                                                                                                        |         |
| SWL (hr./sem)                      | 150                            |                              |                               |                                                                                                                                                                                                                                                                                                        |         |
| Module Level                       |                                | UGI                          | Semester of Delivery          |                                                                                                                                                                                                                                                                                                        | 2       |
| Administering Department           |                                | 2 - (Electrical Engineering) | College                       | UoM2 - (Engineering)                                                                                                                                                                                                                                                                                   |         |
| Module Leader                      | أ.م.د. عمر شرف الدين           |                              | e-mail                        | البريد الالكتروني لرئيس القسم                                                                                                                                                                                                                                                                          |         |
| Module Leader's Acad. Title        |                                | لقبه العلمي                  | Module Leader's Qualification |                                                                                                                                                                                                                                                                                                        | الشهادة |
| Module Tutor                       | Dr. Mohammed Abdulmalek Ahmed  |                              | e-mail                        | Ahmedm86@uomosul.edu.iq                                                                                                                                                                                                                                                                                |         |
| Peer Reviewer Name                 |                                | اسم مُراجع الملف             | e-mail                        | بريده الالكتروني                                                                                                                                                                                                                                                                                       |         |
| Scientific Committee Approval Date |                                | 29/03/2026                   | Version Number                |                                                                                                                                                                                                                                                                                                        | 1.0     |

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>1. Provide students with a strong support for basic learning calculus concepts: limits, derivatives, and integration.</li> <li>2. Help students communicate mathematical ideas through the practice of proper mathematical notations.</li> <li>3. Help students to verify mathematical ideas through the practice of proper mathematical proof techniques.</li> <li>4. Developing mathematical thinking and understanding in students by guiding them towards deep thinking rather than “memorizing all the rules”.</li> <li>5. Increase students’ awareness of alternate means of learning such as group study, as well as strategies that will enhance the learning of mathematics.</li> </ol>                                                                                                                                                                                                                                                      |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>Upon completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. how to calculate the area under and between curves.</li> <li>2. interpret a volume of revolution of a function’s graph around a given axis as a (Riemann) sum of disks or cylindrical shells, convert to definite integral form and compute its value.</li> <li>3. express the length of a curve as a (Riemann) sum of linear segments, convert to definite integral form and compute its value.</li> <li>4. express the surface area of revolution of a function’s graph around a given axis as a (Riemann) sum of rings, convert to definite integral form and compute its value.</li> <li>5. antidifferentiate products of functions by parts.</li> <li>6. recognize and implement appropriate techniques to anti-differentiate products of trigonometric functions.</li> <li>7. devise and apply a trigonometric substitution in integrals involving Pythagorean</li> </ol> |
|                                                                             | <p>Quotients.</p> <ol style="list-style-type: none"> <li>8. decompose a rational integrand using partial fractions.</li> <li>9. determine convergence of improper integrals with discontinuities in their domain or infinite limits of integration.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                             | <p>Indicative content includes the following.</p> <p><b><u>Definite Integrals</u></b></p> <p><b>Areas between Curves:</b> The Basic Formula, Curves That Cross Boundaries with Changing Formulas, Integrating with Respect to y, Combining Integrals with Formulas from Geometry, <b>Volumes of Solids of Revolution:</b> Disc Method, Washer Method, Cylindrical Shells Method, <b>Lengths of Curves in the Plane:</b> The Basic Formula, Dealing with Discontinuities in <math>dy/dx</math>, The Short Differential Formula, <b>Area of Surfaces of Revolution:</b> The Basic Formula, Revolution</p>                                                                                                                                                                                                                                                                                                                                                                                      |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p> | <p>about the y-axis, The Short Differential Form. [16 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]</p> <p>Quizzes [2 hr.]</p> <p><b>Techniques of Integration:</b></p> <p><b>Basic Integration Formulas:</b> Algebraic Procedures and Trigonometric Identities, <b>Integration by Parts:</b> The Formula, Repeated Use, Solving for the Unknown Integral, Tabular Integration, <b>Trigonometric Integrals:</b> Products of Sines and Cosines, Eliminating Square Roots, Integrals of Powers of <math>\tan x</math> and <math>\sec x</math>, Integrals of Odd Functions, Definite Integrals of Even Functions, <b>Trigonometric Substitution:</b> Trigonometric Substitution for Combining Squares, Integrals involving <math>\sqrt{a^2 + x^2}</math>, <math>\sqrt{a^2 - x^2}</math>, <math>\sqrt{x^2 + a^2}</math>, <math>\neq 0</math>, Two Useful Formulas, <b>Rational Functions and Partial Fractions:</b></p> <p>General Description of the Method, The Substitution <math>x = \tan(\theta)</math>. [24 hrs.]</p> <p>Revision problem and tutorial classes [6 hrs.]</p> |
|                                                              | <p>Quizzes [2 hr.]</p> <p><b>Plane Curves and Polar Coordinates:</b> Polar Coordinates, Definition of Polar Coordinates, Negative Values of <math>r</math>, Changing to Radian Measure, The Use of Radian Measure, Elementary Coordinate, Equations and Inequalities, Cartesian Versus Polar Coordinates, <b>Graphing in Polar Coordinates:</b> Symmetry and Slope, Faster Graphing, Finding the Points Where Curves Intersect. [6 hrs.]</p> <p>Revision problem and tutorial classes [2 hrs.]</p> <p>Quizzes [1 hr.]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                          |                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p> | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

|                                                                                           |           |                                                                                      |          |
|-------------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------|----------|
| <p><b>Structured SWL (h/sem)</b></p> <p>الحمل الدراسي المنتظم للطالب خلال الفصل</p>       | <p>63</p> | <p><b>Structured SWL (h/w)</b></p> <p>الحمل الدراسي المنتظم للطالب أسبوعيا</p>       | <p>4</p> |
| <p><b>Unstructured SWL (h/sem)</b></p> <p>الحمل الدراسي غير المنتظم للطالب خلال الفصل</p> | <p>87</p> | <p><b>Unstructured SWL (h/w)</b></p> <p>الحمل الدراسي غير المنتظم للطالب أسبوعيا</p> | <p>6</p> |

|                                       |     |
|---------------------------------------|-----|
| <b>Total SWL (h/sem)</b>              | 150 |
| الحمل الدراسي الكلي للطالب خلال الفصل |     |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |              |             |                  |          |                           |
|---------------------------------------------------|--------------|-------------|------------------|----------|---------------------------|
|                                                   |              | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment                              | Quizzes      | 3           | 15% (15)         | 4,8,12   | LO #2, 5, 8, 9 and 11     |
|                                                   | Assignments  | 1           | 5% (5)           | 7        | LO #2, 3, 4, 5 and 6      |
|                                                   | Homework     | 3           | 12% (12)         | 4,8,10   | LO #2-3, 4-7 and 8-9      |
|                                                   | Report       | 1           | 8% (8)           | 8        |                           |
| Summative assessment                              | Midterm Exam | 1.5 hr      | 10% (10)         | 7        | LO # 1-6                  |
|                                                   | Final Exam   | 3hr         | 50% (50)         | 16       | All                       |
| Total assessment                                  |              |             | 100% (100 Marks) |          |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | Material Covered                                                                                                                                                                                                                                   |
| Week 1                                                            | <b>Calculus and Area:</b> Regions Bounded by Curves, Area under the Graph of a Nonnegative Continuous Function.                                                                                                                                    |
| Week 2                                                            | <b>Definite Integrals:</b> Constant Functions, Area is Strictly a Special Case.                                                                                                                                                                    |
| Week 3                                                            | <b>Indefinite Integrals:</b> The Indefinite Integral of a Function, Rules of Algebra, The Integrals of $x^2$ , Solving Initial Value Problems with Indefinite Integrals.                                                                           |
| Week 4                                                            | <b>Integration by Substitution-Running the Chain Rule Backward:</b> The Generalized Power Rule in Integral Form, Sines and Cosines, The Substitution Method of Integration, Substitution in Definite Integrals.                                    |
| Week 5                                                            | <b>Application of Definite Integrals: Areas between Curves:</b> The Basic Formula, Derived from Riemann Sums, Curves That Cross Boundaries with Changing Formulas, Integrating with Respect to y, Combining Integrals with Formulas from Geometry. |
| Week 6                                                            | <b>Volumes of Solids of Revolution:</b> Disc Method, Washer Method, Cylindrical Shells Method.                                                                                                                                                     |
| Week 7                                                            | <b>Lengths of Curves in the Plane:</b> The Basic Formula, Dealing with Discontinuities in $dy/dx$ , The Short Differential Formula.                                                                                                                |

|                |                                                                                                                                                                                                                                                                       |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 8</b>  | <b>Area of Surfaces of Revolution:</b> The Basic Formula, Revolution about the y-axis, The Short Differential Form.                                                                                                                                                   |
| <b>Week 9</b>  | <b>Techniques of Integration: Basic Integration Formulas:</b> Algebraic Procedures and Trigonometric Identities.                                                                                                                                                      |
| <b>Week 10</b> | <b>Integration by Parts:</b> The Formula, Repeated Use, Solving for the Unknown Integral, Tabular Integration.                                                                                                                                                        |
| <b>Week 11</b> | <b>Trigonometric Integrals:</b> Products of Sines and Cosines, Eliminating Square Roots, Integrals of Powers of $\tan x$ and $\sec x$ , Integrals of Odd Functions, Definite Integrals of Even Functions.                                                             |
| <b>Week 12</b> | <b>Trigonometric Substitution:</b> Trigonometric Substitution for Combining Squares, Integrals involving $\sqrt{a^2 + x^2}$ , $\sqrt{a^2 - x^2}$ , $a \neq 0$ , Two Useful Formulas.                                                                                  |
| <b>Week 13</b> | <b>Rational Functions and Partial Fractions:</b> General Description of the Method, The Substitution $x = \tan(\theta/2)$ .                                                                                                                                           |
| <b>Week 14</b> | <b>Plane Curves and Polar Coordinates:</b> Polar Coordinates, Definition of Polar Coordinates, Negative Values of $r$ , Changing to Radian Measure, The Use of Radian Measure, Elementary Coordinate, Equations and Inequalities, Cartesian Versus Polar Coordinates. |
| <b>Week 15</b> | <b>Graphing in Polar Coordinates:</b> Symmetry and Slope, Faster Graphing, Finding the Points Where Curves Intersect.                                                                                                                                                 |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                                                                                                                                         |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | <b>Text</b>                                                                                 | <b>Available in the Library?</b> |
|--------------------------|---------------------------------------------------------------------------------------------|----------------------------------|
| <b>Required Texts</b>    | Calculus, Thirteenth Edition, by George B. Thomas,                                          | Yes                              |
| <b>Recommended Texts</b> | Calculus, Mathematics for Engineers and Technologists, 2002, by Huw Fox and Bill Bolton.    | No                               |
| <b>Websites</b>          | Khan Academy math ( <a href="https://www.khanacademy.org">https://www.khanacademy.org</a> ) |                                  |

## Grading Scheme

### مخطط الدرجات

| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

|                                           |                                              |                                      |                                                                                                                                                                                                                                                                                    |                          |     |
|-------------------------------------------|----------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----|
| <b>Module Title</b>                       | <b>Computer Programming</b><br>برمجة الحاسوب |                                      | <b>Module Delivery</b>                                                                                                                                                                                                                                                             |                          |     |
| <b>Module Type</b>                        | <b>Basic</b>                                 |                                      | <input checked="" type="checkbox"/> <b>Theory</b><br><input type="checkbox"/> <b>Lecture</b><br><input checked="" type="checkbox"/> <b>Lab</b><br><input type="checkbox"/> <b>Tutorial</b><br><input type="checkbox"/> <b>Practical</b><br><input type="checkbox"/> <b>Seminar</b> |                          |     |
| <b>Module Code</b>                        | <b>EE110</b>                                 |                                      |                                                                                                                                                                                                                                                                                    |                          |     |
| <b>ECTS Credits</b>                       | 6                                            |                                      |                                                                                                                                                                                                                                                                                    |                          |     |
| <b>SWL (hr./sem)</b>                      | 150                                          |                                      |                                                                                                                                                                                                                                                                                    |                          |     |
| <b>Module Level</b>                       | First Level                                  | <b>Semester of Delivery</b>          |                                                                                                                                                                                                                                                                                    |                          | Two |
| <b>Administering Department</b>           | Department of Electrical Engineering         | <b>College</b>                       | Engineering                                                                                                                                                                                                                                                                        |                          |     |
| <b>Module Leader</b>                      | Dr. Omar Sh. Alyozbak                        |                                      | <b>e-mail</b>                                                                                                                                                                                                                                                                      | o.yehya@uomosul.edu.iq   |     |
| <b>Module Leader's Acad. Title</b>        | Head of Department                           | <b>Module Leader's Qualification</b> | PhD                                                                                                                                                                                                                                                                                |                          |     |
| <b>Module Tutor</b>                       | Aws Thamir Mayouf                            |                                      | <b>e-mail</b>                                                                                                                                                                                                                                                                      | awsthamir@uomosul.edu.iq |     |
| <b>Peer Reviewer Name</b>                 |                                              |                                      | <b>e-mail</b>                                                                                                                                                                                                                                                                      |                          |     |
| <b>Scientific Committee Approval Date</b> | 01/06/2023                                   | <b>Version Number</b>                | 1.0                                                                                                                                                                                                                                                                                |                          |     |

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

**Module Aims, Learning Outcomes and Indicative Contents**

| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | 1. Introduction of MATLAB program (m file).<br>2. To understand Types of variables, numbers, Expressions, operation and function.<br>3. To understand Solving of Electrical circuit in MATLAB program.<br>4. To perform Solving equations by symbols.<br>5. To solve the Function and its application (pulse & ramp functions).<br>6. To perform Engineering graphics (two dimensions and three dimensions) such as vector diagram mesh, bar plots).<br>7. To perform Matrix and its applications.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 1. Proficiency in MATLAB: Students should develop a strong understanding of the MATLAB programming language, syntax, and functionality. They should be able to write, debug, and modify M-file programs effectively.<br>2. Problem-solving skills: MATLAB is often used for scientific and engineering applications, so students should learn how to apply MATLAB to solve complex problems in their respective fields. They should be able to analyze problems, develop algorithms, and implement them using MATLAB.<br>3. Data analysis and visualization: MATLAB offers powerful tools for data analysis and visualization. Students should learn how to import, manipulate, analyze, and visualize data using MATLAB functions and techniques.<br>4. computation: MATLAB is well known for its mathematical computing capabilities. Students should become proficient in using MATLAB for performing mathematical computations, including linear algebra and differential equations.<br>5. Algorithm development: MATLAB allows students to develop algorithms and implement them in M-file programs. They should learn how to break down complex problems into smaller, manageable tasks, design algorithms to solve those tasks, and integrate them into a complete MATLAB program.<br>6. Code optimization: Students should develop skills in optimizing MATLAB code for improved performance and efficiency.<br>7. Debugging and troubleshooting: MATLAB programs may encounter errors or produce unexpected results. Students should learn how to effectively debug and troubleshoot their M-file programs, identify and resolve issues, and improve the overall reliability of their code. |
|                                                                  | 8. Documentation and code organization: Writing clear and well-organized code is crucial for collaboration and future maintenance. Students should learn to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | <p>document their MATLAB programs, including comments, variable naming conventions, and overall code structure</p> <p>9. Project implementation: In some cases, students may be required to develop larger-scale projects using MATLAB. They should learn how to plan, manage, and implement MATLAB-based projects, ensuring that their programs meet the specified requirements and deliver the desired outcomes.</p>                                                                                                                                                                                                                                                              |
| <b>Indicative Contents</b><br>المحتويات الإرشادية | <p>Part A - Circuit Components and values</p> <p>Introduction to MATLAB, Types of variables, Numbers and Expressions, Operation, Functions, Solving set of linear equations, Function and its application (pulse &amp; ramp functions). [14 hrs.]</p> <p>Lab. [14 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]</p> <p>Part B- Circuit reduction</p> <p>Differentiation, Integration, Solving of Electrical circuit, Engineering graphics (two dimension and three dimensions) such as vector diagram mesh and bar plots, Solving of ordinary differential equation, Curve fitting and interpolation, Matrix and its applications [14 hrs.]</p> <p>Lab. [14 hrs.]</p> |

| Learning and Teaching Strategies        |                                                                                                                                                                                                                                                                                                                         |                                      |   |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---|
| استراتيجيات التعلم والتعليم             |                                                                                                                                                                                                                                                                                                                         |                                      |   |
| Strategies                              | The main strategy for delivering this module is to encourage student participation in exercises that refine and expand critical thinking skills. This will be achieved through classes and interactive tutorials, as well as by conducting simple experiments involving sampling activities that interest the students. |                                      |   |
| Student Workload (SWL)                  |                                                                                                                                                                                                                                                                                                                         |                                      |   |
| الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا |                                                                                                                                                                                                                                                                                                                         |                                      |   |
| Structured SWL (h/sem)                  | 63                                                                                                                                                                                                                                                                                                                      | Structured SWL (h/w)                 | 4 |
| الحمل الدراسي المنتظم للطالب خلال الفصل |                                                                                                                                                                                                                                                                                                                         | الحمل الدراسي المنتظم للطالب أسبوعيا |   |

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراشي غير المنتظم للطلاب خلال الفصل | 87  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراشي غير المنتظم للطلاب أسبوعيا | 5 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراشي الكلي للطلاب خلال الفصل              | 150 |                                                                           |   |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |             |                |           |                            |
|---------------------------------------------------|------------------------|-------------|----------------|-----------|----------------------------|
|                                                   |                        | Time/Number | Weight (Marks) | Week Due  | Relevant Learning Outcome  |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 1           | 10% (10)       | 4, 8, 12  | LO #1, 5, 8 and 9          |
|                                                   | <b>Assignments</b>     | 10          | 5% (5)         | 2 to 12   | LO #1, 2, 4, 6, 7, 8 and 9 |
|                                                   | <b>Projects / Lab.</b> | 2           | 25% (25)       | CONTINUES | All                        |
|                                                   | <b>Report</b>          | 0           | 0% (0)         | ---       | ---                        |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 2 hrs.      | 10% (10)       | 8         | LO # 1-5                   |
|                                                   | <b>Final Exam</b>      | 3 hrs.      | 50% (50)       | 16        | All                        |
| <b>Total assessment</b>                           |                        |             | 100% (100)     |           |                            |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|                | Material Covered                                                 |
|----------------|------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction to MATLAB, Types of variables, numbers. Expressions |
| <b>Week 2</b>  | Complex Numbers, Array Operations, Matrix Operations             |
| <b>Week 3</b>  | Application of matrix, Solving set of linear equations.          |
| <b>Week 4</b>  | Control structures in MATLAB program.                            |
| <b>Week 5</b>  | Plotting commands 2-D Graphics.                                  |
| <b>Week 6</b>  | Polynomials analysis.                                            |
| <b>Week 7</b>  | Function Files, its application (pulse & ramp functions)         |
| <b>Week 8</b>  | Revision – Mid Term Exam                                         |
| <b>Week 9</b>  | Solving equations by symbols.                                    |
| <b>Week 10</b> | Numerical Integration.                                           |
| <b>Week 11</b> | Transient Analysis.                                              |
| <b>Week 12</b> | Frequency Response using MATLAB                                  |
| <b>Week 13</b> | Partial fraction Expansion.                                      |
| <b>Week 14</b> | Application on Battery Charging on circuit.                      |
| <b>Week 15</b> | Engineering graphics 3D.                                         |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                    |

## Delivery Plan (Weekly Syllabus)

المناهج الأسبوعي للمختبر

|                | Material Covered                                                 |
|----------------|------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction to MATLAB, Types of variables, numbers. Expressions |
| <b>Week 2</b>  | Applied Complex Numbers, Array Operations, Matrix Operations.    |
| <b>Week 3</b>  | Applied Application of matrix, Solving set of linear equations.  |
| <b>Week 4</b>  | Applied Control structures in MATLAB program.                    |
| <b>Week 5</b>  | Applied Plotting commands for 2-D Graphics.                      |
| <b>Week 6</b>  | Applied Polynomials analysis.                                    |
| <b>Week 7</b>  | Applied Function Files, its application (pulse & ramp functions) |
| <b>Week 8</b>  | Revision – Mid Term Exam                                         |
| <b>Week 9</b>  | Applied Solving equation by symbols.                             |
| <b>Week 10</b> | Applied Numerical Integration.                                   |
| <b>Week 11</b> | Applied Transient Analysis.                                      |
| <b>Week 12</b> | Applied Frequency Response using MATLAB                          |
| <b>Week 13</b> | Applied Partial Fraction Expansion.                              |
| <b>Week 14</b> | Applied Application on Battery Charging on circuit.              |
| <b>Week 15</b> | Applied Engineering graphics 3D.                                 |

## Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                               | Available in the Library? |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | <ul style="list-style-type: none"> <li>Numerical Analysis Using MATLAB® and Excel® Third Edition, Steven T. Karris.</li> </ul>                                                                                                                                                     | Available as PDF          |
| <b>Recommended Texts</b> | <ul style="list-style-type: none"> <li>ELEMENTARY MATHEMATICAL and COMPUTATIONAL TOOLS for ELECTRICAL and COMPUTER ENGINEERS USING MATLAB, Jamal T. Manassah City College of New York, 2011</li> <li>ELECTRONICS and CIRCUIT ANALYSIS using MATLAB, JOHN O. ATTIA, 1999</li> </ul> |                           |
| <b>Websites</b>          | <b>Google Classroom</b>                                                                                                                                                                                                                                                            |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                              |                         |                     |           |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                       | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group</b><br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br>(0 - 49)                                                                                                                                                                                                                                                                                                                                                               | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                             |                         |                     |           |                                       |
| <p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p> |                         |                     |           |                                       |

## نموذج وصف المادة الدراسية

| Module Information                 |                                        |                               |                                                                                                                                                                                                                                              |
|------------------------------------|----------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                        |                               |                                                                                                                                                                                                                                              |
| Module Title                       | Digital Techniques<br>التقنيات الرقمية |                               | Module Delivery                                                                                                                                                                                                                              |
| Module Type                        | Core                                   |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | EE111                                  |                               |                                                                                                                                                                                                                                              |
| ECTS Credits                       | 3                                      |                               |                                                                                                                                                                                                                                              |
| SWL (hr./sem)                      | 100                                    |                               |                                                                                                                                                                                                                                              |
| Module Level                       | UGI                                    | Semester of Delivery          |                                                                                                                                                                                                                                              |
| Administering Department           | 2 - (Electrical Engineering)           | College                       | UoM2 - (Engineering)                                                                                                                                                                                                                         |
| Module Leader                      | اسم رئيس القسم                         | e-mail                        | البريد الالكتروني لرئيس القسم                                                                                                                                                                                                                |
| Module Leader's Acad. Title        | لقبه العلمي                            | Module Leader's Qualification | الشهادة                                                                                                                                                                                                                                      |
| Module Tutor                       | Dr. Azam Esam Dawood                   | e-mail                        | azzam.esam@uomosul.edu.iq                                                                                                                                                                                                                    |
| Peer Reviewer Name                 | اسم مُراجع الملف                       | e-mail                        | بريده الالكتروني                                                                                                                                                                                                                             |
| Scientific Committee Approval Date |                                        | Version Number                | 1.0                                                                                                                                                                                                                                          |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |  |
|----------------------------------------------------------|--|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |  |
|                                                          |  |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>46. To develop problem solving skills and understanding of Digital circuit theory through the application of techniques.</p> <p>47. To understand Digital circuit, latches and Flip-flops, asynchronous binary counters, synchronous binary counters.</p> <p>48. This course deals with the basic concept of latches and Flip-flops, asynchronous binary counters, synchronous binary counters.</p> <p>49. To construct data storage units/shift registers using flip flops</p> <p>50. To analyze sequential logic circuits using appropriate tools.</p> <p>51. To design and analyze synchronous binary, up/down counters.</p>                                                                                                                                                                  |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>52. Recognize how combinational logic circuits works.</p> <p>53. Design combinational logic circuits using combination logic design process.</p> <p>54. Define and describe various latches and Flip-flops</p> <p>55. Construct data storage units/shift registers using flip flops</p> <p>56. Define asynchronous and synchronous Digital circuit</p> <p>57. Identify how to design and analyze asynchronous binary counters.</p> <p>58. Explain how to design and analyze BCD asynchronous counters</p> <p>59. Explain the Synchronous counters Binary Counters 2: bit, 3-bit.</p> <p>60. Explain the types of shift registers and Shift register counters Ring Counter.</p>                                                                                                                   |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><b><u>Part A - Circuit Components and values</u></b></p> <p>Introduction to Digital Technique, Basic Definitions, System of Numbers, General number formula: Binary, octal, decimal &amp; hexadecimal numbers, Numbers Base Conversion (Arithmetic operation in different numbers complements, binary codes, BCD, Ex-3, gray codes). [9 hrs.] : Revision problem and tutorial classes [6 hrs.] : Quizzes [1 hr.]</p> <p><b><u>Part B- Circuit reduction</u></b></p> <p>Boolean algebra: (Basic definitions, basic theorem &amp; properties, Boolean functions), Canonical &amp; Standard Forms Digital Logic Gates. [12 hrs.]: Revision problem and tutorial classes [8 hrs.]: Quizzes [1 hr.]</p> <p><b><u>Part C- Circuit Theory</u></b></p> |
|                                                                             | <p>Karnaugh Maps (AND &amp; OR implementation, don't care condition), Adders Arithmetic Operation (Sub tractors, half &amp; full adders &amp; Subtractors, binary parallel adders), Code Conversion (Even and odd parity logic, decoders, encoders comparator, multiplexers &amp; demultiplexers), Sequential Logic (Flip Flops (RS, T, D, JK...) Master slave FF, Counters, Shift registers).. [24 hrs.]: Revision problem and tutorial classes [16 hrs.]:Quizzes [1 hr.]</p>                                                                                                                                                                                                                                                                                                                      |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 37  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 2 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |   |

| Module Evaluation     |              |             |                  |            |                           |
|-----------------------|--------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية |              |             |                  |            |                           |
|                       |              | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes      | 1           | 5% (5)           | 4,8,12     | LO #1, 5, 8 and 9         |
|                       | Assignments  | 10          | 5% (5)           | 2 to 12    | LO #1, 2, 4, 6 7, 8 and 9 |
|                       | Projects /   | 1           | 20% (20)         | Continuous | All                       |
|                       | Report       | 1           | 10% (10)         | 2 to 12    | All                       |
| Summative assessment  | Midterm Exam | 2 hr.       | 10% (10)         | 7          | LO # 1-5                  |
|                       | Final Exam   | 3hr         | 50% (50)         | 16         | All                       |
| Total assessment      |              |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------|
| المناهج الاسبوعي النظري         |                                                                                       |
|                                 | Material Covered                                                                      |
| Week 1                          | Introduction to Digital Technique, General number formula                             |
| Week 2                          | Numbers Base Conversion, Boolean algebra                                              |
| Week 3                          | Canonical & Standard Forms Digital Logic Gates, Karnaugh Maps                         |
| Week 4                          | Adders Arithmetic Operation, Code Conversion                                          |
| Week 5                          | Introduction to sequential logic circuit design<br>Latches, S-R Latch, gated RS Latch |
| Week 6                          | Edge-triggered Flip-Flops, JK-FF and D-FF Flip-Flop Operating Characteristics         |
| Week 7                          | Shift Register operation                                                              |
| Week 8                          | Mid-term Exam                                                                         |
| Week 9                          | Types of shift registers, Shift register counters: Ring Counter                       |
| Week 10                         | Models of State Machines                                                              |

|                |                                                     |
|----------------|-----------------------------------------------------|
| <b>Week 11</b> | Asynchronous Counters: Ripple counter               |
| <b>Week 12</b> | Synchronous counters: Binary Counters 2: bit, 3-bit |
| <b>Week 13</b> | BCD Counter                                         |
| <b>Week 14</b> | Up/down counter                                     |
| <b>Week 15</b> | Synchronous counters design                         |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>       |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                        | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Digital Fundamental:<br>By Thomas L. Floyd<br>11th Edition Pearson Education Limited (2015) | Yes                       |
| <b>Recommended Texts</b> | Contemporary Logic Design, Randy Katz Addison Wesley Publishing Company 1993                | No                        |
| <b>Websites</b>          | Introduction to Boolean algebra and logic design by Gerhard and Melvin                      |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

|                                           |                                  |                                                                                                                                                                                                                                                                                    |                                 |
|-------------------------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Module Title</b>                       | <b>Physics II</b><br>الفيزياء II | <b>Module Delivery</b>                                                                                                                                                                                                                                                             |                                 |
| <b>Module Type</b>                        | <b>Basic</b>                     | <input checked="" type="checkbox"/> <b>Theory</b><br><input type="checkbox"/> <b>Lecture</b><br><input type="checkbox"/> <b>Lab</b><br><input checked="" type="checkbox"/> <b>Tutorial</b><br><input type="checkbox"/> <b>Practical</b><br><input type="checkbox"/> <b>Seminar</b> |                                 |
| <b>Module Code</b>                        | <b>EE112</b>                     |                                                                                                                                                                                                                                                                                    |                                 |
| <b>ECTS Credits</b>                       | <b>3</b>                         |                                                                                                                                                                                                                                                                                    |                                 |
| <b>SWL (hr./sem)</b>                      | <b>75</b>                        |                                                                                                                                                                                                                                                                                    |                                 |
| <b>Module Level</b>                       | UGI                              | <b>Semester of Delivery</b>                                                                                                                                                                                                                                                        | 2                               |
| <b>Administering Department</b>           | 2 - (Electrical Engineering)     | <b>College</b>                                                                                                                                                                                                                                                                     | UoM2 - (Engineering)            |
| <b>Module Leader</b>                      | Dr. Omar Sh. Alyozbaky           | <b>e-mail</b>                                                                                                                                                                                                                                                                      | o.yehya@uomosul.edu.iq          |
| <b>Module Leader's Acad. Title</b>        | Assist. Prof.                    | <b>Module Leader's Qualification</b>                                                                                                                                                                                                                                               | Doctor                          |
| <b>Module Tutor</b>                       | Mr. Ahmad Abduljabbar Ismael     | <b>e-mail</b>                                                                                                                                                                                                                                                                      | a.a.ismail@uomosul.edu.iq       |
| <b>Peer Reviewer Name</b>                 | Mr. Omar Turath                  | <b>e-mail</b>                                                                                                                                                                                                                                                                      | omartawfeeq_1981@uomosul.edu.iq |
| <b>Scientific Committee Approval Date</b> | 10/06/2023                       | <b>Version Number</b>                                                                                                                                                                                                                                                              | 1.0                             |

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

**Module Aims, Learning Outcomes and Indicative Contents**

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|  |                                                                                                                                                                                     |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | 52. To develop problem solving skills of electronic circuit through the understanding solid state for each electronic passive and active elements such as RLC, diodes, transistors, |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>and integrated circuits.</p> <p>53. To understand energy level and atomic structure through energy-band theory of materials.</p> <p>54. This course deals with the basic concept and Internal structure of materials of materials including metals, insulators and semiconductors.</p> <p>55. To understand electrical conduction and characteristics of the all materials such as conductivity, Mobility, energy distribution of electrons, Fermi levels, work function, and electronic emission.</p> <p>56. To understand the intrinsic and extrinsic semiconductors parameters.</p> <p>57. To perform current-voltage characteristics, charge control description for all types of both the diode and transistors.</p> <p>58. To model small signal and large signal of the active electronic devices such as DC load line and AC load line concept.</p> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>61. Recognize the Semiconductors and compound semiconductors materials such as Si, Ge, and GaAs.</p> <p>62. List the various terms associated with active electronics elements.</p> <p>63. Summarize what is meant by an electronic circuit.</p> <p>64. Describe energy band theory of all materials.</p> <p>65. Discuss the various properties of diodes and transistors.</p> <p>66. Explain the homo-junction and Hetero-junction materials such as PN junction diodes, PNP transistors, and NPN transistors.</p> <p>67. Explain the other types of semiconductor diodes: Varactor diode, tunnel diode, photodiode and photovoltaic (solar) cell, Light emitting diode, metal electronic.</p>                                                                                                                                                             |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><b><u>Part A - Energy Level and Atomic Structure</u></b></p> <p>The atom, models, wave nature of light, dual nature of matter, energy-band theory of metals, insulators and semiconductors, crystal structure, ionic, covalent and metallic bonding, energy band of crystals, Internal structure of materials cell, packing miller indices, crystal planes and directions. [8 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]</p> <p>Quizzes [1 hr.]</p>                                                                                                                                                                                                                                                                                                                                      |
|                                                                             | <p><b><u>Part B- Electrical Conduction in Metals:</u></b></p> <p>Mobility and conductivity, energy distribution of electrons, Fermi levels, work function, electronic emission. Semiconductors: Semiconductors materials (Si, Ge and compound semiconductors), extrinsic semiconductors, Fermi-level in semiconductor, diffusion and carrier life time, Hall effect. [8 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part C- Semiconductor p-n Junction:</u></b></p> <p>p-n junction in equilibrium, current-voltage characteristics, charge-control description of a diode, Transition and diffusion capacitance's, diode switching times, diode models, small-signal model and load line concept, and introduction to Hetero-junctions and double Hetero- junctions. [6 hrs.]</p>                         |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Revision problem and tutorial classes [3 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part D- Diode Circuit Applications:</u></b></p> <p>Rectifiers, Zener diodes voltage regulators, clipping circuits, clamping circuits and wave form generation. Other Types of Semiconductor Diodes: Varactor diode, tunnel diode, photodiode and photovoltaic (solar) cell, Light emitting diode, metal electronic. Transistors Principle of Operation and type, Transistor biasing circuits, Application Circuit. [8 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]</p> <p>Quizzes [1 hr.]</p> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                                 | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |

| Student Workload (SWL)                                                         |    |                                                                           |   |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|---|
| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا                                        |    |                                                                           |   |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 48 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 3 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 27 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 2 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 75 |                                                                           |   |

| Module Evaluation     |                    |                 |                  |            |                           |
|-----------------------|--------------------|-----------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية |                    |                 |                  |            |                           |
|                       |                    | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes            | 3               | 15% (15)         | Continuous | LO #1, 4, 6 and 7         |
|                       | Assignments        | 3               | 12% (12)         | Continuous | LO #1, 2, 3, 4, 5 and 7   |
|                       | Onsite Assignments | 5               | 5% (5)           | Continuous | -----                     |
|                       | Report             | 1               | 8% (8)           | Continuous | All                       |
| Summative assessment  | Midterm Exam       | 2 hr.           | 10% (10)         | 7          | LO # 4-7                  |
|                       | Final Exam         | 3hr             | 50% (50)         | 16         | All                       |
| Total assessment      |                    |                 | 100% (100 Marks) |            |                           |

## Delivery Plan (Weekly Syllabus)

## المناهج الاسبوعي النظري

|                | Material Covered                                                                                                                                                                                                        |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Energy Level and Atomic Structure: The atom, models, wave nature of light, dual nature of matter. Energy-band theory of metals, Insulators and semiconductors, Crystal structure, Ionic, Covalent and metallic bonding. |
| <b>Week 2</b>  | Energy band of crystals, Internal structure of materials cell, packing miller indices, crystal planes and directions.                                                                                                   |
| <b>Week 3</b>  | Electrical Conduction in Metals: Mobility and conductivity, energy distribution of electrons.                                                                                                                           |
| <b>Week 4</b>  | Electrical Conduction in Metals: Fermi levels, Work function, Diffusion Current, Electronic emission.                                                                                                                   |
| <b>Week 5</b>  | Introduction of semiconductors: Semiconductors materials (Si, Ge and compound semiconductors).                                                                                                                          |
| <b>Week 6</b>  | Introduction of semiconductors: Intrinsic semiconductors, and Fermi-level in semiconductor.                                                                                                                             |
| <b>Week 7</b>  | Introduction of semiconductors: Extrinsic semiconductors, and Fermi-level in semiconductor.                                                                                                                             |
| <b>Week 8</b>  | Introduction of semiconductors: Demonstrated of electrical conductance in semiconductors materials. Diffusion Current in semiconductors, carrier life time, and Hall effect.                                            |
| <b>Week 9</b>  | Introduction semiconductor P-N junction:<br>P-N junction in equilibrium, current-voltage characteristics. charge-control description of a diode.                                                                        |
| <b>Week 10</b> | Diffusion current, diffusion current density, draw Energy-band level. Transition and diffusion capacitance's, diode switching times.                                                                                    |
| <b>Week 11</b> | diode models, small-signal model and load line concept, and introduction to Hetero-junctions and double Hetero-junctions.                                                                                               |
| <b>Week 12</b> | Introduction of Diodes, current-voltage characteristics of diode. Forward and reverse biasing of diodes, Temperature effects for diode characteristics.                                                                 |
| <b>Week 13</b> | Diode Circuit Applications: Rectifiers, clipping circuits, clamping circuits.                                                                                                                                           |
| <b>Week 14</b> | Zener diodes voltage regulators, and wave form generation. Varactor diode, tunnel diode, photodiode and photovoltaic (solar) cell, Light emitting diode, metal electronic.                                              |
| <b>Week 15</b> | Introduction of transistors, Principle of Operation and type. Current-Voltage characteristics of transistors, DC Load line with state Q-Point. Transistors biasing circuits.                                            |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                                                                                           |

|                                 |                                                                                                                                                               |                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                 |                                                                                                                                                               |                           |
| Learning and Teaching Resources |                                                                                                                                                               |                           |
| مصادر التعلم والتدريس           |                                                                                                                                                               |                           |
|                                 | Text                                                                                                                                                          | Available in the Library? |
| Required Texts                  | Floyd, Thomas L. Electronics Fundamentals: Circuits, Devices and Applications (Floyd Electronics Fundamentals Series). Prentice-Hall, Inc., 2006.             | Yes                       |
| Recommended Texts               | Donald A. Neamen. (2003). "SEMICONDUCTOR PHYSICS AND DEVICES". 3rd Edition, ISBN 0-07-232107-05, USA. (can be downloaded from the Course web page/classroom). | Yes                       |
| Websites                        | Nashelsky, L., & Boylestad, R. L. (2021). Electronic Devices and Circuit Theory Eleventh Edition.                                                             |                           |

| <b>Grading Scheme</b>               |                         |                     |           |                                       |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                        |                         |                     |           |                                       |
| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

### نموذج وصف المادة الدراسية

| Module Information                 |                                                         |                               |                                                                                                                                                                                                                               |
|------------------------------------|---------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                                         |                               |                                                                                                                                                                                                                               |
| Module Title                       | Democracy and Human Rights<br>الديمقراطية وحقوق الانسان |                               | Module Delivery                                                                                                                                                                                                               |
| Module Type                        | Support                                                 |                               | <input type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | UOM1040                                                 |                               |                                                                                                                                                                                                                               |
| ECTS Credits                       | 2                                                       |                               |                                                                                                                                                                                                                               |
| SWL (hr/sem)                       | 50                                                      |                               |                                                                                                                                                                                                                               |
| Module Level                       | 1                                                       | Semester of Delivery          |                                                                                                                                                                                                                               |
| Administering Department           |                                                         | College                       |                                                                                                                                                                                                                               |
| Module Leader                      |                                                         | e-mail                        |                                                                                                                                                                                                                               |
| Module Leader's Acad. Title        |                                                         | Module Leader's Qualification |                                                                                                                                                                                                                               |
| Module Tutor                       |                                                         | e-mail                        |                                                                                                                                                                                                                               |
| Peer Reviewer Name                 |                                                         | e-mail                        |                                                                                                                                                                                                                               |
| Scientific Committee Approval Date | 10/7/2023                                               | Version Number                | 1.0                                                                                                                                                                                                                           |

| Relation with other Modules                              |                                                                                                                                                               |          |      |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|
| العلاقة مع المواد الدراسية الأخرى                        |                                                                                                                                                               |          |      |
| Prerequisite module                                      | None                                                                                                                                                          | Semester | None |
| Co-requisites module                                     | None                                                                                                                                                          | Semester | None |
| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                               |          |      |
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                               |          |      |
|                                                          | The aim of studying the democracy and human rights topics is to:<br><br>1. <b>Understand</b> the concept of human rights and explore their sources, including |          |      |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>international, regional, national, and religious sources.</p> <ol style="list-style-type: none"> <li>2. <b>Define</b> administrative corruption, explore its types, and understand its detrimental effects on society. Study methods to combat administrative corruption and promote transparency, accountability, and good governance.</li> <li>3. <b>Trace</b> the historical development and evolution of human rights, examining key milestones and movements that have shaped the modern understanding of human rights.</li> <li>4. <b>Differentiate</b> between different categories of human rights, including civil and political rights, economic and social rights, and environmental, cultural, and developmental rights.</li> <li>5. <b>Explore</b> legal, institutional, and societal guarantees to prevent human rights violations, including guarantees of human rights in Islam, national-level protections, and international safeguards.</li> <li>6. <b>Comprehend</b> the concept of democracy, including its principles, values, and various forms of democratic governance such as direct, semi-direct, indirect, and digital democracy.</li> </ol> <p>Overall, studying these topics aims to develop a comprehensive understanding of human rights, democracy, and combating corruption, empowering individuals to actively promote and protect human rights and democratic values in society.</p>                                                                                                                                                   |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>After these module aims, students should be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate a comprehensive understanding of the concept of human rights and their sources, including international, regional, national, and religious sources.</li> <li>2. Identify and explain the fundamental characteristics of human rights, such as universality, indivisibility, interdependence, and inalienability.</li> <li>3. Analyze the historical emergence and evolution of human rights, including key milestones and movements that have shaped their development.</li> <li>4. Differentiate between different categories of human rights, including civil and political rights, economic and social rights, and environmental, cultural, and developmental rights.</li> <li>5. Evaluate and apply legal, institutional, and societal guarantees to prevent human rights violations, considering guarantees in Islam, at the national level, and within the international framework.</li> <li>6. Understand and discuss the concept of democracy, including its principles, values, and different forms of democratic governance.</li> <li>7. Evaluate the Islamic stance on democracy and engage in critical analysis of the strengths and weaknesses of the democratic system.</li> <li>8. Recognize and assess the impact of administrative corruption on society and propose methods to combat and prevent corruption in administrative systems.</li> <li>9. Demonstrate critical thinking skills by analyzing and evaluating different</li> </ol> |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | <p>perspectives on human rights, democracy, and corruption.</p> <p>10. Apply acquired knowledge and skills to promote and protect human rights, democracy, and good governance in personal, professional, and civic contexts.</p> <p>Overall, students should have a solid understanding of democracy and human rights, democracy, and corruption issues, and be able to apply this knowledge to contribute to the advancement of human rights and democratic values in society.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Indicative Contents</b><br>المحتويات الإرشادية | <p>The indicative content includes:</p> <ol style="list-style-type: none"> <li>1. Definition and sources of democracy and human rights (international, regional, national, religious). [3h]</li> <li>2. Characteristics of democracy and human rights: universality, indivisibility, interdependence, inalienability. [3h]</li> <li>3. Emergence and evolution of human rights: historical development, key milestones, influential movements. [3h]</li> <li>4. Types of human rights: civil and political, economic and social, environmental, cultural, and developmental. [3h]</li> <li>5. Guarantees to prevent human rights violations: legal, institutional, societal safeguards, Islamic guarantees, national and international levels. [3h]</li> <li>6. Concept of democracy: principles, values, forms of governance (direct, semi-direct, indirect). [3h]</li> <li>7. Islamic stance on democracy: compatibility, strengths, weaknesses. [3h]</li> <li>8. Critique of the democratic system: analysis of strengths and weaknesses. [3h]</li> <li>9. Administrative corruption: definition, types, societal impact. [3h]</li> <li>10. Methods to combat administrative corruption. [3h]</li> </ol> |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <p>When it comes to learning and teaching strategies for a human rights module, there are several approaches can be taken to enhance understanding and engagement. Here are some effective strategies:</p> <ol style="list-style-type: none"> <li>1. Interactive Discussions: Encourage students to actively participate in discussions, debates, and group activities. This promotes critical thinking, allows for different perspectives to be shared, and fosters a deeper understanding of human rights issues.</li> <li>2. Case Studies: Present real-life case studies that highlight human rights violations or achievements. Analyzing these cases helps students apply theoretical concepts to practical situations and develops their problem-solving skills.</li> </ol> |
|                                                                        | <ol style="list-style-type: none"> <li>3. Research Projects: Assign research projects on specific human rights topics or issues. This encourages independent learning, critical analysis, and the development of research skills.</li> <li>4. Collaborative Learning: Foster collaboration among students through group projects or</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|  |                                                                                                                                                                                                                                                                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>assignments. This encourages teamwork, peer learning, and the exchange of diverse perspectives.</p> <p>5. Assessment Variety: Use a variety of assessment methods, including essays, presentations, debates, and quizzes, to assess students' understanding of human rights concepts and their ability to apply them to real-world situations.</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Student Workload (SWL)                                                         |    |                                                                            |   |
|--------------------------------------------------------------------------------|----|----------------------------------------------------------------------------|---|
| الحمل الدراسي للطالب                                                           |    |                                                                            |   |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 33 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعياً       | 2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 17 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعياً | 1 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 50 |                                                                            |   |

| Module Evaluation     |                 |             |                  |                 |                           |
|-----------------------|-----------------|-------------|------------------|-----------------|---------------------------|
| تقييم المادة الدراسية |                 |             |                  |                 |                           |
|                       |                 | Time/Number | Weight (Marks)   | Week Due        | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 2           | 10% (10)         | 5, 10           | LO #2, 4, 6 and 8         |
|                       | Assignments     | 2           | 20% (20)         | 3, 5, 8, 11, 13 | LO # 1, 3, 7, 6, 9 and 10 |
|                       | Projects / Lab. |             | 10% (10)         |                 |                           |
|                       | Report          | 1           | 10% (10)         | 13              | LO # 2,4,5,7,9and 10      |
| Summative assessment  | Midterm Exam    | 2 hr        | 10% (10)         | 7               | LO # 1-7                  |
|                       | Final Exam      | 3 hr        | 50% (50)         | 16              | All                       |
| Total assessment      |                 |             | 100% (100 Marks) |                 |                           |

| Delivery Plan (Weekly Syllabus) |                  |
|---------------------------------|------------------|
| المناهج الأسبوعي النظري         |                  |
|                                 | Material Covered |

|                |                                                                                                                                       |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Definition of human rights and sources of rights (international sources / regional sources / national sources / religious sources).   |
| <b>Week 2</b>  | Characteristics of human rights.                                                                                                      |
| <b>Week 3</b>  | The emergence and evolution of human rights.                                                                                          |
| <b>Week 4</b>  | Types of human rights / civil and political rights. Economic and social rights.<br>Environmental, cultural, and developmental rights. |
| <b>Week 5</b>  | Guarantees to prevent human rights violations / guarantees of human rights in Islam.                                                  |
| <b>Week 6</b>  | Guarantees for the protection of human rights at the national level.                                                                  |
| <b>Week 7</b>  | Guarantees of human rights at the international level.                                                                                |
| <b>Week 8</b>  | The concept of democracy.                                                                                                             |
| <b>Week 9</b>  | Characteristics of a democratic system.                                                                                               |
| <b>Week 10</b> | Forms of democratic governance (direct democracy / semi-direct democracy / indirect democracy).                                       |
| <b>Week 11</b> | Digital democracy / definition and advantages and disadvantages of digital democracy / manifestations of digital democracy.           |
| <b>Week 12</b> | The Islamic stance on democracy.                                                                                                      |
| <b>Week 13</b> | Critique of the democratic system.                                                                                                    |
| <b>Week 14</b> | Administrative corruption / definition and types.                                                                                     |
| <b>Week 15</b> | Methods to combat administrative corruption.                                                                                          |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                         |

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

|               | Material Covered |
|---------------|------------------|
| <b>Week 1</b> |                  |
| <b>Week 2</b> |                  |
| <b>Week 3</b> |                  |
| <b>Week 4</b> |                  |
| <b>Week 5</b> |                  |
| <b>Week 6</b> |                  |
| <b>Week 7</b> |                  |

| مصادر التعلم والتدريس                                                                                                                                                                                                                                                                                                                                                                |                                                                                               |                     |                           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------|---------------------------|---------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                      | Text                                                                                          |                     | Available in the Library? |                                       |
| Required Texts                                                                                                                                                                                                                                                                                                                                                                       | ضمانات حقوق الانسان وحمايتها وفقا للقانون الدولي والتشريع الوطني / نبيل عبد الرحمن ناصر الدين |                     | No                        |                                       |
| Recommended Texts                                                                                                                                                                                                                                                                                                                                                                    | الديمقراطية وحقوق الانسان / د. امير عبد العزيز                                                |                     | No                        |                                       |
| Websites                                                                                                                                                                                                                                                                                                                                                                             |                                                                                               |                     |                           |                                       |
| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                                                                                               |                     |                           |                                       |
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                                                                                               |                     |                           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                                                                                         | التقدير             | Marks (%)                 | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent                                                                                 | امتياز              | 90 - 100                  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good                                                                                 | جيد جدا             | 80 - 89                   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good                                                                                      | جيد                 | 70 - 79                   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory                                                                              | متوسط               | 60 - 69                   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient                                                                                | مقبول               | 50 - 59                   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail                                                                                     | (راسب) قيد المعالجة | (45-49)                   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail                                                                                      | راسب                | (0-44)                    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                               |                     |                           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                                                                                               |                     |                           |                                       |

## نموذج وصف المادة الدراسية

| Module Information                 |                                          |                                                                                                                                                                                                                               |                               |                      |
|------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------|
| معلومات المادة الدراسية            |                                          |                                                                                                                                                                                                                               |                               |                      |
| Module Title                       | English language 1<br>اللغة الانكليزية 1 | Module Delivery                                                                                                                                                                                                               |                               |                      |
| Module Type                        | Basic                                    | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                               |                      |
| Module Code                        | UOM1021                                  |                                                                                                                                                                                                                               |                               |                      |
| ECTS Credits                       | 2                                        |                                                                                                                                                                                                                               |                               |                      |
| SWL (hr./sem)                      | 50                                       |                                                                                                                                                                                                                               |                               |                      |
| Module Level                       | UGI                                      |                                                                                                                                                                                                                               |                               | Semester of Delivery |
| Administering Department           | 2 - (Electrical Engineering)             | College                                                                                                                                                                                                                       | UoM2 - (Engineering)          |                      |
| Module Leader                      |                                          | e-mail                                                                                                                                                                                                                        | البريد الالكتروني لرئيس القسم |                      |
| Module Leader's Acad. Title        | لقبه العلمي                              | Module Leader's Qualification                                                                                                                                                                                                 | الشهادة                       |                      |
| Module Tutor                       |                                          | e-mail                                                                                                                                                                                                                        |                               |                      |
| Peer Reviewer Name                 | اسم مُراجع الملف                         | e-mail                                                                                                                                                                                                                        | بريده الالكتروني              |                      |
| Scientific Committee Approval Date | 01/06/2023                               | Version Number                                                                                                                                                                                                                | 1.0                           |                      |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents   |  |
|----------------------------------------------------------|--|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |  |
|                                                          |  |

|                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                            | 59. To develop Communications skills in the English language.<br>60. To let the students able to read and write in correct Grammar.<br>61. To develop the skills of writing professional writing<br>62. To develop the skills of writing emails for future Engineers                                                                                                                                                                                                                                                                                                                                                            |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية       | 68. Learning Parts of Speech in English<br>69. Learn different tenses of verbs.<br>70. Learn active and passive voice.<br>71. Learn adjectives and adverbs.<br>72. Learn the correct prepositions.<br>73. Learn the correct articles                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                      | Indicative content includes the following.<br><b><u>Part A – learn parts of speech</u></b><br>Nouns, verbs, adjectives, articles, pronouns. [9 hrs.]<br>Revision problem and tutorial classes [5 hrs.]<br>Quizzes [1 hr.]<br><b><u>Part B-different tenses</u></b><br>Present simple, present perfect, present continuous, past simple, past perfect, past continuous. [9 hrs.]<br>Revision problem and tutorial classes [6 hrs.]<br>Quizzes [1 hr.]<br><b><u>Part C- active and passive voice</u></b><br>Active and passive voice, since and for [6 hrs.]<br>Revision problem and tutorial classes [6 hrs.]<br>Quizzes [1 hr.] |
| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Strategies</b>                                                      | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their communications skills. This will be achieved through classes, interactive involving some sampling activities that are interesting to the students.                                                                                                                                                                                                                                                                                               |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا |    |                                                                     |   |
|--------------------------------------------------------------------------|----|---------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل | 33 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا | 2 |

|                                                                                |    |                                                                           |   |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|---|
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 17 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 1 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 50 |                                                                           |   |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                     |                    |                       |                 |                                  |
|---------------------------------------------------|---------------------|--------------------|-----------------------|-----------------|----------------------------------|
|                                                   |                     | <b>Time/Number</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning Outcome</b> |
| <b>Formative assessment</b>                       | <b>Quizzes</b>      | 3                  | 10% (10)              | 4,8,12          | LO #1, 5, 8 and 9                |
|                                                   | <b>Assignments</b>  | 5                  | 10% (5)               | 2 to 12         | LO #1, 2, 4, 6 7, 8 and 9        |
|                                                   | <b>Projects</b>     | 1                  | 20% (25)              | Continuous      | All                              |
|                                                   | <b>Report</b>       | 0                  | 0% (0)                | ----            | ----                             |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b> | 2 hr               | 10% (10)              | 8               | LO # 1-5                         |
|                                                   | <b>Final Exam</b>   | 3hr                | 50% (50)              | 16              | All                              |
| <b>Total assessment</b>                           |                     |                    | 100% (100 Marks)      |                 |                                  |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|                | Material Covered                            |
|----------------|---------------------------------------------|
| <b>Week 1</b>  | Introduction                                |
| <b>Week 2</b>  | Part of speech: Verbs present               |
| <b>Week 3</b>  | Part of speech: Verbs past                  |
| <b>Week 4</b>  | Part of speech: perfect tenses              |
| <b>Week 5</b>  | Part of speech: Noun                        |
| <b>Week 6</b>  | Part of speech: preposition                 |
| <b>Week 7</b>  | Part of speech: adVerbs                     |
| <b>Week 8</b>  | Mid-term Exam                               |
| <b>Week 9</b>  | Part of speech: passive and active          |
| <b>Week 10</b> | Part of speech: since and for               |
| <b>Week 11</b> | Part of speech: articles                    |
| <b>Week 12</b> | Part of speech: conjunctions                |
| <b>Week 13</b> | Writing an email                            |
| <b>Week 14</b> | Writing an email exercises                  |
| <b>Week 15</b> | Technique to fix Grammers.                  |
| <b>Week 16</b> | <b>Preparing week before the Final Exam</b> |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                  | Available in the Library? |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | NEW HEADWAY INTERMEDIATE                                                                                              | Yes                       |
| <b>Recommended Texts</b> | ENGLISH GRAMMAR IN USE                                                                                                | No                        |
| <b>Websites</b>          | <a href="https://www.udemy.com/course/english-for-engineers/">https://www.udemy.com/course/english-for-engineers/</a> |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| Module Information                        |                                                              |                                                                                                                                                                                                                                          |                                      |                             |
|-------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------|
| معلومات المادة الدراسية                   |                                                              |                                                                                                                                                                                                                                          |                                      |                             |
| <b>Module Title</b>                       | Electrical Circuits Analysis I<br>تحليل الدوائر الكهربائية I |                                                                                                                                                                                                                                          | <b>Module Delivery</b>               |                             |
| <b>Module Type</b>                        | Core                                                         | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                                      |                             |
| <b>Module Code</b>                        | EEPM201                                                      |                                                                                                                                                                                                                                          |                                      |                             |
| <b>ECTS Credits</b>                       | 5                                                            |                                                                                                                                                                                                                                          |                                      |                             |
| <b>SWL (hr./sem)</b>                      | 125                                                          |                                                                                                                                                                                                                                          |                                      |                             |
| <b>Module Level</b>                       | Two                                                          |                                                                                                                                                                                                                                          |                                      | <b>Semester of Delivery</b> |
| <b>Administering Department</b>           | 2 - (Electrical Engineering)                                 | <b>College</b>                                                                                                                                                                                                                           | UoM2 - (Engineering)                 |                             |
| <b>Module Leader</b>                      | Dr. Omer S. Yehia                                            |                                                                                                                                                                                                                                          | <b>e-mail</b>                        | o.yehya@uomosul.edu.iq      |
| <b>Module Leader's Acad. Title</b>        | Asst. Prof.                                                  |                                                                                                                                                                                                                                          | <b>Module Leader's Qualification</b> | Doctor                      |
| <b>Module Tutor</b>                       | Dr. Sarra Ismaiel Khalil                                     |                                                                                                                                                                                                                                          | <b>e-mail</b>                        | saraa2020@uomosul.edu.iq    |
| <b>Peer Reviewer Name</b>                 | Dr. Ahmed Salim Jarallah                                     |                                                                                                                                                                                                                                          | <b>e-mail</b>                        | ahmed.salim@uomosul.edu.iq  |
| <b>Scientific Committee Approval Date</b> | 01/09/2023                                                   | <b>Version Number</b>                                                                                                                                                                                                                    | 1.0                                  |                             |

| Relation with other Modules       |      |                 |
|-----------------------------------|------|-----------------|
| العلاقة مع المواد الدراسية الأخرى |      |                 |
| <b>Prerequisite module</b>        | None | <b>Semester</b> |

|                      |      |          |  |
|----------------------|------|----------|--|
| Co-requisites module | None | Semester |  |
|----------------------|------|----------|--|

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <ol style="list-style-type: none"> <li>1. Transient Response of First-Order RL and RC circuits, Natural Response, Complete response.</li> <li>2. Forced response and natural response of First-Order RL and RC circuits, General response, sequential switching.</li> <li>3. Transient Response of Second Order RLC circuits, Natural response of series RLC circuits.</li> <li>4. Analysis of overdamped, underdamped and critically damped RLC circuits.</li> <li>5. Mutual Inductance, Mutual- and self-inductance equations.</li> <li>6. Coupling: Magnetic coupling, Coefficient of coupling, the linear transformer.</li> <li>7. T- and PI model the ideal transformer: impedance matching.</li> <li>8. Two-Port Networks.</li> </ol> |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. Recognize how electricity works in electrical circuits.</li> <li>2. List the various terms associated with electrical circuits.</li> <li>3. Summarize what is meant by a basic AC electric circuit.</li> <li>4. Describe electrical AC voltage, current and power.</li> <li>5. Define Ohm's law in AC circuits.</li> <li>6. Identify the basic circuit passive and active elements and their applications.</li> <li>7. Discuss the various properties of impedance.</li> <li>8. Explain the two Kirchhoff's laws used in AC circuit analysis.</li> <li>9. Explain the Analysis Methods used in AC Electrical Circuits.</li> </ol>                                                                 |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <ol style="list-style-type: none"> <li>1. Transient Response of First-Order RL and RC circuits, Natural Response, Complete response. [12 hrs.]</li> <li>2. Forced response and natural response of First-Order RL and RC circuits, General response, sequential switching. [12 hrs.] + [1 hr. Quiz]</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                              |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | 3. Transient Response of Second Order RLC circuits, Natural response of series RLC circuits. [12 hrs.] + [1 hr. Quiz]<br>4. Analysis of overdamped, underdamped and critically damped RLC circuits. [12 hrs.]<br>5. Mutual Inductance, Mutual- and self-inductance equations. [12 hrs.]<br>6. Coupling: Magnetic coupling, Coefficient of coupling, the linear transformer. [12 hrs.] + [1 hr. Quiz]<br>7. T- and PI model the ideal transformer: impedance matching. [12 hrs.]<br>8. Two-Port Networks. [12 hrs.] + [1 hr. Quiz] |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | For Electrical Networks in electrical Engineering, students will learn: An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics. (1) |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 93  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 7 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 32  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 6 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                           |   |

| Module Evaluation     |                    |             |                  |            |                           |
|-----------------------|--------------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية |                    |             |                  |            |                           |
|                       |                    | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes            | 3           | 12% (12)         | Continuous | LO #1, 5, 8 and 9         |
|                       | Online Assignments | 3           | 12% (12)         | Continuous | LO #1, 2, 4, 6 7, 8 and 9 |
|                       | Onsite Assignments | 1           | 4% (4)           | Continuous | LO #1, 2, 4, 6 7, 8 and 9 |
|                       | Projects / Lab.    | 3           | 12% (12)         | Continuous | All                       |
|                       | Report             | ---         | ---              | ---        | ---                       |
| Summative assessment  | Midterm Exam       | 2 hr.       | 10% (10)         | 7          | LO # 1-5                  |
|                       | Final Exam         | 3 hr.       | 50% (50)         | 15         | All                       |
| Total assessment      |                    |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------|
| المناهج الاسبوعي النظري         |                                                                                                                 |
|                                 | Material Covered                                                                                                |
| Week 1                          | Transient Response of First-Order RL and RC circuits.                                                           |
| Week 2                          | Natural Response, and Complete response of First-Order RL and RC circuits.                                      |
| Week 3                          | , General response, sequential switching of First-Order RL and RC circuits                                      |
| Week 4                          | Forced response and natural response of First-Order RL and RC circuits                                          |
| Week 5                          | Transient Response of Second Order RLC circuits                                                                 |
| Week 6                          | Natural response of series RLC circuits. of Second Order RLC circuits, Natural response of series RLC circuits. |
| Week 7                          | Analysis of overdamped, underdamped and critically damped RLC circuits.                                         |
| Week 8                          | Complete analysis of RLC circuits.                                                                              |
| Week 9                          | Transient analysis of parallel RLC circuits.                                                                    |

|                |                                                                               |
|----------------|-------------------------------------------------------------------------------|
| <b>Week 10</b> | Coupling: Magnetic coupling, Coefficient of coupling, the linear transformer. |
| <b>Week 11</b> | T- and PI model the ideal transformer: impedance matching.                    |
| <b>Week 12</b> | Two-Port Networks.                                                            |
| <b>Week 13</b> | Terminal equations: a, b, y, z, g and h parameters.                           |
| <b>Week 14</b> | Analysis of a terminated 2-port network. Interconnected 2-port networks.      |
| <b>Week 15</b> | Poly-phase Circuits: Single-phase and three phase wire system.                |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                 |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                              | Available in the Library? |
|--------------------------|-------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Engineering Circuit Analysis Eight Edition (William H. Hayt) 2012 | Yes                       |
| <b>Recommended Texts</b> | Electric Circuits Tenth Edition (James W. Nilsson) 2015           | No                        |
| <b>Websites</b>          | Fundamentals of Electric Circuits (Charles K. Alexander) 2009     |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54). The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                         |                              |                                                                                                                                                                                                                                                                                    |                                                                                |
|------------------------------------------------------|-----------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>Module Title</b>                                  | <b>Mathematics III</b><br>الرياضيات III |                              | <b>Module Delivery</b>                                                                                                                                                                                                                                                             |                                                                                |
| <b>Module Type</b>                                   | Basic                                   |                              | <input checked="" type="checkbox"/> <b>Theory</b><br><input type="checkbox"/> <b>Lecture</b><br><input type="checkbox"/> <b>Lab</b><br><input checked="" type="checkbox"/> <b>Tutorial</b><br><input type="checkbox"/> <b>Practical</b><br><input type="checkbox"/> <b>Seminar</b> |                                                                                |
| <b>Module Code</b>                                   | EEPM202                                 |                              |                                                                                                                                                                                                                                                                                    |                                                                                |
| <b>ECTS Credits</b>                                  | 5                                       |                              |                                                                                                                                                                                                                                                                                    |                                                                                |
| <b>SWL (hr./sem)</b>                                 | 125                                     |                              |                                                                                                                                                                                                                                                                                    |                                                                                |
| <b>Module Level</b>                                  |                                         | 2                            | <b>Semester of Delivery</b>                                                                                                                                                                                                                                                        | 3                                                                              |
| <b>Administering Department</b>                      |                                         | 2 - (Electrical Engineering) | <b>College</b>                                                                                                                                                                                                                                                                     | UoM2 - (Engineering)                                                           |
| <b>Module Leader</b>                                 | Omar Sharaf Deen                        |                              | <b>e-mail</b>                                                                                                                                                                                                                                                                      | <a href="mailto:o.yehya@uomosul.edu.iq">o.yehya@uomosul.edu.iq</a>             |
| <b>Module Leader's Acad. Title</b>                   |                                         | Assistant Professor          | <b>Module Leader's Qualification</b>                                                                                                                                                                                                                                               | Ph.D.                                                                          |
| <b>Module Tutor</b>                                  | Ibrahim Ismael Alnaib                   |                              | <b>e-mail</b>                                                                                                                                                                                                                                                                      | <a href="mailto:ibrahim-85353@uomosul.edu.iq">ibrahim-85353@uomosul.edu.iq</a> |
| <b>Peer Reviewer Name</b>                            |                                         | Dr. Ahmad Salam              | <b>e-mail</b>                                                                                                                                                                                                                                                                      | ahmed.salim@uomosul.edu.iq                                                     |
| <b>Scientific Committee Approval Date</b>            |                                         | 01/06/2023                   | <b>Version Number</b>                                                                                                                                                                                                                                                              | 1.0                                                                            |

| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |      |                 |  |
|-------------------------------------------------------------------------|------|-----------------|--|
| <b>Prerequisite module</b>                                              | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>                                             | None | <b>Semester</b> |  |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                           |
|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
|                                                                                                                           | 9. Develop problem-solving skills and understand partial differentiation. |

|                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br><br>أهداف المادة الدراسية                      | 10. Understand the chain rule and the total derivative.<br>11. Understand vectors and units, space coordinates, and space vectors.<br>12. Understand gradient, divergence, and Curl in curved coordinates.<br>13. Solving linear differential equations of the first and second order with constant coefficients.<br>14. Understanding Fourier series.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Module Learning Outcomes</b><br><br>مخرجات التعلم للمادة الدراسية | 10. Understand the concept of partial derivatives for functions of two or more variables.<br>11. Understand the concept of the total derivative and its relationship to partial derivatives.<br>12. Determine whether a critical point is a maximum, minimum, or saddle point using the second derivative test or other methods.<br>13. Understand vector representation and components in Cartesian coordinates.<br>14. Understand the geometric interpretation of the vector product.<br>15. Express gradient, divergence, and curl in terms of curvilinear coordinates.<br>16. Solve first and second-order linear differential equations with constant coefficients.<br>17. Understand the need for Fourier series in representing periodic functions.<br>18. Understand double integrals and their properties. |
| <b>Indicative Contents</b><br><br>المحتويات الإرشادية                | Indicative content includes the following.<br><br><b><u>Part A - Partial Differentiation and Vectors</u></b><br><br>Partial Differentiation, function of two or more variables, partial derivatives, The Chain Rule and total Derivative, maxima, minima and saddle point, Vectors component and Units, Space coordinate and Space Vector, Scalar Product and Vector Product, Product of Three Vectors, Applications [20 hrs.]<br><br>Revision problem and tutorial classes [5 hrs.]                                                                                                                                                                                                                                                                                                                                |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Quizzes [1 hr.]</p> <p><b><u>Part B- Vector Calculus and Differential Equations</u></b></p> <p>Vector Functions and Their Derivatives, Gradient of Scalar Field, Divergence of Vector Field, Curl of Vector Field, Directional Derivatives, Gradient, Divergence, and Curl in Curvilinear Coordinates, 1st and 2nd order linear differential equations. [20 hrs.]</p> <p>Revision problem and tutorial classes [5 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part C- Fourier Series and Multiple Integrals</u></b></p> <p>Fourier series, Periodic functions and Fourier Series-Euler formulas, Double integrals, areas, and volumes [20 hrs.]</p> <p>Revision problem and tutorial classes [5 hrs.]</p> <p>Quizzes [1 hr.]</p> |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

| <b>Structured SWL (h/sem)</b>               |     | <b>Structured SWL (h/w)</b>              |   |
|---------------------------------------------|-----|------------------------------------------|---|
| الحمل الدراسي المنتظم للطالب خلال الفصل     | 78  | الحمل الدراسي المنتظم للطالب أسبوعيا     | 5 |
| <b>Unstructured SWL (h/sem)</b>             |     | <b>Unstructured SWL (h/w)</b>            |   |
| الحمل الدراسي غير المنتظم للطالب خلال الفصل | 72  | الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5 |
| <b>Total SWL (h/sem)</b>                    | 125 |                                          |   |
| الحمل الدراسي الكلي للطالب خلال الفصل       |     |                                          |   |

## Module Evaluation

تقييم المادة الدراسية

|                      |              | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
|----------------------|--------------|-------------|------------------|----------|---------------------------|
| Formative assessment | Quizzes      | 3           | 15% (5*3)        | 2 to 12  | All                       |
|                      | Assignments  | 3           | 12% (4*3)        | 2 to 12  | All                       |
|                      | Classwork    | 1           | 5% (1*5)         | 7        | All                       |
|                      | Report       | 1           | 8% (1*8)         | 8        | ----                      |
| Summative assessment | Midterm Exam | 2 hr        | 10% (1*10)       | 10       | All                       |
|                      | Final Exam   | 3hr         | 50% (1*50)       | 16       | All                       |
| Total assessment     |              |             | 100% (100 Marks) |          |                           |

## Delivery Plan (Weekly Syllabus)

المناهج الاسبوعي النظري

|                | Material Covered                                                                                  |
|----------------|---------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Partial Differentiation: Function of two or more variables, partial derivatives.                  |
| <b>Week 2</b>  | The Chain Rule and Total Derivative, Maxima, minima, and saddle points.                           |
| <b>Week 3</b>  | Vectors: Vector components and units, Space coordinates and space vectors.                        |
| <b>Week 4</b>  | Scalar Product and Vector Product, Units and plane equations.                                     |
| <b>Week 5</b>  | Equations of lines and planes, Product of Three Vectors, Applications of vectors.                 |
| <b>Week 6</b>  | Vector Functions and Their Derivatives, Gradient of Scalar Field.                                 |
| <b>Week 7</b>  | Divergence of Vector Field, Curl of Vector Field.                                                 |
| <b>Week 8</b>  | Mid-term Exam                                                                                     |
| <b>Week 9</b>  | Directional Derivatives, Gradient, Divergence, and Curl in Curvilinear Coordinates.               |
| <b>Week 10</b> | Introduction to Differential Equations, 1st and 2nd order linear differential equations.          |
| <b>Week 11</b> | Application of differential equations to electrical systems.                                      |
| <b>Week 12</b> | Transformation of higher order linear differential equations onto coupled differential equations. |
| <b>Week 13</b> | Periodic functions and Fourier Series-Euler formulas.                                             |
| <b>Week 14</b> | Application of Fourier series in Electrical Engineering.                                          |
| <b>Week 15</b> | Double integrals, areas, and volumes                                                              |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                     |

## Learning and Teaching Resources

## مصادر التعلم والتدريس

|                          | Text                                                                              | Available in the Library? |
|--------------------------|-----------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Calculus By Thomas Finny 13th Edition, Pearson Publisher, 2016.                   | No                        |
| <b>Recommended Texts</b> | Advanced Engineering Mathematics, 10th Edition, By Reyszig ERWIN, Publisher 2011. | No                        |
| <b>Websites</b>          |                                                                                   |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                                           |                                      |                                                                                                                                                                                                                                                                                               |                             |
|------------------------------------------------------|-----------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Module Title</b>                                  | <b>Electromagnetic Fields</b><br>المجالات الكهرومغناطيسية |                                      | <b>Module Delivery</b>                                                                                                                                                                                                                                                                        |                             |
| <b>Module Type</b>                                   | Basic learning activities                                 |                                      | <input checked="" type="checkbox"/> <b>Theory</b><br><input checked="" type="checkbox"/> <b>Lecture</b><br><input type="checkbox"/> <b>Lab</b><br><input checked="" type="checkbox"/> <b>Tutorial</b><br><input type="checkbox"/> <b>Practical</b><br><input type="checkbox"/> <b>Seminar</b> |                             |
| <b>Module Code</b>                                   | EPPM203                                                   |                                      |                                                                                                                                                                                                                                                                                               |                             |
| <b>ECTS Credits</b>                                  | 4                                                         |                                      |                                                                                                                                                                                                                                                                                               |                             |
| <b>SWL (hr./sem)</b>                                 | 100                                                       |                                      |                                                                                                                                                                                                                                                                                               |                             |
| <b>Module Level</b>                                  | 2                                                         | <b>Semester of Delivery</b>          |                                                                                                                                                                                                                                                                                               | 3                           |
| <b>Administering Department</b>                      | 2 - (Electrical Engineering)                              | <b>College</b>                       | UoM2 - (Engineering)                                                                                                                                                                                                                                                                          |                             |
| <b>Module Leader</b>                                 | Dr. Omar Sharaf Deen Yehya Al- Yozbaky                    |                                      | <b>e-mail</b>                                                                                                                                                                                                                                                                                 | o.yehya @uomosul.edu.iq     |
| <b>Module Leader's Acad. Title</b>                   | Assist. Prof.                                             | <b>Module Leader's Qualification</b> | PhD                                                                                                                                                                                                                                                                                           |                             |
| <b>Module Tutor</b>                                  | Dr Saad Wasmi Osman                                       |                                      | <b>e-mail</b>                                                                                                                                                                                                                                                                                 | s.w.o.luhaib@uomosul.edu.iq |
| <b>Peer Reviewer Name</b>                            |                                                           |                                      | <b>e-mail</b>                                                                                                                                                                                                                                                                                 |                             |
| <b>Scientific Committee Approval Date</b>            | 01/09/2023                                                | <b>Version Number</b>                | 1.0                                                                                                                                                                                                                                                                                           |                             |

| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |      |                 |  |
|-------------------------------------------------------------------------|------|-----------------|--|
| <b>Prerequisite module</b>                                              | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>                                             | None | <b>Semester</b> |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>The aims of this module are to:</p> <ol style="list-style-type: none"> <li>1. Introduce fundamental coordinate systems and vector analysis required for electromagnetic field theory.</li> <li>2. Develop a solid understanding of electrostatic fields and forces produced by discrete and continuous charge distributions.</li> <li>3. Enable students to apply Gauss's law to analyze electric fields and electric flux density for highly symmetric charge configurations.</li> <li>4. Provide a clear understanding of electric potential, potential difference, and energy concepts in electrostatic fields.</li> <li>5. Explain the behavior of electric fields in conductors and dielectric materials, including boundary conditions and capacitance.</li> <li>6. Introduce magnetostatic field concepts and enable analysis of magnetic fields produced by steady current distributions.</li> <li>7. Develop the ability to apply Biot–Savart law and Ampere's circuital law to practical magnetic field problems.</li> <li>8. Explain magnetic forces, work, power, and inductance in electromagnetic systems.</li> <li>9. Introduce time-varying electromagnetic fields and electromagnetic induction principles.</li> <li>10. Provide a foundation for understanding Maxwell's equations and electromagnetic wave propagation in free space.</li> <li>11. Prepare students for advanced studies in electromagnetics, antennas, microwave engineering, and communication systems.</li> </ol> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>19. Apply coordinate systems and vector analysis             <ol style="list-style-type: none"> <li>a. Use rectangular, cylindrical, and spherical coordinate systems.</li> <li>b. Manipulate scalars and vectors using vector algebra, vector components, unit vectors, and vector operations.</li> </ol> </li> <li>20. Analyze electrostatic fields             <ol style="list-style-type: none"> <li>a. Apply Coulomb's law to determine electric force and electric field intensity due to point charges.</li> <li>b. Evaluate electric fields due to multiple point charges and continuous charge distributions (line, surface, and volume charges).</li> </ol> </li> <li>21. Apply Gauss's law</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                              | <p>a. Calculate electric flux density and electric field using Gauss's law for symmetric charge distributions, including point, line, surface, and volume charges.</p> <p>22. Evaluate electric potential and energy</p> <p>a. Determine work done in moving charges.</p> <p>b. Analyze electric potential and potential difference in electrostatic fields.</p> <p>23. Analyze conductors, dielectrics, and capacitors</p> <p>a. Explain electric fields in material media.</p> <p>b. Apply boundary conditions at dielectric–dielectric, conductor–dielectric, and conductor–free space interfaces.</p> <p>c. Analyze capacitance and capacitor configurations.</p> <p>24. Analyze magnetostatic fields</p> <p>a. Apply Biot–Savart law and Ampere's circuital law to determine magnetic fields due to various current distributions.</p> <p>b. Analyze magnetic fields of solenoids, toroids, and coaxial transmission lines.</p> <p>25. Evaluate magnetic forces, energy, and inductance</p> <p>a. Calculate magnetic force on moving charges and current-carrying conductors.</p> <p>b. Analyze magnetic flux, flux density, work, power, and inductance of conductors and toroids.</p> <p>26. Analyze time-varying electromagnetic fields</p> <p>a. Apply Faraday's law to determine induced electromotive force.</p> <p>b. Understand electromagnetic induction phenomena.</p> <p>27. Apply Maxwell's equations</p> <p>a. Use vector calculus operators and the divergence theorem.</p> <p>b. Derive and apply Maxwell's equations to uniform plane waves and wave propagation in free space.</p> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following. <b>Part A:</b><br/> <b>Mathematical Foundations (6 hours)</b></p> <ul style="list-style-type: none"> <li>• Coordinate systems: rectangular, cylindrical, and spherical (2 hrs)</li> <li>• Scalars and vectors (1 hr)</li> <li>• Vector algebra, vector components, unit vectors (2 hrs)</li> <li>• Vector addition, subtraction, and multiplication (1 hr) <b>Part B: Electrostatics (9 hours)</b></li> </ul> <ul style="list-style-type: none"> <li>• Coulomb's law and electric force (2 hrs)</li> <li>• Electric field intensity (1 hr)</li> <li>• Electric field of a point charge and multiple point charges (2 hrs)</li> <li>• Electric fields due to continuous charge distributions: <ul style="list-style-type: none"> <li>o Line charge (2 hrs)</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

- o Surface and volume charges (2 hrs) [Part](#)

#### [C: Electric Flux Density and Gauss's Law \(6 hours\)](#)

- Electric flux and electric flux density (1 hr)
- Gauss's law: theory and physical interpretation (1 hr)
- Applications of Gauss's law:
  - o Point charge (1 hr)
  - o Line charge (1 hr)
  - o Surface charge (1 hr)
  - o Volume charge (1 hr)

#### [Part D: Electric Potential and Material Media \(6 hours\)](#)

- Work done in moving a point charge (1 hr)
- Electric potential and potential difference (2 hrs)
- Conductors and dielectrics: electric fields in material space (1 hr)
- Boundary conditions:
  - o Dielectric–dielectric
  - o Conductor–dielectric
  - o Conductor–free space (1 hr)
- Capacitance and capacitors (1 hr)

#### [Part E: Magnetostatics \(9 hours\)](#)

- Static magnetic fields and magnetic field concepts (1 hr)
- Biot–Savart law (2 hrs)
- Magnetic field due to different current distributions (1 hr)
- Right-hand rule (0.5 hr)
- Solenoids and applications (1.5 hrs)
- Toroids (1 hr)
- Ampere's circuital law and applications (2 hrs):
  - o Infinite line current
  - o Infinite sheet of current
  - o Infinitely long coaxial transmission line

#### [Part F: Magnetic Forces and Inductance \(5 hours\)](#)

- Magnetic flux and magnetic flux density (1 hr)
- Magnetic force on a moving charge (1 hr)
- Work and power in magnetic fields (1 hr)
- Inductance:
  - o Inductance of a conductor (1 hr)
  - o Inductance of a toroid (1 hr)

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Part G: Time-Varying Fields and Maxwell's Equations (4 hours)</p> <ul style="list-style-type: none"> <li>Faraday's law of electromagnetic induction (1 hr)</li> <li>Induced electromotive force (1 hr)</li> <li>Vector operator (del) and divergence theorem (0.5 hr)</li> <li>Derivation and applications of Maxwell's equations (1.5 hrs) <b>Part</b></li> </ul> <p>H: Electromagnetic Waves (2 hours)</p> <ul style="list-style-type: none"> <li>Uniform plane waves (1 hr)</li> <li>Wave propagation in free space (1 hr)</li> </ul> <p>Part I: Revision and Examination Preparation (3 hours)</p> <ul style="list-style-type: none"> <li>Comprehensive revision</li> <li>Problem-solving and exam-oriented examples</li> </ul> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 37  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 3 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |   |

## Module Evaluation

| تقييم المادة الدراسية |                   |                 |                  |          |                           |
|-----------------------|-------------------|-----------------|------------------|----------|---------------------------|
|                       |                   | Time/<br>Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes           | 3               | 15% (15)         | 4,8,14   | LO #1, 4, 6 and 7         |
|                       | Assignments       | 3               | 12% (12)         | 2 to 13  | LO #1, 2, 3, 4, 5 and 7   |
|                       | Onsite assessment | 1               | 5% (5)           |          | LO #1-7                   |
|                       | Projects          |                 |                  |          |                           |
|                       | Report            | 8               | 8% (8)           | ----     | ----                      |
| Summative assessment  | Midterm Exam      | 1.5 hr          | 10% (10)         | 7        | LO # 4-7                  |
|                       | Final Exam        | 3hr             | 50% (50)         | 16       | All                       |
| Total assessment      |                   |                 | 100% (100 Marks) |          |                           |

| Delivery Plan (Weekly Syllabus)<br>المنهاج الاسبوعي النظري |                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            | Material Covered                                                                                                                                                                                                                                                             |
| Week 1                                                     | coordinate systems: rectangular coordinate system, cylindrical coordinate system, spherical coordinate system. vector analysis: scalars and vectors.                                                                                                                         |
| Week 2                                                     | Vector analysis: vector algebra, vector components and unit vectors, vector addition and subtraction. vector multiplication. coulomb's law and electric force: the experimental law of coulomb.                                                                              |
| Week 3                                                     | Electric field intensity: electric field of a point charge, electric field of n point charges. Electric fields due to continuous charge distributions: electric field of a line charge. electric field of a volume of charge.                                                |
| Week 4                                                     | Electric flux density and gauss's law: gauss's law application on a point charge, gauss's law application on a line charge.                                                                                                                                                  |
| Week 5                                                     | Electric flux density and gauss's law: gauss's law application on a surface charge. electric flux density and gauss's law: gauss's law application on a volume charge.                                                                                                       |
| Week 6                                                     | Work, potential & potential difference: work done in moving a point charge. work, potential & potential difference: potential & potential difference. Conductors, dielectrics, and capacitance: electric fields in material space. conductors, dielectrics, and capacitance. |
| Week 7                                                     | dielectric – dielectric boundary conditions, conductor – dielectric boundary conditions, conductor – free space boundary conditions. Conductors, dielectrics, and capacitance: capacitance and capacitors.                                                                   |
| Week 8                                                     | Magneto-statics: the static magnetic fields, biot-savart law. magnetic field due to different current distributions. right-hand rule. solenoid, applications of solenoid, toroid. ampere's circuital law,                                                                    |

|                |                                                                                                                                                          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | applications of ampere's law. applications of ampere's law: infinite line current, infinite sheet of current. infinitely long coaxial transmission line. |
| <b>Week 9</b>  | Magneto-statics: magnetic flux and magnetic flux density. inductance: inductance of a conductor, inductance of toroid.                                   |
| <b>Week 10</b> | Magnetic forces, work & power: force on a moving charge. work and power.                                                                                 |
| <b>Week 11</b> | Magnetic forces, work & power: power. time varying fields: faraday's law. time varying fields: induced electromotive force.                              |
| <b>Week 12</b> | Maxwell's equations: the vector operator (del) and the divergence theorem                                                                                |
| <b>Week 13</b> | Maxwell's equations: derivation of Maxwell's equations and applications.                                                                                 |
| <b>Week 14</b> | Maxwell's equations: the uniform plane wave.                                                                                                             |
| <b>Week 15</b> | Maxwell's equations: wave propagation in free space.                                                                                                     |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                            |

## Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                        | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | William H. Hayt "Engineering Electromagnetics" 4 <sup>th</sup> edition                      | Yes                       |
| <b>Recommended Texts</b> | Schaum's outline of theory and problems of Electromagnetics                                 | Yes                       |
| <b>Websites</b>          | Nefyodov, Eugene I., and Sergey Smolskiy. Electromagnetic fields and waves. Springer, 2019. |                           |

## Grading Scheme

مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                                |                                                                                                                                                                                                                                          |                                      |                        |
|------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------------------------|
| <b>Module Title</b>                                  | Electrical Transformers<br>المحولات الكهربائية |                                                                                                                                                                                                                                          | <b>Module Delivery</b>               |                        |
| <b>Module Type</b>                                   | Core                                           | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                                      |                        |
| <b>Module Code</b>                                   | EETM204                                        |                                                                                                                                                                                                                                          |                                      |                        |
| <b>ECTS Credits</b>                                  | 5                                              |                                                                                                                                                                                                                                          |                                      |                        |
| <b>SWL (hr./sem)</b>                                 | 125                                            |                                                                                                                                                                                                                                          |                                      |                        |
| <b>Module Level</b>                                  |                                                | 2                                                                                                                                                                                                                                        | <b>Semester of Delivery</b>          | 3                      |
| <b>Administering Department</b>                      |                                                | Department of Electrical Engineering                                                                                                                                                                                                     | <b>College</b>                       | College of Engineering |
| <b>Module Leader</b>                                 | أ.م.د. عمر شرف الدين يحيى                      |                                                                                                                                                                                                                                          | <b>e-mail</b>                        | o.yehya@uomosul.edu.iq |
| <b>Module Leader's Acad. Title</b>                   |                                                | أستاذ مساعد                                                                                                                                                                                                                              | <b>Module Leader's Qualification</b> | دكتوراه                |
| <b>Module Tutor</b>                                  | د. هبة ناظم أمين                               |                                                                                                                                                                                                                                          | <b>e-mail</b>                        | hkaoaz@uomosul.edu.iq  |
| <b>Peer Reviewer Name</b>                            |                                                |                                                                                                                                                                                                                                          | <b>e-mail</b>                        |                        |
| <b>Scientific Committee Approval Date</b>            |                                                |                                                                                                                                                                                                                                          | <b>Version Number</b>                |                        |

| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |                                    |                 |     |
|-------------------------------------------------------------------------|------------------------------------|-----------------|-----|
| <b>Prerequisite module</b>                                              | Electrical Circuit Analysis I & II | <b>Semester</b> | 4&3 |

|                      |      |          |  |
|----------------------|------|----------|--|
| Co-requisites module | None | Semester |  |
|----------------------|------|----------|--|

### Module Aims, Learning Outcomes and Indicative Contents

#### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <ol style="list-style-type: none"> <li>1. To understand the principle of transformers, E.M.F and transformer construction.</li> <li>2. To understand and study transformer on no load and on load.</li> <li>3. To understand the transformer equivalent circuit and Separation of core losses.</li> <li>4. To study the Regulation of transformer, Losses and efficiency.</li> <li>5. To study the Parallel operation of transformer, Three-phase transformer, connections and cooling of transformers.</li> </ol> |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. Identify the principle of transformers.</li> <li>2. Identify the transformer on no load and on load.</li> <li>3. Identify the Regulation of transformer, Losses and efficiency.</li> <li>4. Summarize the Parallel operation of transformer, Three-phase transformer.</li> </ol>                                                                                                                                                                                         |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p>Transformers working, principle of transformers. Transformer construction, E.M.F equation. Transformer on no load and on load. Transformer equivalent circuit. Open and short circuit test. Separation of core losses. Regulation of transformer. Losses and efficiency. All-Day efficiency. Auto transformer. Parallel operation. Three-phase transformer, connections. Open-Delta Scott connection, cooling of transformers.</p>                            |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |     |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|-----|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4.2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 62  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4.1 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                           |     |

## Module Evaluation

### تقييم المادة الدراسية

|         | Time/Number | Weight (Marks) | Week Due  | Relevant Learning Outcome |
|---------|-------------|----------------|-----------|---------------------------|
| Quizzes | 3           | 5 (15%)        | 3,6,11,14 | LO 1-4                    |

|                             |                                                 |      |                  |         |        |
|-----------------------------|-------------------------------------------------|------|------------------|---------|--------|
| <b>Formative assessment</b> | <b>Online assignments</b><br>واجبات بيئية       | 3    | 4 (12%)          | 3 to 12 | LO 1-4 |
|                             | <b>Onsite Assignments</b><br>واجبات داخل الكلية | 1    | 5 (5%)           | 5 to 8  | LO 1-4 |
|                             | <b>Report</b>                                   | 1    | 8 (8%)           | 13      | LO 1-4 |
| <b>Summative assessment</b> | <b>Midterm Exam</b>                             | 2 hr | 10%              | 7       | LO 1-4 |
|                             | <b>Final Exam</b>                               | 3 hr | 50%              | 16      | All    |
| <b>Total assessment</b>     |                                                 |      | 100% (100 Marks) |         |        |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | Material Covered                                                                                                                                                                                                                                                                                                      |
| <b>Week 1</b>                                                     | <p>Introduction and Applications of Transformers.</p> <ul style="list-style-type: none"> <li>Basic Concepts: Understanding electromagnetism, Faraday's law, and mutual induction.</li> <li>Construction and Working Principle: Core Design: Material selection, core type, and core design considerations.</li> </ul> |
|                                                                   | <ul style="list-style-type: none"> <li>Winding Design: Materials, insulation, and layout.</li> <li>Thermal Design: Cooling methods, temperature rise, and thermal performance.</li> </ul>                                                                                                                             |
| <b>Week 2</b>                                                     | Types of Transformers: Step-up, step-down, power, distribution, and instrument transformers.                                                                                                                                                                                                                          |
| <b>Week 3</b>                                                     | <p>Transformer Parameters</p> <ul style="list-style-type: none"> <li>Equivalent Circuit: Deriving the equivalent circuit parameters.</li> </ul>                                                                                                                                                                       |
| <b>Week 4</b>                                                     | <p>Transformer Parameters</p> <ul style="list-style-type: none"> <li>Impedance and Losses: Core losses (hysteresis and eddy current), copper losses, and efficiency.</li> </ul>                                                                                                                                       |
|                                                                   | Transformer Testing                                                                                                                                                                                                                                                                                                   |

|         |                                                                                                                                                                                                                                                                                                |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 5  | <ul style="list-style-type: none"> <li>Open Circuit Test: Determining core losses and magnetizing reactance.</li> <li>Short Circuit Test: Determining copper losses and leakage reactance.</li> <li>Polarity Test: Importance and procedure for testing polarity.</li> </ul>                   |
| Week 6  | Transformer Testing <ul style="list-style-type: none"> <li>Polarity Test: Importance and procedure for testing polarity.</li> </ul>                                                                                                                                                            |
| Week 7  | Mid-term Exam                                                                                                                                                                                                                                                                                  |
| Week 8  | Transformer Performance <ul style="list-style-type: none"> <li>Efficiency: Calculating efficiency under different load conditions.</li> </ul>                                                                                                                                                  |
| Week 9  | Transformer Performance                                                                                                                                                                                                                                                                        |
|         | <ul style="list-style-type: none"> <li>Voltage Regulation: Importance, calculation, and factors affecting voltage regulation.</li> <li>Load Characteristics: Performance under varying loads.</li> </ul>                                                                                       |
| Week 10 | Transformer Performance<br>All day efficiency                                                                                                                                                                                                                                                  |
| Week 11 | Transformer Theory <ul style="list-style-type: none"> <li>Ideal Transformer: Assumptions, voltage transformation ratio, and basic equations.</li> <li>EMF Equation: Derivation and significance.</li> <li>Turns Ratio and Voltage Regulation: Impact on performance and efficiency.</li> </ul> |
| Week 12 | Three-Phase Transformers <ul style="list-style-type: none"> <li>Connections: Y-Y, Y-<math>\Delta</math>, <math>\Delta</math>-Y, <math>\Delta</math>-<math>\Delta</math> connections, and phase shift implications.</li> </ul>                                                                  |
| Week 13 | Three-Phase Transformers <ul style="list-style-type: none"> <li>Parallel Operation: Conditions for successful parallel operation, load sharing, and voltage regulation.</li> <li>Open-Delta and Scott Connection</li> </ul>                                                                    |

|                |                                                                                                                                                                                                                                                                              |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 14</b> | <p>Special Transformers</p> <ul style="list-style-type: none"> <li>Autotransformers: Construction, working principle, advantages, and disadvantages.</li> </ul>                                                                                                              |
| <b>Week 15</b> | <p>Special Transformers</p> <ul style="list-style-type: none"> <li>Instrument Transformers: Current transformers (CTs) and potential transformers (PTs) for measurement and protection.</li> <li>Isolation Transformers: Applications and significance in safety.</li> </ul> |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                                                                                                                                                |

| <b>Learning and Teaching Resources</b><br><b>مصادر التعلم والتدريس</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                  |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                        | <b>Text</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                                  | <ol style="list-style-type: none"> <li>Rajput, R. K. (2004). A Textbook of Electrical Technology. Firewall Media.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                             | Online (yes)                     |
| <b>Recommended Texts</b>                                               | <ol style="list-style-type: none"> <li>Del Vecchio, R. M., Poulin, B., Feghali, P. T., Shah, D. M., &amp; Ahuja, R. (2001). Transformer design principles: with applications to core-form power transformers. CRC press.</li> <li>Harlow, J. H. (2003). Electric power transformer engineering. CRC press.</li> <li>Winders, J. (2002). Power transformers: principles and applications. CrC Press.</li> <li>Theraja, B. L. (2014). A textbook of electrical technology. S. Chand Publishing.</li> </ol> | Online (yes)                     |
| <b>Websites</b>                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                  |

## Grading Scheme

### مخطط الدرجات

| Group                              | Grade                   | التقدير             | Marks (%) | Definition                            |
|------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group</b><br>(50 - 100) | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                    | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                    | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                    | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                    | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br>(0 – 49)      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                    | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                    |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

|                                           |                                              |                              |                                                                                                                                                                                                                                          |                              |        |
|-------------------------------------------|----------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------|
| <b>Module Title</b>                       | Electronics Principles<br>مبادئ الالكترونيات |                              | <b>Module Delivery</b>                                                                                                                                                                                                                   |                              |        |
| <b>Module Type</b>                        | Core                                         |                              | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                              |        |
| <b>Module Code</b>                        | EEPM205                                      |                              |                                                                                                                                                                                                                                          |                              |        |
| <b>ECTS Credits</b>                       | 4                                            |                              |                                                                                                                                                                                                                                          |                              |        |
| <b>SWL (hr./sem)</b>                      | 100                                          |                              |                                                                                                                                                                                                                                          |                              |        |
| <b>Module Level</b>                       |                                              | 2                            | <b>Semester of Delivery</b>                                                                                                                                                                                                              |                              | Three  |
| <b>Administering Department</b>           |                                              | 2 - (Electrical Engineering) | <b>College</b>                                                                                                                                                                                                                           | UoM2 - (Engineering)         |        |
| <b>Module Leader</b>                      | Dr. Omar Sh. Alyozbak                        |                              | <b>e-mail</b>                                                                                                                                                                                                                            | o.yehya@uomosul.edu.iq       |        |
| <b>Module Leader's Acad. Title</b>        |                                              | Assist. Prof.                | <b>Module Leader's Qualification</b>                                                                                                                                                                                                     |                              | Doctor |
| <b>Module Tutor</b>                       | Mr. Firas Natheer Abdulkadir                 |                              | <b>e-mail</b>                                                                                                                                                                                                                            | firas_nadheer@uomosul.edu.iq |        |
| <b>Peer Reviewer Name</b>                 |                                              | Dr. Ahmad Salam              | <b>e-mail</b>                                                                                                                                                                                                                            | ahmed.salim@uomosul.edu.iq   |        |
| <b>Scientific Committee Approval Date</b> |                                              | 30/11/2023                   | <b>Version Number</b>                                                                                                                                                                                                                    |                              | 1.0    |

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>15. To develop problem solving skills of electronic circuit through the understanding solid state for each electronic passive and active elements such as RLC, diodes, transistors, and integrated circuits.</li> <li>16. To understand the Basic Transistor Construction through graphical analysis of transistors Connections and biasing.</li> <li>17. This course deals with the basic concept of the small-signal analysis of the transistors such as D.C. and A.C. Equivalent Circuits.</li> <li>18. To understand the Load Line Analysis, Operating Point Transistor Parameters, and Rating Amplification Stabilization.</li> <li>19. To understand the H-parameters, Hybrid Equivalent Circuit. Z-parameters, R-parameters Equivalent Circuit.</li> <li>20. To perform current-voltage characteristics, charge control description for all types of both the diode and transistors.</li> <li>21. To Describe and operation of the Multistage Transistor Amplifiers</li> </ol> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> <li>28. Recognize the regions of operation, graphical analysis of BJT, regions of operation stability.</li> <li>29. List the various terms associated with bias configuration of the transistors.</li> <li>30. Summarize what is meant of the practical circuit of transistor amplifier.</li> <li>31. Describe the types of multistage amplifiers.</li> <li>32. Discuss the various properties of transistors used as an amplifier</li> <li>33. Explain the transistor construction and operation such as amplifier and switching.</li> <li>34. Explain the operation of the linear amplifier through the a.c. load line and DC load line analysis.</li> </ol>                                                                                                                                                                                                                                                                                                                            |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p> <p><b><u>Part A - Transistor Construction, Operation, and Stabilization</u></b></p> <p>Transistor Construction. Transistor Symbols. Transistor Operation. Transistor Connections: Common Base CB Connection, Common Emitter CE Connection, Transistor Curves, Cutoff and</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                             | <p>Saturation. Transistor as a switch. Common Collector Connection. Transistor Load Line Analysis, Operating Point, Transistor Parameters and Rating Amplification. Stabilization, Stability Factor Methods of Transistor Biasing. [15 hrs.]</p> <p>Revision problem and tutorial classes [5 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part B- D.C and A.C Equivalent Circuits of the transistors</u></b></p> <p>Practical Circuit of Transistor Amplifier, D.C. and A.C. Equivalent Circuits. Transistor ac Equivalent Circuits h-parameters, Hybrid Equivalent Circuit. r-parameters, r-parameters Equivalent Circuit. The Linear Amplifier. [15 hrs.]</p> <p>Revision problem and tutorial classes [5 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part C- Transistor Bias Configuration and Multistage Transistor Amplifiers</u></b></p>                                                                                                                                                                                    |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>The a.c. Load Line, A.C. Analysis Using re Model for Transistor Common Emitter Fixed Bias Configuration, Common-Emitter Emitter Bias Configuration, Common – Emitter Collector Feedback Configuration, Common – Emitter Voltage Divider Configuration. The Common – Collector Amplifier, the Common – Base Amplifier. Multistage Transistor Amplifiers. [15 hrs.]</p> <p>Revision problem and tutorial classes [5 hrs.]</p> <p>Quizzes [1 hr.]</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

#### Strategies

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 37  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 2 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |   |

## Module Evaluation

### تقييم المادة الدراسية

|                      |                    | Time/<br>Number | Weight (Marks) | Week Due   | Relevant Learning Outcome |
|----------------------|--------------------|-----------------|----------------|------------|---------------------------|
| Formative assessment | Quizzes            | 3               | 15% (5)        | 4,8,14     | LO #1, 4, 6 and 7         |
|                      | Assignments        | 3               | 12% (4)        | 2 to 13    | LO #1, 2, 3, 4, 5 and 7   |
|                      | Onsite Assignments | 1               | 5% (5)         | ----       | -----                     |
|                      | Report             | 1               | 8% (8)         | Continuous | All                       |

|                             |                     |      |                  |    |          |
|-----------------------------|---------------------|------|------------------|----|----------|
| <b>Summative assessment</b> | <b>Midterm Exam</b> | 2 hr | 10% (10)         | 7  | LO # 4-7 |
|                             | <b>Final Exam</b>   | 3hr  | 50% (50)         | 16 | All      |
| <b>Total assessment</b>     |                     |      | 100% (100 Marks) |    |          |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

|                | <b>Material Covered</b>                                                                                                                                           |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Transistor Construction. Transistor Symbols. Transistor Operation.                                                                                                |
| <b>Week 2</b>  | Transistor Connections: Common Base CB Connection, Common Emitter CE Connection.                                                                                  |
| <b>Week 3</b>  | Transistor Curves, Cutoff and Saturation. Transistor as a switch. Common Collector Connection.                                                                    |
| <b>Week 4</b>  | Transistor Load Line Analysis, Operating Point, Transistor Parameters and Rating Amplification.                                                                   |
| <b>Week 5</b>  | Stabilization, Stability Factor Methods of Transistor Biasing.                                                                                                    |
| <b>Week 6</b>  | Practical Circuit of Transistor Amplifier.                                                                                                                        |
| <b>Week 7</b>  | D.C. and A.C. Equivalent Circuits. Transistor ac Equivalent Circuits.                                                                                             |
| <b>Week 8</b>  | Transistor ac Equivalent Circuits h-parameters, Hybrid Equivalent Circuit.                                                                                        |
| <b>Week 9</b>  | Transistor ac Equivalent Circuits, r-parameters, r-parameters Equivalent Circuit.                                                                                 |
| <b>Week 10</b> | The Linear Amplifier.                                                                                                                                             |
| <b>Week 11</b> | The a.c. Load Line, A.C. Analysis Using re Model for Transistor Common Emitter Fixed Bias Configuration.                                                          |
| <b>Week 12</b> | The a.c. Load Line, A.C. Analysis Using re Model for Transistor Common – Emitter Emitter – Bias Configuration, Common – Emitter Collector Feedback Configuration. |
| <b>Week 13</b> | The a.c. Load Line, A.C. Analysis Using re Model for Transistor Common – Emitter Voltage Divider Configuration.                                                   |
| <b>Week 14</b> | The Common – Collector Amplifier, the Common – Base Amplifier.                                                                                                    |
| <b>Week 15</b> | Multistage Transistor Amplifiers.                                                                                                                                 |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                                     |

|                                                                 |                                                                                                                                                               |                                  |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                 |                                                                                                                                                               |                                  |
| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                                               |                                  |
|                                                                 | <b>Text</b>                                                                                                                                                   | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                           | Floyd, Thomas L. Electronics Fundamentals: Circuits, Devices and Applications (Floyd Electronics Fundamentals Series). Prentice-Hall, Inc., 2006.             | Yes                              |
| <b>Recommended Texts</b>                                        | Donald A. Neamen. (2003). "SEMICONDUCTOR PHYSICS AND DEVICES". 3rd Edition, ISBN 0-07-232107-05, USA. (can be downloaded from the Course web page/classroom). | Yes                              |
| <b>Websites</b>                                                 | Nashelsky, L., & Boylestad, R. L. (2021). Electronic Devices and Circuit Theory Eleventh Edition.                                                             |                                  |

| <b>Grading Scheme</b><br><b>مخطط الدرجات</b>                                                                                                                                                                                                                                                                                                                                         |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group</b><br><b>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                            | <b>A - Excellent</b>    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B - Very Good</b>    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C - Good</b>         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D - Satisfactory</b> | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E - Sufficient</b>   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br><b>(0 - 49)</b>                                                                                                                                                                                                                                                                                                                                                 | <b>FX – Fail</b>        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F – Fail</b>         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                                               |                                                                                                                                                                                                                               |                        |                             |
|------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------|
| <b>Module Title</b>                                  | Electrical Engineering Lab. I<br>مختبرات الهندسة الكهربائية I |                                                                                                                                                                                                                               | <b>Module Delivery</b> |                             |
| <b>Module Type</b>                                   | Core                                                          | <input type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                        |                             |
| <b>Module Code</b>                                   | EEPM206                                                       |                                                                                                                                                                                                                               |                        |                             |
| <b>ECTS Credits</b>                                  | 3                                                             |                                                                                                                                                                                                                               |                        |                             |
| <b>SWL (hr./sem)</b>                                 | 75                                                            |                                                                                                                                                                                                                               |                        |                             |
| <b>Module Level</b>                                  | 2                                                             |                                                                                                                                                                                                                               |                        | <b>Semester of Delivery</b> |
| <b>Administering Department</b>                      | 2 - (Electrical Engineering)                                  | <b>College</b>                                                                                                                                                                                                                | UoM2 - (Engineering)   |                             |
| <b>Module Leader</b>                                 | Dr. Omar Sharaf Deen Yehya Al- Yozbaky                        |                                                                                                                                                                                                                               | <b>e-mail</b>          | o.yehya@uomosul.edu.iq      |
| <b>Module Leader's Acad. Title</b>                   | Assist. Prof.                                                 | <b>Module Leader's Qualification</b>                                                                                                                                                                                          | Doctor                 |                             |
| <b>Module Tutor</b>                                  | Dr. Ahmed Salim Jarallah                                      |                                                                                                                                                                                                                               | <b>e-mail</b>          | Ahmed.salim@uomosul.edu.iq  |
| <b>Peer Reviewer Name</b>                            | Dr. Ahmed Salim Jarallah                                      |                                                                                                                                                                                                                               | <b>e-mail</b>          | Ahmed.salim@uomosul.edu.iq  |
| <b>Scientific Committee Approval Date</b>            | 28/01/2026                                                    | <b>Version Number</b>                                                                                                                                                                                                         | 1.0                    |                             |

| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |      |                 |  |
|-------------------------------------------------------------------------|------|-----------------|--|
| <b>Prerequisite module</b>                                              | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>                                             | None | <b>Semester</b> |  |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |  |
|---------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                           |  |

|                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                            | 22. To handle laboratory equipment and electrical elements professionally and scientifically.<br>23. To analyze electrical circuits and comprehend their operational principles.<br>24. To cultivate a scientific mindset in the student by interpreting practical results based on theoretical concepts.<br>25. To enhance the student's capability to design basic electronic circuits in accordance with their scientific aptitude.<br>26. To analyze and simulate circuit processes using various software tools on electronic calculators and compare the analysis results with practical outcomes.                                                   |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية       | 35. Dealing with laboratory equipment and electrical elements in a professional and scientific manner(i).<br>36. Ability to analyze electrical circuits and understand the nature of their work(ii).<br>37. Building a scientific mentality for the student through his ability to interpret the practical results according to theoretical concepts(iii).<br>38. Develop the student's ability to design simple electronic circuits in line with his scientific abilities(iv).<br>39. Analyze and simulate the process circuit using different software on the electronic calculator and match the results of the analysis with the practical results(v). |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                      | Indicative content includes the following.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Strategies</b>                                                      | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.                                                                                                                                                                                                                                                               |

| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا<br><b>Student Workload (SWL)</b>       |    |                                                                           |   |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 33 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 42 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 3 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 75 |                                                                           |   |

## Module Evaluation

تقييم المادة الدراسية

|                      |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|----------------------|-----------------|-------------|------------------|------------|---------------------------|
| Formative assessment | Quizzes         | 1           | 5% (5)           | 4,8,12     | LO #1, 5, 8 and 9         |
|                      | Assignments     | 0           | 0%(0)            | 2 to 12    | LO #1, 2, 4, 6 7, 8 and 9 |
|                      | Projects / Lab. | 2           | 25% (25)         | Continuous | All                       |
|                      | Report          | 10          | 10% (10)         | ---        | ---                       |
| Summative assessment | Midterm Exam    | 2Hr         | 10% (10)         | 7          | LO # 1-5                  |
|                      | Final Exam      | 3Hr         | 50% (50)         | 16         | All                       |
| Total assessment     |                 |             | 100% (100 Marks) |            |                           |

## Delivery Plan (Weekly Lab. Syllabus)

المناهج الاسبوعي للمختبر

|         | Material Covered                                               |
|---------|----------------------------------------------------------------|
| Week 1  | Introduction & representation about first group of experiments |
| Week 2  | Thevenin theory in AC circuits                                 |
| Week 3  | Measurement of power factor in electrical networks             |
| Week 4  | Study of I-V characteristics of normal diode & zener diode     |
| Week 5  | First quiz                                                     |
| Week 6  | Introduction & representation about second group of experiment |
| Week 7  | Diode application I: Rectifier filters                         |
| Week 8  | Diode application II: Clipping & clamping circuits             |
| Week 9  | Transient condition for R-L & R-C circuits                     |
| Week 10 | Second quiz + first term theoretical exam. for 1st & 2nd group |
| Week 11 | First term practical exam                                      |
| Week 12 | Introduction & representation about third group of experiment  |

|                |                                                    |
|----------------|----------------------------------------------------|
| <b>Week 13</b> | Transient condition for RLC circuits               |
| <b>Week 14</b> | Transformer tests: open, short & load test         |
| <b>Week 15</b> | Study of common emitter transistor characteristics |

|                                                                        | Text                                                                                                                                                                                                                                                                                             | Available in the Library |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Learning and Teaching Resources</b><br><b>مصادر التعلم والتدريس</b> |                                                                                                                                                                                                                                                                                                  |                          |
| <b>Required Texts</b>                                                  | <ul style="list-style-type: none"> <li>Electrical technology (twenty-third edition) BL.THERAJA, AK. THERAJA S. Chand and company Ltd. (2005), ISBN: 81-219- 2440-5.</li> <li>Electronics devices (Ninth edition) by Thomas L. Floyd (2012), Prentice Hall ISBN-13: 978-0-13-254986-8.</li> </ul> | No                       |
| <b>Recommended Texts</b>                                               |                                                                                                                                                                                                                                                                                                  | No                       |
| <b>Websites</b>                                                        |                                                                                                                                                                                                                                                                                                  |                          |

| <b>Grading Scheme</b><br><b>مخطط الدرجات</b> |                         |                     |           |                                       |
|----------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                        | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>          | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                              | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                              | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound works with notable errors       |
|                                              | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                              | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>               | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                              | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                              |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

### نموذج وصف المقرر

|                                                             |                                                                                                                                                                                                             |                        |                        |                           |               |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------------|---------------------------|---------------|
| 1 . اسم المقرر                                              |                                                                                                                                                                                                             |                        |                        |                           |               |
| جرائم نظام البعث في العراق                                  |                                                                                                                                                                                                             |                        |                        |                           |               |
| 2 . رمز المقرر                                              |                                                                                                                                                                                                             |                        |                        |                           |               |
| UOM2050                                                     |                                                                                                                                                                                                             |                        |                        |                           |               |
| 3 . الفصل / السنة                                           |                                                                                                                                                                                                             |                        |                        |                           |               |
| 2025-2026                                                   |                                                                                                                                                                                                             |                        |                        |                           |               |
| 4 . تاريخ إعداد هذا الوصف                                   |                                                                                                                                                                                                             |                        |                        |                           |               |
| 15/09/2025                                                  |                                                                                                                                                                                                             |                        |                        |                           |               |
| 5 . أشكال الحضور المتاحة                                    |                                                                                                                                                                                                             |                        |                        |                           |               |
| جماعي                                                       |                                                                                                                                                                                                             |                        |                        |                           |               |
| 6 . عدد الساعات الدراسية (الكلية) / عدد الوحدات (الكلية)    |                                                                                                                                                                                                             |                        |                        |                           |               |
| اربعة عشرة ساعة – 14 ساعة                                   |                                                                                                                                                                                                             |                        |                        |                           |               |
| 7 . اسم مسؤول المقرر الدراسي ( إذا أكثر من اسم يذكر)        |                                                                                                                                                                                                             |                        |                        |                           |               |
| الاسم: وسام جمال حسين<br>الأيمل: wisam.jamal@uomosul.edu.iq |                                                                                                                                                                                                             |                        |                        |                           |               |
| 8 . اهداف المقرر                                            |                                                                                                                                                                                                             |                        |                        |                           |               |
| اهداف المادة الدراسية                                       | <ul style="list-style-type: none"> <li>• توعية .الطلاب بالجرائم التي ارتكبها البعث في العراق..</li> <li>• توجيه الطلاب للإلمام والمعرفة بالجرائم.....</li> <li>• توعية الطلاب بخطورة الجرائم....</li> </ul> |                        |                        |                           |               |
| 9 . استراتيجيات التعليم والتعلم                             |                                                                                                                                                                                                             |                        |                        |                           |               |
| الاستراتيجية                                                | من خلال الكتاب المقرر                                                                                                                                                                                       |                        |                        |                           |               |
| 10 . بنية المقرر                                            |                                                                                                                                                                                                             |                        |                        |                           |               |
| الأسبوع                                                     | الساعات                                                                                                                                                                                                     | مخرجات التعلم المطلوبة | اسم الوحدة او الموضوع  | طريقة التعلم              | طريقة التقييم |
| الأسبوع الأول                                               | 2                                                                                                                                                                                                           |                        | مفهوم الجرائم واقسامها | عرض محاضرات ومشاركات صفية |               |
| الأسبوع الثاني                                              | 2                                                                                                                                                                                                           |                        | أنواع الجرائم الدولية  | =                         | محاضرة مكتوبة |
| الأسبوع الثالث                                              | 2                                                                                                                                                                                                           |                        | الجريمة السياسية       | =                         |               |
| الأسبوع الرابع                                              | 2                                                                                                                                                                                                           |                        | امتحان                 | =                         |               |
|                                                             | 2                                                                                                                                                                                                           |                        |                        |                           | =             |

|   |   |                                                                     |  |   |            |
|---|---|---------------------------------------------------------------------|--|---|------------|
|   |   |                                                                     |  |   | الخامس     |
|   |   | الجريمة الاجتماعية                                                  |  |   |            |
| = | = |                                                                     |  | 2 | السادس     |
|   |   | جريمة قمع الانتفاضة الشعبانية                                       |  |   |            |
| = | = | الجرائم النفسية واثارها                                             |  | 2 | السابع     |
|   |   | جرائم نظام البعث وفق قانون المحكمة الجنائية العراقية العليا 2005    |  | 2 | الثامن     |
| = | = | جرائم احاث صلاة الجمعة                                              |  | 2 | التاسع     |
| = | = | جرائم المقابر الجماعية                                              |  | 2 | العاشر     |
|   |   | قصف العتبات المقدسة                                                 |  | 2 |            |
| = | = | الهجوم الكيميائي على حلبجة                                          |  | 2 | الحادي عشر |
| = | = | استعمال الأسلحة المحرمة دوليا                                       |  | 2 |            |
|   |   | امتحان                                                              |  | 2 | الثاني عشر |
|   |   | الجرائم البيئية لنظام البعث في العراق                               |  | 2 | الثالث عشر |
| = | = | احداث المقابر والابادة الجماعية المرتكبة من النظام البعثي في العراق |  | 2 | الرابع عشر |
|   |   |                                                                     |  | 2 | الخامس عشر |
| = | = |                                                                     |  |   |            |

#### 1. 1 . تقييم المقرر

توزيع الدرجة من 100 على وفق المهام المكلف بها الطالب مثل التحضير اليومي والامتحانات اليومية والشفوية والشهرية والتحريرية والتقارير

1. الامتحان النظري داخل القاعة .
2. الامتحان اليومي
3. اعداد النشاط داخل الصف
4. السؤال والجواب والمشاركة
5. الامتحان الشهري... الخ

#### 2. 1 . مصادر التعلم والتدريس

|                                                                     |                                                                                  |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------|
| الكتب المقررة المطلوبة ( المنهجية أن وجدت )                         | كتاب المقرر جرائم نظام البعث في العراق من قبل وزارة التعليم العالي والبعث العلمي |
| المراجع الرئيسة ( المصادر )                                         |                                                                                  |
| الكتب والمراجع الساندة التي يوصى بها (المجلات العلمية، التقارير.... |                                                                                  |
| (                                                                   |                                                                                  |
| المراجع الإلكترونية ، مواقع الانترنت                                |                                                                                  |

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

|                                           |                                       |                                            |                             |
|-------------------------------------------|---------------------------------------|--------------------------------------------|-----------------------------|
| <b>Module Title</b>                       | Arabic Language 2<br>اللغة العربية 2  | <b>Module Delivery</b>                     |                             |
| <b>Module Type</b>                        | Basic                                 | <input checked="" type="checkbox"/> Theory |                             |
| <b>Module Code</b>                        | UOM2012                               |                                            |                             |
| <b>ECTS Credits</b>                       | 50                                    |                                            |                             |
| <b>SWL (hr./sem)</b>                      | 2                                     |                                            |                             |
| <b>Module Level</b>                       | 2                                     | <b>Semester of Delivery</b>                | 3                           |
| <b>Administering Department</b>           | 2 - (Electrical Engineering)          | <b>College</b>                             | UoM2 - (Engineering)        |
| <b>Module Leader</b>                      | Dr. Omar Sharaf Deen Yehya Al- Yozbak | <b>e-mail</b>                              | o.yehya @uomosul.edu.iq     |
| <b>Module Leader's Acad. Title</b>        | Assistant Prof.                       | <b>Module Leader's Qualification</b>       | Phd                         |
| <b>Module Tutor</b>                       | سوسن أمين خضر                         | <b>e-mail</b>                              | sausan.zakar@uomosul.edu.iq |
| <b>Peer Reviewer N</b>                    | Ahmad Salam                           | <b>e-mail</b>                              | ahmed.salim@uomosul.edu.iq  |
| <b>Scientific Committee Approval Date</b> | 26/01/2023                            | <b>Version Number</b>                      | 1                           |

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

**Module Aims, Learning Outcomes and Indicative Contents**

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ul style="list-style-type: none"> <li>1- تنمية مهارات الطلبة في استخدام اللغة العربية استخدامًا سليمًا في السياقات الأكاديمية والعلمية.</li> <li>2- تمكين الطلبة من فهم النصوص العلمية والهندسية المكتوبة باللغة العربية وتحليلها.</li> <li>3- تطوير قدرة الطلبة على التعبير الكتابي والشفهي بأسلوب واضح ودقيق.</li> <li>4- تعزيز مهارات الكتابة الوظيفية المرتبطة بالتخصص الهندسي مثل التقارير والمراسلات الرسمية.</li> <li>5- ترسيخ قواعد اللغة العربية الأساسية بما يخدم التواصل العلمي والمهني.</li> <li>6- تنمية مهارات التفكير النقدي والتحليل اللغوي لدى الطلبة.</li> <li>7- تعزيز الثقة بالنفس في استخدام اللغة العربية في العروض والمناقشات العلمية.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <ul style="list-style-type: none"> <li>1- يميز بين بناء الفعل للمعلوم وبناءه للمجهول، ويستخدم كليهما استخدامًا صحيحًا في الجمل والنصوص الوظيفية.</li> <li>2- يتعرف على أقسام الأفعال في اللغة العربية (ماضي، مضارع، أمر) ويفرق بينها من حيث الصيغة والدلالة والاستعمال.</li> <li>3- يحدد علامات الجزم وعلامات النصب للأفعال المضارعة، ويطبقها تطبيقًا سليمًا في الكتابة الأكاديمية.</li> <li>4- يستخدم الأعداد في اللغة العربية استخدامًا صحيحًا من حيث التذكير والتأنيث، والإعراب، وتمييز العدد.</li> <li>5- يفرق بين حرفي الضاد والطاء نطقًا وكتابةً، ويتجنب الأخطاء الشائعة المرتبطة بهما.</li> <li>6- يوظف علامات الترقيم توظيفًا صحيحًا في النصوص الكتابية بما يحقق الوضوح والدقة في المعنى.</li> <li>7- يتعرف على الأغلاط اللغوية الشائعة في الاستعمال الكتابي والشفهي، ويصححها وفق القواعد اللغوية.</li> <li>8- يميز بين المفعول فيه (الظرف) والمفعول معه من حيث التعريف والدلالة والإعراب.</li> <li>9- يعرب الجمل التي تحتوي على المفاعيل المختلفة إعرابًا صحيحًا.</li> <li>10- يطبق القواعد النحوية المدروسة في صياغة جمل ونصوص علمية ووظيفية سليمة لغويًا.</li> <li>11- ينمي مهارته في التحليل اللغوي وربط القاعدة بالتطبيق العملي.</li> <li>12- يظهر دقة لغوية ومسؤولية أكاديمية في الكتابة والتعبير.</li> </ul> |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>بناء الفعل في اللغة العربية .</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

- تعريف الفعل المعلوم والفعل المجهول
- صيغ بناء الفعل للمعلوم
- صيغ بناء الفعل للمجهول
- تحويل الفعل من المعلوم إلى المجهول
- تطبيقات لغوية من نصوص علمية ووظيفية
- 2. أقسام الأفعال في اللغة العربية
- الفعل الماضي: خصائصه ودلالاته
- الفعل المضارع: خصائصه ودلالاته
- فعل الأمر: صوغه واستعماله
- دلالة الزمن في الأفعال
- تطبيقات عملية على استعمال الأفعال
- 3. نصب الفعل المضارع وجزمه
- أدوات نصب الفعل المضارع
- علامات النصب الأصلية والفرعية
- أدوات جزم الفعل المضارع
- علامات الجزم الأصلية والفرعية
- الفرق بين النصب والجزم في الاستعمال
- تمارين تطبيقية وإعرابية
- 4. الأعداد في اللغة العربية
- تعريف العدد وتمييزه
- (أنواع الأعداد) المفردة، المركبة، المعطوفة، العقود
- تذكير العدد وتأنينه
- إعراب الأعداد وتمييزها
- أخطاء شائعة في استعمال الأعداد
- تطبيقات من السياقات العلمية والهندسية
- 5. الضاد والظاء
- الفرق الصوتي والكتابي بين الضاد والظاء

- مواضع شيوع كل حرف
- كلمات شائعة يخطئ فيها الطلبة
- تدريبات على النطق والكتابة الصحيحة
- 6. علامات الترقيم
- مفهوم علامات الترقيم وأهميتها
- الفاصلة، الفاصلة المنقوطة، النقطة
- علامة الاستفهام والتعجب
- النقطتان، الأقواس، الشرطة
- توظيف علامات الترقيم في النصوص العلمية
- 7. الأغلاط اللغوية الشائعة
- أخطاء نحوية شائعة في الكتابة
- أخطاء إملائية وصرفية
- أخطاء في التراكيب والأساليب
- أساليب تصحيح الأخطاء اللغوية
- 8. المفاعيل في اللغة العربية
- المفعول فيه (الظرف): تعريفه وأنواعه
- المفعول معه: تعريفه ودلالته
- الفرق بين المفعول فيه والمفعول معه
- إعراب المفاعيل وتطبيقاتها
- أمثلة من النصوص العلمية والوظيفية
- 9. التطبيقات اللغوية
- تحليل نصوص مختارة
- إعراب جمل مختارة
- كتابة جمل ونصوص قصيرة وفق القواعد المدروس

## Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

|            |  |
|------------|--|
| Strategies |  |
|------------|--|

## Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 17  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 3 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 33  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |   |

## Module Evaluation

تقييم المادة الدراسية

|                      |              | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|--------------|-------------|----------------|----------|---------------------------|
|                      | Quizzes      | 3           | 15% (5*3)      | 2 to 12  | L0#1-4-6-7                |
| Formative assessment | Assignments  | 3           | 12% (4*3)      | 2 to 12  | L0#1-4-6-7                |
|                      | Classwork    | 1           | 5% (1*5)       | 7        | -----                     |
|                      | Report       | 1           | 8% (1*8)       | 8        | -----                     |
| Summative assessment | Midterm Exam | 2 hr        | 10% (1*10)     | 10       | LO#4-7                    |
|                      | Final Exam   | 3hr         | 50% (1*50)     | 16       | All                       |
| Total assessment     |              |             | 100%           |          |                           |

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|         | Material Covered                                              |
|---------|---------------------------------------------------------------|
| Week 1  | بناء الفعل للمعلوم والمجهول                                   |
| Week 2  | أقسام الأفعال في العربية                                      |
| Week 3  | علامات الجزم في اللغة العربية                                 |
| Week 4  | علامات النصب في اللغة العربية                                 |
| Week 5  | الأعداد في اللغة العربية                                      |
| Week 6  | الفرق بين الضاد والطاء                                        |
| Week 7  | علامات الترتيب                                                |
| Week 8  | أغلاط شائعة                                                   |
| Week 9  | المفعول فيه                                                   |
| Week 10 | المفعول معه                                                   |
| Week 11 | المفعول لأجله                                                 |
| Week 12 | من القرآن الكريم -سورة الاسراء                                |
| Week 13 | من الأحاديث النبوية – ان الله يحب اذا عمل احدكم عملا ان يتقنه |
| Week 14 | من النصوص الأدبية- دالية أبي العلاء المعري                    |
| Week 15 | من النصوص الأدبية- رُب ليل كأنه الصبح في الحُسن               |
| Week 16 | Preparatory week before the final Exam                        |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                   | Text                                 | Available in the Library? |
|-------------------|--------------------------------------|---------------------------|
| Required Texts    | جامع الدروس العربية لمصطفى الغلاييني |                           |
| Recommended Texts | مغني اللبيب لابن هشام/ شرح ابن عقيل  |                           |
| Websites          | المكتبة الشاملة                      |                           |

## Grading Scheme

### مخطط الدرجات

| Group                | Grade                   | التقدير             | Marks (%) | Definition                            |
|----------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group</b> | <b>A - Excellent</b>    | امتياز              | 90 - 100  | Outstanding Performance               |
| <b>(50 - 100)</b>    | <b>B - Very Good</b>    | جيد جدا             | 80 - 89   | Above average with some errors        |
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| <b>(0 – 49)</b>      | <b>F – Fail</b>         | راسب                | (0-44)    | Considerable amount of work required  |
|                      |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                                                |                                                                                                                                                                                                                                              |                                      |                          |
|------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------|
| <b>Module Title</b>                                  | Electrical Circuits Analysis II<br>II تحليل الدوائر الكهربائية |                                                                                                                                                                                                                                              | <b>Module Delivery</b>               |                          |
| <b>Module Type</b>                                   | Core                                                           | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                                      |                          |
| <b>Module Code</b>                                   | EEPM208                                                        |                                                                                                                                                                                                                                              |                                      |                          |
| <b>ECTS Credits</b>                                  | 5                                                              |                                                                                                                                                                                                                                              |                                      |                          |
| <b>SWL (hr./sem)</b>                                 | 125                                                            |                                                                                                                                                                                                                                              |                                      |                          |
| <b>Module Level</b>                                  |                                                                | UGII                                                                                                                                                                                                                                         | <b>Semester of Delivery</b>          | Semester four            |
| <b>Administering Department</b>                      |                                                                | 2 - (Electrical Engineering)                                                                                                                                                                                                                 | <b>College</b>                       | UoM2 - (Engineering)     |
| <b>Module Leader</b>                                 | Dr. Omar Sharaf Deen Yehya Al- Yozbak                          |                                                                                                                                                                                                                                              | <b>e-mail</b>                        | o.yehya @uomosul.edu.iq  |
| <b>Module Leader's Acad. Title</b>                   |                                                                | Assist. Prof.                                                                                                                                                                                                                                | <b>Module Leader's Qualification</b> | PhD                      |
| <b>Module Tutor</b>                                  | Dr. Sarra Ismaiel Khalil                                       |                                                                                                                                                                                                                                              | <b>e-mail</b>                        | saraa2020@uomosul.edu.iq |
| <b>Peer Reviewer Name</b>                            |                                                                |                                                                                                                                                                                                                                              | <b>e-mail</b>                        |                          |
| <b>Scientific Committee Approval Date</b>            |                                                                | 01/09/2023                                                                                                                                                                                                                                   | <b>Version Number</b>                | 1.0                      |

## Redules

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

### Module Aims, Learning Outcomes and Indicative Contents

#### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <p>This course equips students with the skills to analyze circuits in the S-domain, apply transfer functions, and calculate system outputs using partial fractions and convolution. It covers sinusoidal steady-state response, frequency response, and the design of first-order RL and RC filters. Students will study resonance in series and parallel circuits, Bode plot scaling, and key parameters like resonant frequency, Q-factor, and bandwidth. The course also introduces passive and active filter design, the use of OPAMPs as amplifiers and buffers, and the implementation of Butterworth and cascaded filters for practical applications.</p>                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1. Analyze electrical circuits in the S-domain using Laplace transform techniques.</li> <li>2. Apply transfer functions to model linear systems and determine their dynamic behavior.</li> <li>3. Calculate system outputs using partial fraction expansion and convolution methods.</li> <li>4. Analyze sinusoidal steady-state responses and evaluate circuit behavior in the frequency domain.</li> <li>5. Design and analyze first-order RL and RC filters and assess their performance characteristics.</li> <li>6. Understand and analyze resonance phenomena in series and parallel RLC circuits.</li> <li>7. Interpret and construct Bode plots, including magnitude and phase scaling.</li> <li>8. Evaluate key resonance parameters such as resonant frequency, quality factor (Q-factor), and bandwidth.</li> <li>9. Design and implement passive and active filters for practical engineering applications.</li> <li>10. Use operational amplifiers (OPAMPs) as amplifiers and buffers in analog circuit design.</li> </ol> |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | 11. Design and analyze Butterworth filters and cascaded filter structures to meet specific frequency response requirements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Indicative Contents</b><br>المحتويات الإرشادية | 1. Transient response of first-order RL and RC circuits: natural response and complete response. [12 hrs.]<br>2. Forced and natural response of first-order RL and RC circuits: general response and sequential switching. [12 hrs.] + [1 hr. Quiz]<br>3. Transient response of second-order RLC circuits: natural response of series RLC circuits. [12 hrs.] + [1 hr. Quiz]<br>4. Analysis of overdamped, underdamped, and critically damped RLC circuits. [12 hrs.]<br>5. Mutual inductance: self-inductance and mutual inductance equations. [12 hrs.]<br>6. Magnetic coupling: coefficient of coupling and linear transformer. [12 hrs.] + [1 hr. Quiz]<br>7. Ideal transformer models: T-model and $\pi$ -model, impedance matching. [12 hrs.]<br>8. Two-port networks and their applications. [12 hrs.] + [1 hr. Quiz] |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | For Electrical Networks in electrical Engineering, students will learn: An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics. (1) |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 93  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 7 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 32  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 6 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |                                                                           |   |

## Module Evaluation

### تقييم المادة الدراسية

|                      |                 | Time/Number | Weight (Marks) | Week Due   | Relevant Learning Outcome |
|----------------------|-----------------|-------------|----------------|------------|---------------------------|
| Formative assessment | Quizzes         | 3           | 12% (12)       | Continuous | LO #1, 5, 8 and 9         |
|                      | Assignments     | 3           | 12% (12)       | Continuous | LO #1, 2, 4, 6 7, 8 and 9 |
|                      | Projects / Lab. | 3           | 12% (12)       | Continuous | All                       |
|                      | Report          |             |                |            |                           |
| Summative assessment | Midterm Exam    | 2 hr.       | 10% (10)       | 7          | LO # 1-5                  |
|                      | Final Exam      | 3 hr.       | 50% (50)       | 15         | All                       |
| Total assessment     |                 |             | %100           |            |                           |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|         | Material Covered                                                                          |
|---------|-------------------------------------------------------------------------------------------|
| Week 1  | Analysis of circuits in S-domain circuit elements.                                        |
| Week 2  | Applications the transfer function.                                                       |
| Week 3  | Output calculation using partial fraction.                                                |
| Week 4  | Output calculation using convolution integral.                                            |
| Week 5  | Sinusoidal steady state response from TF.                                                 |
| Week 6  | Frequency Response.                                                                       |
| Week 7  | First- Order RL and RC filters.                                                           |
| Week 8  | Series resonance other resonance from scaling bode plots.                                 |
| Week 9  | Parallel RLC resonant circuit resonant frequency: Q-factor, bandwidth cutoff frequencies. |
| Week 10 | Passive filter design.                                                                    |
| Week 11 | Active filter design.                                                                     |

|                |                                                 |
|----------------|-------------------------------------------------|
| <b>Week 12</b> | First – order low- pass and high – pass filter. |
| <b>Week 13</b> | The use of OPAMP as amplifier and Buffer.       |
| <b>Week 14</b> | Butterworth filter.                             |
| <b>Week 15</b> | Cascaded filter.                                |
| <b>Week 16</b> | Preparatory week before the final Exam          |

## Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Available in the Library? |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | <ol style="list-style-type: none"> <li><b>William H. Hayt, Jack E. Kemmerly, Steven M. Durbin</b> – <i>Engineering Circuit Analysis</i>, McGraw- Hill Education.</li> <li><b>Charles K. Alexander, Matthew N. O. Sadiku</b> – <i>Fundamentals of Electric Circuits</i>, McGraw-Hill Education.</li> <li><b>Richard C. Dorf, James A. Svoboda</b> – <i>Introduction to Electric Circuits</i>, Wiley.</li> <li><b>Robert L. Boylestad</b> – <i>Introductory Circuit Analysis</i>, Pearson.</li> <li><b>Sergio Franco</b> – <i>Design with Operational Amplifiers and Analog Integrated Circuits</i>, McGraw-Hill Education.</li> <li><b>A. Bruce Carlson</b> – <i>Circuits: Engineering Concepts and Analysis of Linear Electric Circuits</i>, Thomson Engineering.</li> <li><b>Leonard S. Bobrow</b> – <i>Foundations of Electrical Engineering</i>, Oxford University Press.</li> </ol> <p><b>Allan H. Robbins, Wilhelm C. Miller</b> – <i>Circuit Analysis: Theory and Practice</i>, Cengage Learning</p> |                           |
| <b>Recommended Texts</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |
| <b>Websites</b>          | <a href="https://www.allaboutcircuits.com/">https://www.allaboutcircuits.com/</a><br><br><a href="https://www.electronics-tutorials.ws/">https://www.electronics-tutorials.ws/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                |                                                                                                                                                                                                                                          |                                                                                |
|------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>Module Title</b>                                  | Mathematics IV<br>الرياضيات IV |                                                                                                                                                                                                                                          | <b>Module Delivery</b>                                                         |
| <b>Module Type</b>                                   | Basic                          | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                                                                                |
| <b>Module Code</b>                                   | EEPM209                        |                                                                                                                                                                                                                                          |                                                                                |
| <b>ECTS Credits</b>                                  | 5                              |                                                                                                                                                                                                                                          |                                                                                |
| <b>SWL (hr./sem)</b>                                 | 125                            |                                                                                                                                                                                                                                          |                                                                                |
| <b>Module Level</b>                                  | Basic learning activities      |                                                                                                                                                                                                                                          |                                                                                |
| <b>Administering Department</b>                      | 2 - (Electrical Engineering)   | <b>College</b>                                                                                                                                                                                                                           | UoM2 - (Engineering)                                                           |
| <b>Module Leader</b>                                 | Omar Sharaf Deen               | <b>e-mail</b>                                                                                                                                                                                                                            | <a href="mailto:o.yehya@uomosul.edu.iq">o.yehya@uomosul.edu.iq</a>             |
| <b>Module Leader's Acad. Title</b>                   | Assistant Professor            | <b>Module Leader's Qualification</b>                                                                                                                                                                                                     | Ph.D.                                                                          |
| <b>Module Tutor</b>                                  | Ibrahim Ismael Alnaib          | <b>e-mail</b>                                                                                                                                                                                                                            | <a href="mailto:ibrahim-85353@uomosul.edu.iq">ibrahim-85353@uomosul.edu.iq</a> |
| <b>Peer Reviewer Name</b>                            | Dr. Ahmad Salam                | <b>e-mail</b>                                                                                                                                                                                                                            | ahmed.salim@uomosul.edu.iq                                                     |
| <b>Scientific Committee Approval Date</b>            | 01/06/2023                     | <b>Version Number</b>                                                                                                                                                                                                                    | 1.0                                                                            |

| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |      |                 |  |
|-------------------------------------------------------------------------|------|-----------------|--|
| <b>Prerequisite module</b>                                              | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>                                             | None | <b>Semester</b> |  |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
|                                                                                                                           | 27. To develop problem-solving of Eigenvalues and eigenvectors<br>28. To understand Laplace Transforms. |

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | 29. This course deals with the basic concept of DC electrical circuits.<br>30. To understand the application of Laplace Transforms in electronic circuits.<br>31. To understand the Fourier, transform and their applications in electrical engineering                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | 1. Recognize Eigenvalues and eigenvectors.<br>2. Summarize series and series geometric.<br>3. Identify the Laplace Transforms.<br>4. Identify the Fourier transform their applications.<br>5. Identify the application in Electrical Circuits.                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | Indicative content includes the following.<br>Eigenvalues and eigenvectors; diagonalization. Sequence and series, sequence convergence, series geometric series, nth partial sum, test of convergence, Laplace Transforms: Introduction to transforms and operators, Laplace transforms of basic functions; unit step function, transforms of 1st and 2nd derivatives, Application to electric circuits; Transforms of piecewise continuous functions<br>Inverse Laplace transforms, derivation using partial fractions. Direct (s-domain) analysis of electrical circuits, Interpretation of s-domain functions Initial & final value theorems. |
|                                                                  | Fourier transform for different functions (unit step function, unit impulse function, singularity function, applications in electrical engineering.<br>Fourier transform for different functions (unit step function, unit impulse function, singularity function, applications in electrical engineering.                                                                                                                                                                                                                                                                                                                                       |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                               |    |                                                                     |     |
|-------------------------------|----|---------------------------------------------------------------------|-----|
| <b>Structured SWL (h/sem)</b> | 78 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا | 5.2 |
|-------------------------------|----|---------------------------------------------------------------------|-----|

|                                                                                |     |                                                                           |     |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|-----|
| الحمل الدراشي المنتظم للطالب خلال الفصل                                        |     |                                                                           |     |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراشي غير المنتظم للطالب خلال الفصل | 47  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراشي غير المنتظم للطالب أسبوعيا | 3.1 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراشي الكلي للطالب خلال الفصل              | 125 |                                                                           |     |

| Module Evaluation     |              |             |                  |            |                           |
|-----------------------|--------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية |              |             |                  |            |                           |
|                       |              | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes      | 3           | 15% (5*3)        | 4,8,12     | All                       |
|                       | Assignments  | 3           | 12% (4*3)        | 2 to 12    | All                       |
|                       | Classwork    | 1           | 5% (1*5)         | Continuous | All                       |
|                       | Report       | 1           | 8% (1*8)         | ----       | ----                      |
| Summative assessment  | Midterm Exam | 2 hr        | 10% (1*10)       | 8          | All                       |
|                       | Final Exam   | 3hr         | 50% (1*50)       | 16         | All                       |
| Total assessment      |              |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                                |
|---------------------------------|----------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                |
|                                 | Material Covered                                               |
| Week 1                          | Sequence and series, sequence convergence,                     |
| Week 2                          | series geometric series, nth partial sum, test of convergence, |
| Week 3                          | Taylor and Mandarin series,                                    |
| Week 4                          | Eigenvalues and eigenvectors; diagonalization.                 |

|                |                                                                                                                                                     |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 5</b>  | Introduction to transforms and operators, Laplace Transforms                                                                                        |
| <b>Week 6</b>  | Laplace transforms of basic functions                                                                                                               |
| <b>Week 7</b>  | unit step function, transforms of 1st and 2nd derivatives                                                                                           |
| <b>Week 8</b>  | Mid-term Exam                                                                                                                                       |
| <b>Week 9</b>  | Inverse Laplace transforms,                                                                                                                         |
| <b>Week 10</b> | Application to electric circuits;                                                                                                                   |
| <b>Week 11</b> | Direct (s-domain) analysis of electrical circuits, Interpretation of s-domain functions Initial & final value theorems                              |
| <b>Week 12</b> | derivation using partial fractions                                                                                                                  |
| <b>Week 13</b> | Transforms of piecewise continuous functions.                                                                                                       |
| <b>Week 14</b> | Fourier transform: Introduction, Fourier transform equation, properties,                                                                            |
| <b>Week 15</b> | Fourier transform for different functions (unit step function, unit impulse function, singularity function, applications in electrical engineering. |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                       |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                              | Available in the Library? |
|--------------------------|-----------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Advanced Engineering Mathematics, 10th Edition, By Reyszig ERWIN, Publisher 2011. | No                        |
| <b>Recommended Texts</b> | Calculus By Thomas Finny 13th Edition, Pearson Publisher, 2016.                   | No                        |

|          |  |
|----------|--|
| Websites |  |
|----------|--|

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                              |                         |                     |           |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                       | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                         | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                              | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                             |                         |                     |           |                                       |
| <p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p> |                         |                     |           |                                       |

## نموذج وصف المادة الدراسية

| Module Information                 |                                      |                                                                                                                                                                                                                                          |                        |
|------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| معلومات المادة الدراسية            |                                      |                                                                                                                                                                                                                                          |                        |
| Module Title                       | DC Machines<br>مكائن التيار المستمر  | Module Delivery                                                                                                                                                                                                                          |                        |
| Module Type                        | Core                                 | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                        |
| Module Code                        | EEPM210                              |                                                                                                                                                                                                                                          |                        |
| ECTS Credits                       | 5                                    |                                                                                                                                                                                                                                          |                        |
| SWL (hr./sem)                      | 125                                  |                                                                                                                                                                                                                                          |                        |
| Module Level                       | 2                                    |                                                                                                                                                                                                                                          |                        |
| Administering Department           | Department of Electrical Engineering | College                                                                                                                                                                                                                                  | College of Engineering |
| Module Leader                      | أ.م.د. عمر شرف الدين يحيى            | e-mail                                                                                                                                                                                                                                   | o.yehya@uomosul.edu.iq |
| Module Leader's Acad. Title        | أستاذ مساعد                          | Module Leader's Qualification                                                                                                                                                                                                            | دكتوراه                |
| Module Tutor                       | د. هبة ناظم أمين                     | e-mail                                                                                                                                                                                                                                   | hkaoaz@uomosul.edu.iq  |
| Peer Reviewer Name                 |                                      | e-mail                                                                                                                                                                                                                                   |                        |
| Scientific Committee Approval Date |                                      | Version Number                                                                                                                                                                                                                           |                        |

| Relation with other Modules       |                                    |          |     |
|-----------------------------------|------------------------------------|----------|-----|
| العلاقة مع المواد الدراسية الأخرى |                                    |          |     |
| Prerequisite module               | Electrical Circuit Analysis I & II | Semester | 4&3 |
| Co-requisites module              | None                               | Semester |     |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                             |
| <b>Module Aims</b><br><br>أهداف المادة الدراسية          | <ol style="list-style-type: none"> <li><b>6.</b> To understand the principle of Electro-Mechanical Energy Conversion of DC Machine.</li> <li><b>7.</b> To understand Armature. Reaction and communication.</li> <li><b>8.</b> To understand the D.C generator. General principle</li> </ol> |

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                   | <p><b>9.</b> To study the Regulation of DC generator, Losses and efficiency.</p> <p><b>10.</b> To study Motors principle. Voltage equation of motor, torque, types of motors. Motor characteristics</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p>       | <p><b>5.</b> Identify the principle of DC machine.</p> <p><b>6.</b> Identify the Armature. Reaction and communication.</p> <p><b>7.</b> Identify the Regulation of DC generator, Losses and efficiency.</p> <p><b>8.</b> Summarize the testing of DC machines and Speed control of D.C motors.</p>                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                      | <p>Indicative content includes the following.</p> <p>Principles of Electro-Mechanical Energy Conversion. Classification of Electrical machines. D.C generator. General principle. Construction and working, E.M.F equation. Armature Winding Armature. Reaction and communication, types of generation. Losses in generator. The efficiency, generation characteristics. Parallel operation of D.C generator. D.C Motors principle. Voltage equation of motor, torque, types of motors. Motor characteristics, power stages, losses and efficiency. Speed control of D.C motors, breaking. Starters, testing of D.C Machines Permeant D.C Machines.</p> |
| <p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <p><b>Strategies</b></p>                                                          | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p>                                                                                                                                                                                                                                                     |

| <p><b>Student Workload (SWL)</b></p> <p>الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</p>       |     |                                                                                      |     |
|-------------------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------|-----|
| <p><b>Structured SWL (h/sem)</b></p> <p>الحمل الدراسي المنتظم للطالب خلال الفصل</p>       | 63  | <p><b>Structured SWL (h/w)</b></p> <p>الحمل الدراسي المنتظم للطالب أسبوعيا</p>       | 4.2 |
| <p><b>Unstructured SWL (h/sem)</b></p> <p>الحمل الدراسي غير المنتظم للطالب خلال الفصل</p> | 62  | <p><b>Unstructured SWL (h/w)</b></p> <p>الحمل الدراسي غير المنتظم للطالب أسبوعيا</p> | 4.1 |
| <p><b>Total SWL (h/sem)</b></p> <p>الحمل الدراسي الكلي للطالب خلال الفصل</p>              | 125 |                                                                                      |     |

## Module Evaluation

### تقييم المادة الدراسية

|                      |                                          | Time/Number | Weight (Marks)   | Week Due  | Relevant Learning Outcome |
|----------------------|------------------------------------------|-------------|------------------|-----------|---------------------------|
|                      | Quizzes                                  | 3           | 5 (15%)          | 3,6,11,14 | LO 1-4                    |
| Formative assessment | Online assignments<br>واجبات بيئية       | 3           | 4 (12%)          | 3 to 12   | LO 1-4                    |
|                      | Onsite Assignments<br>واجبات داخل الكلية | 1           | 5 (5%)           | 5 to 8    | LO 1-4                    |
|                      | Report                                   | 1           | 8 (8%)           | 13        | LO 1-4                    |
| Summative assessment | Midterm Exam                             | 2 hr        | 10%              | 7         | LO 1-4                    |
|                      | Final Exam                               | 3 hr        | 50%              | 16        | All                       |
| Total assessment     |                                          |             | 100% (100 Marks) |           |                           |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|        | Material Covered                                                                                                                                                |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1 | Principles of Electro-Mechanical Energy Conversion.                                                                                                             |
| Week 2 | Classification of Electrical machines.                                                                                                                          |
| Week 3 | D.C generator. General principle.                                                                                                                               |
|        | <ul style="list-style-type: none"> <li>Construction and working, E.M.F equation.</li> </ul>                                                                     |
| Week 4 | D.C generator. General principle. <ul style="list-style-type: none"> <li>Armature Winding Armature. Reaction and communication, types of generation.</li> </ul> |
| Week 5 | D.C generator. General principle. <ul style="list-style-type: none"> <li>Losses in generator. The efficiency, generation characteristics.</li> </ul>            |

|                |                                                                    |
|----------------|--------------------------------------------------------------------|
| <b>Week 6</b>  | Parallel operation of D.C generator.                               |
| <b>Week 7</b>  | Mid-term Exam                                                      |
| <b>Week 8</b>  | D.C Motors principle.<br>• Voltage equation of motor, torque.      |
| <b>Week 9</b>  | D.C Motors principle.<br>• Types of motors. Motor characteristics. |
| <b>Week 10</b> | D.C Motors principle.<br>• power stages, losses and efficiency.    |
| <b>Week 11</b> | Speed control of D.C motors                                        |
| <b>Week 12</b> | Breaking of D.C motors.                                            |
| <b>Week 13</b> | Starters of D.C motor                                              |
| <b>Week 14</b> | Testing of D.C Machines Permeant D.C Machines.                     |
| <b>Week 15</b> | Testing of D.C Machines Permeant D.C Machines.                     |
| <b>Week 16</b> | Preparatory week before the final Exam                             |

### Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | <b>Text</b>                                                                      | <b>Available in the Library?</b> |
|--------------------------|----------------------------------------------------------------------------------|----------------------------------|
| <b>Required Texts</b>    | Theraja, B. L. (2014). A textbook of electrical technology. S. Chand Publishing. | Online (yes)                     |
| <b>Recommended Texts</b> | Rajput, R. K. (2004). A Textbook of Electrical Technology. Firewall Media.       | Online (yes)                     |
| <b>Websites</b>          |                                                                                  |                                  |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| Module Information                        |                                            |                              |                                                                                                                                                                                                                                          |                                                                          |     |
|-------------------------------------------|--------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-----|
| معلومات المادة الدراسية                   |                                            |                              |                                                                                                                                                                                                                                          |                                                                          |     |
| <b>Module Title</b>                       | <b>Distribution Systems</b><br>نظم التوزيع |                              | <b>Module Delivery</b>                                                                                                                                                                                                                   |                                                                          |     |
| <b>Module Type</b>                        | <b>Core</b>                                |                              | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                                                                          |     |
| <b>Module Code</b>                        | <b>EEPM211</b>                             |                              |                                                                                                                                                                                                                                          |                                                                          |     |
| <b>ECTS Credits</b>                       | 5                                          |                              |                                                                                                                                                                                                                                          |                                                                          |     |
| <b>SWL (hr./sem)</b>                      | 125                                        |                              |                                                                                                                                                                                                                                          |                                                                          |     |
| <b>Module Level</b>                       |                                            | Second-Power<br>and machines | <b>Semester of Delivery</b>                                                                                                                                                                                                              |                                                                          | 6   |
| <b>Administering Department</b>           |                                            | Department of<br>Electrical  | <b>College</b>                                                                                                                                                                                                                           | Engineering                                                              |     |
| <b>Module Leader</b>                      | Dr.Omar Sh. Alyozbak                       |                              | <b>e-mail</b>                                                                                                                                                                                                                            | o.yehya@uomosul.edu.iq                                                   |     |
| <b>Module Leader's Acad. Title</b>        |                                            | Head of Dept.                | <b>Module Leader's Qualification</b>                                                                                                                                                                                                     |                                                                          | PhD |
| <b>Module Tutor</b>                       | M.Sc. Ahmed Bassam Aziz                    |                              | <b>e-mail</b>                                                                                                                                                                                                                            | <a href="mailto:ahmed.aziz@uomosul.edu.iq">ahmed.aziz@uomosul.edu.iq</a> |     |
| <b>Peer Reviewer Name</b>                 |                                            | M.Sc. Ahmed Bassam<br>Aziz   | <b>e-mail</b>                                                                                                                                                                                                                            | <a href="mailto:ahmed.aziz@uomosul.edu.iq">ahmed.aziz@uomosul.edu.iq</a> |     |
| <b>Scientific Committee Approval Date</b> |                                            |                              | <b>Version Number</b>                                                                                                                                                                                                                    | 1.0                                                                      |     |

### Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b>    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | Power Distribution Systems: The module aims to familiarize students with the distribution of electrical power from the transmission grid to end-users. It covers distribution network design, components, and operation, including substations, distribution transformers, switchgear, and protection systems. Students learn about the challenges associated with distribution system operation, such as voltage regulation, power quality, and reliability.                                                                                                                                                                                                                                                                                                                                     |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <p>Upon completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Familiarity with Power Distribution Systems: Students will gain a solid understanding of power distribution systems, including network design, components, and operation. They will become knowledgeable about substations, distribution transformers, switchgear, and protection systems. They will understand the challenges associated with voltage regulation, power quality, and system reliability in distribution networks.</li> <li>2. Students will be able to apply engineering principles and concepts to solve practical problems related to distribution systems. They will develop problem-solving skills and apply their knowledge to design efficient and</li> </ol> |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | reliable power systems, address system vulnerabilities, and optimize system performance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Indicative Contents</b><br>المحتويات الإرشادية | Indicative content includes the following.<br><b><u>Distribution Systems:</u></b> Introduction, Classification of Distribution System, Methods of Connection, Comparison among Distribution Systems, Type of D.C Distributions: D.C Distributor fed at One End-Concentrated Loading, D.C Distributor fed at Both End-Concentrated Loading, D.C Distributor fed at One End with Uniformly Distributed Load, D.C Distributor fed at Both Ends with Uniformly Distributor Load, D.C Ring Distributor, Ring Distributor with Inter-Connector, Stepped Distributor, Classification of A. C. Distribution Systems. Methods of Connection, Single Phase Distribution Systems, Three Phase Distribution Systems. Types of A. C. Distribution Systems. A. C. Radial Systems: A. C. Distributor fed at one end. A. C. Distributor fed at both ends. A. C. Ring Systems Protection of Distribution Systems, Distribution Transformers, Types of Sub-Stations, Sub-Stations Measurements Devices. [24 hrs.]<br>Revision problem and tutorial classes [6 hrs.]<br>Quizzes [3 hr.] |

| Learning and Teaching Strategies |                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  | استراتيجيات التعلم والتعليم                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Strategies</b>                | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|                                  |                                                                                                                                                                                                                                                                                                                                                                                              |

| Student Workload (SWL)                                                         |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| الحمل الدراشي للطلاب محسوب لـ ١٥ اسبوعا                                        |     |                                                                           |   |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراشي المنتظم للطلاب خلال الفصل       | 60  | <b>Structured SWL (h/w)</b><br>الحمل الدراشي المنتظم للطلاب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراشي غير المنتظم للطلاب خلال الفصل | 60  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراشي غير المنتظم للطلاب أسبوعيا | 4 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراشي الكلي للطلاب خلال الفصل              | 120 |                                                                           |   |

| Module Evaluation     |             |                |          |                           |
|-----------------------|-------------|----------------|----------|---------------------------|
| تقييم المادة الدراسية |             |                |          |                           |
| As                    | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |

|                             |                        |       |                  |         |                 |
|-----------------------------|------------------------|-------|------------------|---------|-----------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 1/3   | 4% (4)           | 3,6,11  | LO # 1,2, and 3 |
|                             | <b>Assignments</b>     | 3     | 4% (4)           | 2 to 15 | LO # 1,2, and 3 |
|                             | <b>Projects / Lab.</b> |       |                  |         |                 |
|                             | <b>Report</b>          | 1     | 8% (8)           | 7       | LO # 1,2, and 3 |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 1.5hr | 10% (10)         | 8       | LO # 1-6        |
|                             | <b>Final Exam</b>      | 3hr   | 50% (50)         | 16      | All             |
| <b>Total assessment</b>     |                        |       | 100% (100 Marks) |         |                 |

| <b>Delivery Plan (Weekly Syllabus)</b> |                                                                                     |
|----------------------------------------|-------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري                |                                                                                     |
| <b>Week</b>                            | <b>Material Covered</b>                                                             |
| <b>Week 1</b>                          | Introduction to Distribution Systems.                                               |
| <b>Week 2</b>                          | Classification of DC Distribution Systems.                                          |
| <b>Week 3</b>                          | Comparison among Distribution Systems.                                              |
| <b>Week 4</b>                          | Mathematical methods for calculation currents, voltages, voltage drops, resistance. |
| <b>Week 5</b>                          | Solve examples, class works, homeworks.                                             |
| <b>Week 6</b>                          | Classification of AC Distribution Systems.                                          |
| <b>Week 7</b>                          | Single Phase Distribution Systems.                                                  |
| <b>Week 8</b>                          | Solve examples, Quiz.                                                               |
| <b>Week 9</b>                          | three Phase Distribution Systems.                                                   |
| <b>Week 10</b>                         | Distribution Transformers.                                                          |
| <b>Week 11</b>                         | Solve examples, class works, homeworks.                                             |
| <b>Week 12</b>                         | Midterm exam                                                                        |
| <b>Week 13</b>                         | Types of Sub-Stations.                                                              |
| <b>Week 14</b>                         | Sub-Stations Protection Devices.                                                    |
| <b>Week 15</b>                         | Sub-Stations Measurements Devices.                                                  |
| <b>Week 16</b>                         | Preparatory week before the final Exam                                              |

| Learning and Teaching Resources |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                           | مصادر التعلم والتدريس |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------|
|                                 | Text                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Available in the Library? |                       |
| Required Texts                  | <ol style="list-style-type: none"> <li>1. Power Distribution Planning Reference Book by H. Lee willis, 2014.</li> <li>2. Electrical Distribution Systems by Dale R. Patrick and Stephen W. Fardo, 2009.</li> <li>3. A Course in Electrical Power. By J. B. Gupta.</li> <li>4. Electric Power Generation, Transmission, and Distribution. Edited By Leonard L. Grigsby.</li> <li>5. Electric Power Distribution Reliability. By Richard E. Brown Power &amp; Machines.</li> </ol> | Yes                       |                       |
| Recommended Texts               | <ol style="list-style-type: none"> <li>6. Electrical Engineering Fundamentals by S. Bobby Rauf, 2020</li> </ol>                                                                                                                                                                                                                                                                                                                                                                  | No                        |                       |
| Websites                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                           |                       |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       | مخطط الدرجات |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|--------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |              |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |              |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |              |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |              |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |              |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |              |
| Fail Group<br>(0 - 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |              |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |              |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |              |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |              |

## نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                                                     |                                      |                                                                                                                                                                                                                                                                         |                          |      |
|------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|
| <b>Module Title</b>                                  | Renewable Energies Sciences<br><small>علوم الطاقات المتجددة</small> |                                      | <b>Module Delivery</b>                                                                                                                                                                                                                                                  |                          |      |
| <b>Module Type</b>                                   | Core learning activity                                              |                                      | <input checked="" type="checkbox"/> <b>Theory</b><br><input type="checkbox"/> <b>Lecture</b><br><input type="checkbox"/> <b>Lab</b><br><input type="checkbox"/> <b>Tutorial</b><br><input type="checkbox"/> <b>Practical</b><br><input type="checkbox"/> <b>Seminar</b> |                          |      |
| <b>Module Code</b>                                   | EPPM212                                                             |                                      |                                                                                                                                                                                                                                                                         |                          |      |
| <b>ECTS Credits</b>                                  | 2                                                                   |                                      |                                                                                                                                                                                                                                                                         |                          |      |
| <b>SWL (hr./sem)</b>                                 | 50                                                                  |                                      |                                                                                                                                                                                                                                                                         |                          |      |
|                                                      |                                                                     |                                      |                                                                                                                                                                                                                                                                         |                          |      |
| <b>Module Level</b>                                  |                                                                     | Second- Power and Machines           | <b>Semester of Delivery</b>                                                                                                                                                                                                                                             |                          | four |
| <b>Administering Department</b>                      |                                                                     | Department of Electrical Engineering | <b>College</b>                                                                                                                                                                                                                                                          | Engineering              |      |
| <b>Module Leader</b>                                 | Dr.Omar Sh. Alyozbak                                                |                                      | <b>e-mail</b>                                                                                                                                                                                                                                                           | o.yehya@uomosul.edu.iq   |      |
| <b>Module Leader's Acad. Title</b>                   |                                                                     | Head of Dept.                        | <b>Module Leader's Qualification</b>                                                                                                                                                                                                                                    |                          | PhD  |
| <b>Module Tutor</b>                                  | Raghad Adeeb Othman                                                 |                                      | <b>e-mail</b>                                                                                                                                                                                                                                                           | raghadeeb@uomosul.edu.iq |      |
| <b>Peer Reviewer Name</b>                            |                                                                     |                                      | <b>e-mail</b>                                                                                                                                                                                                                                                           |                          |      |
| <b>Scientific Committee Approval Date</b>            |                                                                     |                                      | <b>Version Number</b>                                                                                                                                                                                                                                                   | 1.1                      |      |

## Relation with other Modules

## العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <ul style="list-style-type: none"> <li>Understanding the physical and engineering principles underlying technologies for converting renewable energy into usable electrical or thermal energy.</li> <li>Enabling students to analyze renewable energy resources and assess their potential in different regions, especially in hot and arid environments like Iraq.</li> <li>Giving students basic skills in designing renewable energy systems (such as photovoltaic solar systems).</li> <li>Developing the ability to evaluate the performance and efficiency of renewable energy systems through technical calculations and operational data.</li> <li>Familiarizing students with the economic and environmental aspects of renewable energy projects, such as investment costs, payback periods, and emissions reduction.</li> <li>Enhancing students' awareness of the role of renewable energy in sustainable development and energy security.</li> <li>Preparing students to review global standards and trends in renewable energy issued by international organizations such as the International Renewable Energy Agency (IRENA).</li> </ul> |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <p>By the end of the course, the student will be able to</p> <ol style="list-style-type: none"> <li>analyze renewable energy resources,</li> <li>design simple systems based on them,</li> <li>evaluate their performance and economic and environmental feasibility,</li> <li>link theoretical aspects to practical applications in the local context.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p><b>W1 Understanding Electrical Energy and Its Sources</b></p> <ul style="list-style-type: none"> <li>The concept of energy and its forms</li> <li>Classification of energy sources</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                  | <ul style="list-style-type: none"> <li>Definition of electrical energy and electrical power</li> <li>Mathematical questions</li> </ul> <p><b>W2 Introduction to Renewable Energy Sciences</b></p> <ul style="list-style-type: none"> <li>Introduction to Traditional and Renewable Energy Sources</li> <li>Motivations for the Transition to Renewable Energy</li> <li>Energy Challenges in the World and Iraq</li> <li>Advantages and Disadvantages of Renewable Energy</li> <li>Understanding the Concept of Energy Security</li> <li>Reviewing Statistics Issued by the International Renewable Energy Agency (IRENA).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

### **W3 Solar and Photovoltaic Energy**

- Principle of photovoltaic conversion
- Types of solar cells
- Current-voltage (I-V) and power-voltage (PV) curves
- Effect of temperature and radiation
- Series and parallel connections
- Calculation of voltage, current, and power
- Standard rating factors (STC)

### **W4 Solar thermal energy**

- The concept of solar thermal energy and the difference between it and photovoltaic solar energy
- The principle of converting solar radiation into thermal energy
- Types of solar thermal energy systems:
- Types of solar thermal collectors:
- Basic components of a solar thermal system:
- Methods of storing thermal energy
- Factors affecting system performance:
- Technical and environmental advantages of solar thermal energy
- Technical and economic challenges
- Suitability of solar thermal energy systems for hot and arid environments (such as Iraq)

### **W5 wind energy**

- Wind Turbine Working Principle
- Types of Wind Turbine Farms

- Turbine Power Curve
- Cutoff, Input, and Output Speeds
- Selecting the Right Site
- Calculating Power Generation

#### **W6 Hydroelectric energy**

- The Concept of Hydropower and Its Importance in Renewable Energy Systems
- The Principle of Converting Water Energy into Mechanical Energy and then into Electrical Energy
- Basic Components of a Hydropower Plant
- Types of Hydropower Plants
- Types of Water Turbines
- Factors Affecting Power Generation
- The Basic Equation for Calculating Hydropower

#### **W7 Geothermal energy**

- The concept of geothermal energy and its natural sources
- The Earth's thermal structure and geothermal heat sources
- The principle of converting geothermal energy into electrical energy
- Types of geothermal resources
- Types of geothermal power plants
- Basic components of a geothermal power plant
- Direct uses of geothermal energy

#### **W8 Tidal energy (ocean energy)**

- The concept of ocean energy and its main types
- The concept of tidal energy and its physical source
- The principle of converting tidal energy into electrical energy
- Tidal energy utilization methods and technologies
- Basic components of a tidal energy system
- Operating principle of tidal turbines
- Characteristics of the energy resource

#### **W9 Biofuel energy**

- The Concept of Biofuels and Their Importance in Renewable Energy Systems
- Sources of Biofuels (Agricultural Crops, Agricultural Waste, Organic Waste)
- Types of Biofuels
- Biofuel Production Technologies

- Different Generations of Biofuels (First, Second, and Third Generation)
- Physical and Energy Properties of Biofuels
- Comparison of Biofuels to Fossil Fuels

#### **W10 Storage system**

- The Concept of Energy Storage and Its Importance in Renewable Energy Systems
- The Role of Storage Systems in Addressing the Fluctuations of Renewable Energy Sources
- Classification of Energy Storage Systems
- Electrochemical Storage Systems
- Mechanical Storage Systems
- Thermal Storage Systems
- Chemical (Hydrogen) Storage Systems
- Basic Components of Storage Systems
- Key Performance Indicators (KPIs) for Storage Systems

#### **W11 hydrogen fuel cell**

- Introduction to Hydrogen as an Energy Carrier
- The Concept and Principle of Operation of a Hydrogen Fuel Cell
- Electrochemical Reactions within a Fuel Cell
- Types of Fuel Cells (PEMFC, SOFC, AFC, MCFC)
- Basic Components of a Fuel Cell System
- Performance and Efficiency Characteristics of Fuel Cells
- Methods of Hydrogen Production
- Methods of Hydrogen Storage and Transportation
- Integrating Fuel Cells with Renewable Energy Systems
- Applications of Hydrogen Fuel Cells (Transportation, Buildings, Standby Systems, Backup Generation)

#### **W12 Hybrid Renewable Energy Systems**

- The Concept of Hybrid Systems
- Combining Solar with Wind or Diesel
- Control Strategies
- Improving Reliability

#### **W13 Economic Aspects of Renewable Energy Projects**

- Investment Costs
- Operating and Maintenance Costs
- Backup Period
- Comparison of Renewable and Conventional Systems

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>W14 Environmental and Social Impacts and Supporting Policies</b></p> <ul style="list-style-type: none"> <li>• Emissions Reduction</li> <li>• Impact on Rural Development</li> <li>• The Role of Policies and Legislation</li> <li>• The Role of International Organizations such as the International Renewable Energy Agency and the International Energy Agency</li> </ul> <p><b>W15 Case study and practical application of a renewable energy project</b></p> <ul style="list-style-type: none"> <li>• Real site analysis</li> <li>• Resource estimation</li> <li>• Selection of the appropriate system</li> <li>• Presenting and discussing design results</li> </ul> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                           |   |
|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---|
| Strategies                                                                     | <p><b>1. Lectures</b></p> <ul style="list-style-type: none"> <li>• Structured lectures introduce fundamental concepts, theories, and analytical techniques</li> <li>• Emphasis is placed on conceptual understanding, mathematical formulation, and physical interpretation.</li> </ul> <p><b>2. Problem-Solving Sessions</b></p> <ul style="list-style-type: none"> <li>• Active student participation is encouraged through in-class discussions.</li> <li>• Forming groups of students to prepare specialized reports on the scientific subject and present them during discussion sessions with the students.</li> </ul> <p><b>3. Self-Directed Learning</b></p> <ul style="list-style-type: none"> <li>• Students are encouraged to engage in independent study through textbooks, research papers, and online resources.</li> <li>• Homework assignments and reading tasks support deeper understanding.</li> </ul> <p><b>4. Continuous Feedback</b></p> <ul style="list-style-type: none"> <li>• Regular formative feedback is provided through assignments, quizzes, and reports.</li> <li>• Feedback helps students identify strengths and areas for improvement.</li> </ul> |                                                                           |   |
|                                                                                | <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                           |   |
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 33                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 1 |

|                                       |    |
|---------------------------------------|----|
| <b>Total SWL (h/sem)</b>              | 50 |
| الحمل الدراسي الكلي للطالب خلال الفصل |    |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                     |             |                |           |                           |
|---------------------------------------------------|---------------------|-------------|----------------|-----------|---------------------------|
|                                                   |                     | Time/Number | Weight (Marks) | Week Due  | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>      | 1/3         | 15             | 5,8,11    | 1-4                       |
|                                                   | <b>Assignments</b>  | 1/3         | 12             | 2,4,7     | 1-3                       |
|                                                   | <b>CLASSWORK</b>    | 1/1         | 5              | 4         | 1-4                       |
|                                                   | <b>Report</b>       | 1/1         | 8              | CONTINUES | 1-4                       |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b> | 1.5/1       | 10             | 7         | 1-4                       |
|                                                   | <b>Final Exam</b>   | 3/1         | 50             | 16        | 1-4                       |
| <b>Total assessment</b>                           |                     |             | 100            |           |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                 |
|-------------------------------------------------------------------|-------------------------------------------------|
|                                                                   | <b>Material Covered</b>                         |
| <b>Week 1</b>                                                     | Understanding Electrical Energy and Its Sources |
| <b>Week 2</b>                                                     | Introduction to Renewable Energy Sciences       |
| <b>Week 3</b>                                                     | Solar and Photovoltaic Energy                   |
| <b>Week 4</b>                                                     | Solar thermal energy                            |
| <b>Week 5</b>                                                     | wind energy                                     |
| <b>Week 6</b>                                                     | Hydroelectric energy                            |
| <b>Week 7</b>                                                     | Exam                                            |

|                |                                                                           |
|----------------|---------------------------------------------------------------------------|
| <b>Week 8</b>  | <b>Geothermal energy</b>                                                  |
| <b>Week 9</b>  | <b>Tidal energy (ocean energy)</b>                                        |
| <b>Week 10</b> | <b>Biofuel energy</b>                                                     |
| <b>Week 11</b> | <b>Storage system</b>                                                     |
| <b>Week 12</b> | <b>hydrogen fuel cell</b>                                                 |
| <b>Week 13</b> | <b>Hybrid Renewable Energy Systems</b>                                    |
| <b>Week 14</b> | <b>Economic Aspects of Renewable Energy Projects</b>                      |
| <b>Week 15</b> | <b>Environmental and Social Impacts and Supporting Policies</b>           |
| <b>Week 16</b> | <b>Case study and practical application of a renewable energy project</b> |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | <b>Text</b>                                                                                                                                                     | <b>Available in the Library?</b> |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>Required Texts</b>    | <b>FUNDAMENTALS OF SMART</b>                                                                                                                                    |                                  |
|                          | <b>GRID SYSTEMS, By: MUHAMMAD KAMRAN</b>                                                                                                                        |                                  |
| <b>Recommended Texts</b> | <b>DESIGN OF SMART POWER GRID RENEWABLE ENERGY SYSTEMS, By: ALI KEYHANI</b>                                                                                     |                                  |
|                          | <b>HANDBOOK OF RENEWABLE ENERGY TECHNOLOGY, By : Ahmed F. Zobaa Brunel University, U.K.</b><br><b>Ramesh C. Bansal, The University of Queensland, Australia</b> |                                  |

### Grading Scheme

مخطط الدرجات

| <b>Group</b> | <b>Grade</b> | <b>التقدير</b> | <b>Marks (%)</b> | <b>Definition</b> |
|--------------|--------------|----------------|------------------|-------------------|
|--------------|--------------|----------------|------------------|-------------------|

|                                     |                         |                     |          |                                       |
|-------------------------------------|-------------------------|---------------------|----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A - Excellent</b>    | امتياز              | 90 - 100 | Outstanding Performance               |
|                                     | <b>B - Very Good</b>    | جيد جدا             | 80 - 89  | Above average with some errors        |
|                                     | <b>C - Good</b>         | جيد                 | 70 - 79  | Sound work with notable errors        |
|                                     | <b>D - Satisfactory</b> | متوسط               | 60 - 69  | Fair but with major shortcomings      |
|                                     | <b>E - Sufficient</b>   | مقبول               | 50 - 59  | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX – Fail</b>        | (راسب) قيد المعالجة | (45-49)  | More work required but credit awarded |
|                                     | <b>F – Fail</b>         | راسب                | (0-44)   | Considerable amount of work required  |
|                                     |                         |                     |          |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                                                 |                                                                                                                                                                                                                               |                             |
|------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Module Title</b>                                  | Electrical Engineering Lab. II<br>مختبرات الهندسة الكهربائية II |                                                                                                                                                                                                                               | <b>Module Delivery</b>      |
| <b>Module Type</b>                                   | Core                                                            | <input type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                             |
| <b>Module Code</b>                                   | EEPM213                                                         |                                                                                                                                                                                                                               |                             |
| <b>ECTS Credits</b>                                  | 3                                                               |                                                                                                                                                                                                                               |                             |
| <b>SWL (hr./sem)</b>                                 | 75                                                              |                                                                                                                                                                                                                               |                             |
| <b>Module Level</b>                                  | 2                                                               |                                                                                                                                                                                                                               | <b>Semester of Delivery</b> |
| <b>Administering Department</b>                      | 2 - (Electrical Engineering)                                    | <b>College</b>                                                                                                                                                                                                                | UoM2 - (Engineering)        |
| <b>Module Leader</b>                                 | Dr. Omar Sharaf Deen Yehya Al- Yozbaky                          | <b>e-mail</b>                                                                                                                                                                                                                 | o.yehya@uomosul.edu.iq      |
| <b>Module Leader's Acad. Title</b>                   | Assist. Prof.                                                   | <b>Module Leader's Qualification</b>                                                                                                                                                                                          | Doctor                      |
| <b>Module Tutor</b>                                  | Dr. Ahmed Salim Jarallah                                        | <b>e-mail</b>                                                                                                                                                                                                                 | Ahmed.salim@uomosul.edu.iq  |
| <b>Peer Reviewer Name</b>                            | اسم مُراجع الملف                                                | <b>e-mail</b>                                                                                                                                                                                                                 | بريده الالكتروني            |
| <b>Scientific Committee Approval Date</b>            | 28/01/2026                                                      | <b>Version Number</b>                                                                                                                                                                                                         | 1.0                         |

| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |      |                 |  |
|-------------------------------------------------------------------------|------|-----------------|--|
| <b>Prerequisite module</b>                                              | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>                                             | None | <b>Semester</b> |  |

|                                                               |
|---------------------------------------------------------------|
| <b>Module Aims, Learning Outcomes and Indicative Contents</b> |
|---------------------------------------------------------------|

## أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | This course deals with general and different topics in the fields of electronic and power within the framework of the student's curriculum and includes practical experiences in studying the characteristics of the diode and its applications and the types of connection of the transistor and its advantages. This course also covers the study of transient conditions in electrical circuits and transformer tests and DC machines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <p>This course designed to develop the students' abilities about using the different measurement equipment's that necessary to execute the practical experiments. Also this course covered the need of students to investigate the theoretical subjects according to practical method that's will improve the scientific level of students through this course By the end of this course, student should be able to:</p> <ul style="list-style-type: none"> <li>• Dealing with laboratory equipment and electrical elements in a professional and scientific manner(i).</li> <li>• Ability to analyze electrical circuits and understand the nature of their work(ii).</li> <li>• Building a scientific mentality for the student through his ability to interpret the practical results according to theoretical concepts(iii).</li> <li>• Develop the student's ability to design simple electronic circuits in line with his scientific abilities(iv).</li> <li>• Analyze and simulate the process circuit using different software on the electronic calculator and match the results of the analysis with the practical results(v).</li> </ul> |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | Indicative content includes the following.<br>Part A - Circuit Components and values<br>DC circuits, Current and voltage definitions, Passive sign convention and circuit elements,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                  | Resistive networks, real and ideal elements, voltage and current sources. [9 hrs.]<br>Lab. [6 hrs.]<br>Revision problem and tutorial classes [6 hrs.]<br>Quizzes [1 hr.]<br>Part B- Circuit reduction<br><br>combining sources, Combining resistive elements in series and parallel, delta and star transformation. [12 hrs.]<br>Revision problem and tutorial classes [8 hrs.]<br>Lab. [8 hrs.]<br>Quizzes [1 hr.]<br><br>Part C- Circuit Theory<br><br>Kirchhoff's laws and Ohm's law. Introduction to mesh and nodal analysis, Introduction to thevenin and Norton theory, maximum power transfer, introduction to superposition theory. [24 hrs.]<br>Revision problem and tutorial classes [16 hrs.]                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## Learning and Teaching Strategies

| استراتيجيات التعلم والتعليم                 |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |   |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---|
| Strategies                                  | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |                                          |   |
|                                             |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |   |
| Student Workload (SWL)                      |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |   |
| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا     |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |   |
| Structured SWL (h/sem)                      | 33                                                                                                                                                                                                                                                                                                                                                                                           | Structured SWL (h/w)                     | 2 |
| الحمل الدراسي المنتظم للطالب خلال الفصل     |                                                                                                                                                                                                                                                                                                                                                                                              | الحمل الدراسي المنتظم للطالب أسبوعيا     |   |
| Unstructured SWL (h/sem)                    | 42                                                                                                                                                                                                                                                                                                                                                                                           | Unstructured SWL (h/w)                   | 3 |
| الحمل الدراسي غير المنتظم للطالب خلال الفصل |                                                                                                                                                                                                                                                                                                                                                                                              | الحمل الدراسي غير المنتظم للطالب أسبوعيا |   |
| Total SWL (h/sem)                           | 75                                                                                                                                                                                                                                                                                                                                                                                           |                                          |   |
| الحمل الدراسي الكلي للطالب خلال الفصل       |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |   |

| Module Evaluation           |                        |             |                  |            |                           |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية       |                        |             |                  |            |                           |
|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b> | <b>Quizzes</b>         | 1           | 5% (5)           | 4,8,12     | LO #1, 5, 8 and 9         |
|                             | <b>Assignments</b>     | 0           | 0%(0)            | 2 to 12    | LO #1, 2, 4, 6 7, 8 and 9 |
|                             | <b>Projects / Lab.</b> | 2           | 25% (25)         | Continuous | All                       |
|                             | <b>Report</b>          | 10          | 10% (10)         | ---        | ---                       |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2Hr         | 10% (10)         | 7          | LO # 1-5                  |
|                             | <b>Final Exam</b>      | 3Hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

## Delivery Plan (Weekly Lab. Syllabus)

المناهج الاسبوعي للمختبر

|         | Material Covered                                          |
|---------|-----------------------------------------------------------|
| Week 1  | Lab 1: Introduction to lab. components                    |
| Week 2  | Lab 2: Study of common base transistor characteristic     |
| Week 3  | Lab 3: Common emitter transistor as an amplifier          |
| Week 4  | Lab 4: Common Collector transistor as an amplifier        |
| Week 5  | Lab 5: Low bass filter                                    |
| Week 6  | Lab 6: band bass filter                                   |
| Week 7  | Lab 7: high bass filter                                   |
| Week 8  | Lab 8: Transistor as a switch & device drive              |
| Week 9  | Lab 9: Mid-term exam                                      |
| Week 10 | Lab 10: Digital logics                                    |
| Week 11 | Lab 11: Digital Circuits                                  |
| Week 12 | Lab 12: Study of JFET Transistor characteristics          |
| Week 13 | Lab 13: Negative feedback connection                      |
| Week 14 | Lab 14: Speed control for DC motor                        |
| Week 15 | Lab 15: preparatory week before the Final exam and review |
| Week 16 | Lab 16 : Final exam                                       |

## Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                                             | Available in the Library? |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | <ul style="list-style-type: none"> <li>Electrical technology (twenty-third edition) BL.THERAJA, AK. THERAJA S. Chand and company Ltd. (2005), ISBN: 81-219- 2440-5.</li> <li>Electronics devices (Ninth edition) by Thomas L. Floyd (2012), Prentice Hall ISBN-13: 978-0-13-254986-8.</li> </ul> | Yes                       |
| <b>Recommended Texts</b> |                                                                                                                                                                                                                                                                                                  | Yes                       |
| <b>Websites</b>          |                                                                                                                                                                                                                                                                                                  |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group</b><br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                   | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound works with notable errors       |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                        | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

## نموذج وصف المادة الدراسية

| Module Information                        |                                                  |                                                                                                                                                                                                                                                            |                           |
|-------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| معلومات المادة الدراسية                   |                                                  |                                                                                                                                                                                                                                                            |                           |
| <b>Module Title</b>                       | Mathematical Analysis<br>التحليلات الرياضية      | <b>Module Delivery</b>                                                                                                                                                                                                                                     |                           |
| <b>Module Type</b>                        | B                                                | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> <input type="checkbox"/> Lecture<br><b>Lab</b><br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                           |
| <b>Module Code</b>                        | EETM301                                          |                                                                                                                                                                                                                                                            |                           |
| <b>ECTS Credits</b>                       | 4                                                |                                                                                                                                                                                                                                                            |                           |
| <b>SWL (hr./sem)</b>                      | 100                                              |                                                                                                                                                                                                                                                            |                           |
| <b>Module Level</b>                       | 3                                                | <b>Semester of Delivery</b>                                                                                                                                                                                                                                | 5                         |
| <b>Administering Department</b>           | 2 - (Electrical Engineering)                     | <b>College</b>                                                                                                                                                                                                                                             | UoM2 - (Engineering)      |
| <b>Module Leader</b>                      | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbak   | <b>e-mail</b>                                                                                                                                                                                                                                              | o.yehya@uomosul.edu.iq    |
| <b>Module Leader's Acad. Title</b>        | استاذ مساعد                                      | <b>Module Leader's Qualification</b>                                                                                                                                                                                                                       | الشهادة                   |
| <b>Module Tutor</b>                       | Dr. Riyadh Zaki Sabry                            | <b>e-mail</b>                                                                                                                                                                                                                                              | riyadhzaki@uomosul.edu.iq |
| <b>Peer Reviewer Name</b>                 | د. محمد ناطق عبدالقادر<br>Mohamad N. Abdul Kadir | <b>e-mail</b>                                                                                                                                                                                                                                              | makadr@uomosul.edu.iq     |
| <b>Scientific Committee Approval Date</b> | 01/06/2026                                       | <b>Version Number</b>                                                                                                                                                                                                                                      | 1.0                       |

| العلاقة مع المواد الدراسية الأخرى |      |                 |  |
|-----------------------------------|------|-----------------|--|
| Relation with other Modules       |      |                 |  |
| <b>Prerequisite module</b>        | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>       | None | <b>Semester</b> |  |

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <p>On successful completion of this subject, students must be able:</p> <ul style="list-style-type: none"> <li>• To understand the concepts of z transform and to solve the difference equations.</li> <li>• Teaching student, the basic principles of function of complex variables.</li> </ul>                                                          |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <p>Discrete time system analysis Z-transforms Inverse Z-transform<br/> Difference equations<br/> Series solution of differential equation. Power series Frobenious method Bessel differential equation Solutions of Bessel's Equation<br/> Applications of Bessel's Equation, functions of complex variables, ;<br/> Analytic functions integrations.</p> |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                |                                                                                                                                                                                                                                                                                                                                                           |

## Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                 |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills.</p> |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Student Workload (SWL)

الحمل الدراشي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراشي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراشي المنتظم للطالب أسبوعيا       | 4    |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراشي غير المنتظم للطالب خلال الفصل | 37  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراشي غير المنتظم للطالب أسبوعيا | 2.47 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراشي الكلي للطالب خلال الفصل              | 100 |                                                                           |      |

### Module Evaluation

تقييم المادة الدراسية

|                             |                           | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
|-----------------------------|---------------------------|-------------|------------------|----------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>            | 3           | 15% (5)          | 4,8,12   | LO #1, 5, 8 and 9         |
|                             | <b>Assignments</b>        | 3           | 12% (5)          | 2 to 12  | LO #1, 2, 4, 6 7, 8 and 9 |
|                             | <b>Projects / Lab.</b>    | 0           | 0% (25)          |          |                           |
|                             | <b>On-site assignment</b> | 1           | 5%(5)            | 12       | All                       |
|                             | <b>Report</b>             | 1           | 8% (8)           | 14-      | All                       |
| <b>Summative assessment</b> | <b>Midterm Exam</b>       | 1           | 10% (10)         | 7        | LO # 1-5                  |
|                             | <b>Final Exam</b>         | 3hr         | 50% (50)         | 16       | All                       |
| <b>Total assessment</b>     |                           |             | 100% (100 Marks) |          |                           |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|                | Material Covered                                                  |
|----------------|-------------------------------------------------------------------|
| <b>Week 1</b>  | Discrete time system analysis , Z transform; sampling             |
| <b>Week 2</b>  | Region of convergence                                             |
| <b>Week 3</b>  | properties of z transform                                         |
| <b>Week 4</b>  | properties of z transform                                         |
| <b>Week 5</b>  | Inverse Z transform                                               |
| <b>Week 6</b>  | Convolution                                                       |
| <b>Week 7</b>  | Difference equations                                              |
| <b>Week 8</b>  | Mid-term Exam                                                     |
| <b>Week 9</b>  | Inverse Z transform                                               |
| <b>Week 10</b> | Series solution of differential equation                          |
| <b>Week 11</b> | Power series Frobenious method                                    |
| <b>Week 12</b> | Bessel differential equation                                      |
| <b>Week 13</b> | Solutions of Bessel's Equation Applications of Bessel's Equation  |
| <b>Week 14</b> | Functions of complex variables.                                   |
| <b>Week 15</b> | functions of complex variables, ; Analytic functions integrations |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                     |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                  | Available in the Library? |
|--------------------------|-------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, Inc; 10 <sup>th</sup> Ed.; 2011. | Yes                       |
| <b>Recommended Texts</b> | Advanced Engineering Mathematics Cengage Learning, Seventh Edition., 2007.                            | Yes                       |
| <b>Websites</b>          |                                                                                                       |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                              |                         |                     |           |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                       | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group</b><br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                             |                         |                     |           |                                       |
| <p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p> |                         |                     |           |                                       |

### نموذج وصف المادة الدراسية

| Module Information                 |                                                  |                               |                                                                                                                                                                                                                                          |   |
|------------------------------------|--------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| معلومات المادة الدراسية            |                                                  |                               |                                                                                                                                                                                                                                          |   |
| Module Title                       | Transmission Systems<br>نظم النقل                |                               | Module Delivery                                                                                                                                                                                                                          |   |
| Module Type                        | Core                                             |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |   |
| Module Code                        | EEPM302                                          |                               |                                                                                                                                                                                                                                          |   |
| ECTS Credits                       | 6                                                |                               |                                                                                                                                                                                                                                          |   |
| SWL (hr./sem)                      | 150                                              |                               |                                                                                                                                                                                                                                          |   |
| Module Level                       | UG III                                           | Semester of Delivery          |                                                                                                                                                                                                                                          | 5 |
| Administering Department           | 2 - (Electrical Engineering)                     | College                       | UoM2 - (Engineering)                                                                                                                                                                                                                     |   |
| Module Leader                      | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbak   | e-mail                        | o.yehya@uomosul.edu.iq                                                                                                                                                                                                                   |   |
| Module Leader's Acad. Title        | Assistant Professor                              | Module Leader's Qualification | الشهادة                                                                                                                                                                                                                                  |   |
| Module Tutor                       | Dr. Saad Enad Mohammed                           | e-mail                        | saadmohamed@uomosul.edu.iq                                                                                                                                                                                                               |   |
| Peer Reviewer Name                 | د. محمد ناطق عبدالقادر<br>Mohamad N. Abdul Kadir | e-mail                        | makadr@uomosul.edu.iq                                                                                                                                                                                                                    |   |
| Scientific Committee Approval Date | 01/06/2023                                       | Version Number                | 1.0                                                                                                                                                                                                                                      |   |

## Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية | <ol style="list-style-type: none"> <li>1. Introduction to power transmission systems: The module aims to provide an overview of power transmission systems, including their importance in electrical power distribution networks. Students learn about the role of power transmission in delivering electricity from power plants to distribution substations.</li> <li>2. Study of transmission system components: The module aims to familiarize students with the various components of a power transmission system. This may include topics such as transformers, circuit breakers, transmission lines, insulators, and protective devices. Students learn about the functions, characteristics, and operational considerations of these components.</li> <li>3. Understanding transmission line parameters: The module aims to provide an understanding of transmission line parameters such as resistance, inductance, capacitance, and conductance. Students learn how these parameters affect the performance and efficiency of power transmission systems.</li> <li>4. Safety and environmental considerations: The module aims to emphasize safety practices and environmental considerations associated with power transmission systems. Students learn about safety protocols, grounding techniques, electromagnetic fields, and environmental impacts of transmission line construction and operation.</li> </ol> |
|                                             | <ol style="list-style-type: none"> <li>5. Practical application and problem-solving: The module aims to develop practical skills in students for designing, analyzing, and troubleshooting power transmission systems. This may involve laboratory experiments, simulation exercises, case studies, and projects to reinforce theoretical concepts.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Module Learning Outcomes</b>             | <p style="text-align: center;">Upon completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate knowledge and understanding of the principles, theories, and concepts related to power transmission systems.</li> <li>2. Explain the role and importance of power transmission systems in electrical power distribution networks.</li> <li>3. Identify and describe the components of power transmission systems, such as transformers, circuit breakers, transmission lines, and protective devices.</li> <li>4. Understand the parameters and characteristics of transmission lines, including resistance, inductance, capacitance, and conductance.</li> <li>5. Apply problem-solving skills to troubleshoot and resolve issues related to power transmission system operation and performance.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| مخرجات التعلم للمادة الدراسية                                              | <ol style="list-style-type: none"> <li>6. Apply knowledge of power system reliability and maintenance techniques to ensure the proper functioning of transmission systems.</li> <li>7. Utilize appropriate tools and techniques to analyze and improve the efficiency and reliability of power transmission systems.</li> </ol>                                                                                                                                                                                                                                                                                  |
| <b>Indicative Contents</b><br><br>المحتويات الإرشادية                      | <p>Indicative content includes the following.</p> <p><b>Introduction of Transmission Systems:</b> Choice of Transmission Voltage, Overhead Transmission Lines (OHTL), Electrical Calculations of OHTL, Mechanical calculations of OHTL, Insulators of OHTL, Corona. [24 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]<br/>Quizzes [2 hr.]</p> <p><b>Representation of Overhead Transmission Lines:</b> Short and Medium Transmission Lines, Long Transmission Lines, Incident and reflected voltage, General Circuit Constant. [24 hrs.]</p> <p>Revision problem and tutorial classes [6 hrs.]</p> |
|                                                                            | <p>Quizzes [2 hr.]</p> <p><b>Electrical Power Cables (EPC):</b> Capacitance of EPC, Current Rating of Cables. [12 hrs.]</p> <p>Revision problem and tutorial classes [3 hrs.]<br/>Quizzes [1 hr.]</p>                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Learning and Teaching Strategies</b><br><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Strategies</b>                                                          | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p>                                                                                                                                                                                                              |

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

|                                                                                |     |                                                                           |     |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|-----|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 78  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 5   |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 72  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4.8 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                           |     |

| Module Evaluation     |                    |             |                  |          |                           |
|-----------------------|--------------------|-------------|------------------|----------|---------------------------|
| تقييم المادة الدراسية |                    |             |                  |          |                           |
|                       |                    | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes            | 3           | 15% (15)         | 2, 8, 12 | LO# 3, 4, 5 and 8         |
|                       | Assignments        | 3           | 12% (12)         | 2 to 15  | LO # 2, 4, 5, 7, and 8    |
|                       | Projects / Lab.    | 0           | 0 (0)            | -----    | ----                      |
|                       | Report             | 1           | 8% (8)           | 11       | 3,5                       |
|                       | On-site assignment | 1           | 5%(5)            | 12       | 4                         |
| Summative assessment  | Midterm Exam       | 1           | 10% (10)         | 9        | 1-6                       |
|                       | Final Exam         | 3hr         | 50% (50)         | 16       | ALL                       |
| Total assessment      |                    |             | 100% (100 Marks) |          |                           |

| Delivery Plan (Weekly Syllabus) |                                     |
|---------------------------------|-------------------------------------|
| المنهاج الاسبوعي النظري         |                                     |
|                                 | Material Covered                    |
| Week 1                          | Introduction Transmission Systems   |
| Week 2                          | Choice of Transmission Voltage.     |
| Week 3                          | Overhead Transmission Lines (OHTL). |
| Week 4                          | Electrical Calculations of OHTL.    |
| Week 5                          | Mechanical calculations of OHTL.    |
| Week 6                          | Insulators of OHTL.                 |
| Week 7                          | Corona                              |
| Week 8                          | Representation of OHTL.             |

|                |                                               |
|----------------|-----------------------------------------------|
| <b>Week 9</b>  | Short and Medium Transmission Lines (TL).     |
| <b>Week 10</b> | Long TL.                                      |
| <b>Week 11</b> | Incident and reflected voltage.               |
| <b>Week 12</b> | General Circuit Constant.                     |
| <b>Week 13</b> | Electrical Power Cables (EPC).                |
| <b>Week 14</b> | Capacitance of EPC.                           |
| <b>Week 15</b> | Current rating of Cables.                     |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b> |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                            | Available in the Library? |
|--------------------------|-------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | 1. A course in Electrical Power by J. B. Gupta. | Yes                       |
| <b>Recommended Texts</b> | 2. Principles of Power Systems by V. K. Mehta.  | No                        |
| <b>Websites</b>          |                                                 |                           |

### Grading Scheme

مخطط الدرجات

| Group | Grade | التقدير | Marks (%) | Definition |
|-------|-------|---------|-----------|------------|
|-------|-------|---------|-----------|------------|

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above

|                                     |                         |                     |          |                                       |
|-------------------------------------|-------------------------|---------------------|----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A - Excellent</b>    | امتياز              | 90 - 100 | Outstanding Performance               |
|                                     | <b>B - Very Good</b>    | جيد جدا             | 80 - 89  | Above average with some errors        |
|                                     | <b>C - Good</b>         | جيد                 | 70 - 79  | Sound work with notable errors        |
|                                     | <b>D - Satisfactory</b> | متوسط               | 60 - 69  | Fair but with major shortcomings      |
|                                     | <b>E - Sufficient</b>   | مقبول               | 50 - 59  | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX – Fail</b>        | (راسب) قيد المعالجة | (45-49)  | More work required but credit awarded |
|                                     | <b>F – Fail</b>         | راسب                | (0-44)   | Considerable amount of work required  |
|                                     |                         |                     |          |                                       |

### نموذج وصف المادة الدراسية

| Module Information                 |                                               |                               |                                                                                                                                                                                                                                          |                             |
|------------------------------------|-----------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| معلومات المادة الدراسية            |                                               |                               |                                                                                                                                                                                                                                          |                             |
| Module Title                       | AC Machines<br>مكائن التيار المتناوب          |                               | Module Delivery                                                                                                                                                                                                                          |                             |
| Module Type                        | Core                                          |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                             |
| Module Code                        | EEPM303                                       |                               |                                                                                                                                                                                                                                          |                             |
| ECTS Credits                       | 6                                             |                               |                                                                                                                                                                                                                                          |                             |
| SWL (hr./sem)                      | 150                                           |                               |                                                                                                                                                                                                                                          |                             |
| Module Level                       | 3                                             | Semester of Delivery          |                                                                                                                                                                                                                                          | 1                           |
| Administering Department           | 2 - (Electrical Engineering)                  | College                       | UoM2 - (Engineering)                                                                                                                                                                                                                     |                             |
| Module Leader                      | Dr. Omar Sh. Alyozbaky<br>د. عمر ف الدين [Z]  |                               | e-mail                                                                                                                                                                                                                                   | o.yehya@uomosul.edu.iq      |
| Module Leader's Acad. Title        | Assistant Professor                           | Module Leader's Qualification | الشهادة                                                                                                                                                                                                                                  |                             |
| Module Tutor                       | Dr. Yasir M.Y. Ameen                          |                               | e-mail                                                                                                                                                                                                                                   | Yasir_752000@uomosul.edu.iq |
| Peer Reviewer Name                 | د. القادر محمد ناطق<br>Mohamad N. Abdul Kadir |                               | e-mail                                                                                                                                                                                                                                   | makadr@uomosul.edu.iq       |
| Scientific Committee Approval Date | 01/06/2023                                    | Version Number                | 1.0                                                                                                                                                                                                                                      |                             |

## Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                             |                                     |                 |   |
|-----------------------------|-------------------------------------|-----------------|---|
| <b>Prerequisite module</b>  | Basics of Electrical Engineering II | <b>Semester</b> | 2 |
| <b>Co-requisites module</b> | None                                | <b>Semester</b> |   |

## Module Aims, Learning Outcomes and Indicative Contents

أهداف الإرشاد ونتائج التعلم والمحتمل أهداف المادة الدراسية

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b><br/>أهداف المادة الدراسية</p> | <ol style="list-style-type: none"> <li>1. Understand the concept of rotating magnetic field and understand the principles of the rotating AC machines (induction machines and synchronous machines).</li> <li>2. Understand and know how to use the equivalent circuit of the induction machine and the synchronous machine.</li> <li>3. Understand power flows and the power flow diagram.</li> <li>4. Understand the torque-speed characteristic curve.</li> <li>5. Understand the philosophy and benefits of speed control methods, starting methods and braking methods.</li> <li>6. Understand the induction machine used as a generator.</li> <li>7. Understand the phasor diagrams for a synchronous machine. Understand the equations for power and torque in a synchronous machine, understand how terminal voltage varies with load in a synchronous generator operating alone.</li> <li>8. Understand the conditions required to parallel two or more synchronous generators, and understand the operation of synchronous generators in parallel with infinite bus.</li> <li>9. Understand the static stability limit of a synchronous generator. Understand synchronous machine ratings, and what condition limits each rating value.</li> <li>10. Understand the effect of governor set point changing, load changing and field current changing on the synchronous machine variables.</li> <li>11. Understand how and why power factor varies as synchronous motor field current varies -the "V" curve.</li> </ol> |
|                                                     | <p>Upon successful completion of this module, students will be able to:</p> <ol style="list-style-type: none"> <li>1- Explain the concept of a rotating magnetic field and its significance in AC machines.</li> <li>2- Demonstrate a comprehensive understanding of the principles underlying the operation of induction machines and synchronous machines.</li> <li>3- Apply equivalent circuit models to analyze and predict the behavior of induction machines and synchronous machines.</li> <li>4- Analyze power flows and power flow diagrams in AC machines, considering factors affecting power transfer and distribution.</li> <li>5- Interpret and analyze torque-speed characteristic curves, enabling the prediction</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة<br/>ةالدراسة</p> | <p>of machine performance under different operating conditions.</p> <ol style="list-style-type: none"> <li>6- Evaluate and understand the operation of induction machines as generators, including considerations for efficient generator mode operation.</li> <li>7- Construct and interpret phasor diagrams for synchronous machines, and use them to analyze and predict machine behavior.</li> <li>8- Formulate equations for power and torque in synchronous machines and demonstrate an understanding of how terminal voltage varies with load in a synchronous generator operating independently.</li> <li>9- Identify and comprehend the conditions required for parallel operation of synchronous generators, and evaluate the operation of synchronous generators in parallel with an infinite bus.</li> <li>10- Assess the static stability limit of synchronous generators and understand synchronous machine ratings, recognizing the factors that limit each rating value.</li> <li>11- Analyze the effect of changing governor set points, loads, and field currents on synchronous machine variables, and predict the impact of these changes on machine performance.</li> <li>12- Analyze the relationship between synchronous motor field current and power factor variations using the "V" curve, explaining how and why power factor varies in synchronous motors.</li> </ol> |
| <p><b>Indicative Contents</b></p> <p>ةات الإرشادpqالمحد</p>                     | <p>Indicative content includes the following.</p> <p><b><u>Part A: Overview [10hr]</u></b></p> <ol style="list-style-type: none"> <li>1- Introduction to AC Machines.</li> <li>- Overview of AC machines and their importance in electrical engineering .</li> <li>- Historical background and development of AC machines</li> <li>2- Rotating Magnetic Field</li> <li>-Concept of a rotating magnetic field</li> <li>-Generation and properties of a rotating magnetic field</li> </ol> <p><b><u>Part B: Induction Machines [25 hr]</u></b></p> <ul style="list-style-type: none"> <li>-Construction and working principles of induction machines</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                 | <ul style="list-style-type: none"> <li>-Induction machine equivalent circuit.</li> <li>-Power and torque equations in induction motor</li> <li>-Torque-speed characteristics of induction machines.</li> <li>-speed control methods of induction motor.</li> <li>-Finding equivalent circuit parameters.</li> <li>-Induction machine as a generator.</li> </ul> <p><b><u>Part C: Synchronous Machines [40 hrs]</u></b></p> <ul style="list-style-type: none"> <li>-Construction and working principles of synchronous machines</li> <li>-Synchronous machine equivalent circuit</li> <li>-Phasor diagrams for synchronous machines</li> <li>-Power and torque equations in synchronous machines and Power Flow Diagrams</li> <li>-Variation of terminal voltage with load in synchronous generators</li> <li>-Synchronous Generators operating alone.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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|  | <ul style="list-style-type: none"> <li>-Parallel Operation of Synchronous Generators and Conditions required for parallel operation of synchronous generators</li> <li>-Operation of synchronous generators in parallel with an infinite bus</li> <li>-Stability and Ratings of Synchronous Generators</li> <li>-Effect of governor set point changes and field current changes on synchronous generator variables</li> <li>-Impact of load changes and field current changes on synchronous motor performance.</li> </ul> <p>Synchronous machine "V" Curves.</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>Lectures: Conduct regular lectures to deliver theoretical concepts and foundational knowledge. Use multimedia presentations, diagrams, and examples to enhance understanding. Encourage student participation through discussions and questions.</p> <p>Practical Laboratory Sessions in cooperation with the Course of the Power and Machine Lab to provide students with practical experience in operating AC machines.</p> <p>Case Studies and Problem-Solving Exercises: Assign case studies and problem-solving exercises that simulate real-world scenarios related to AC machines. Encourage students to apply their theoretical knowledge to analyze and solve these problems, fostering critical thinking and problem-solving skills.</p> <p>Group Discussions and Peer Learning: Organize group discussions and collaborative learning activities where students can discuss and share their understanding of AC</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>machines. Encourage peer-to-peer teaching and learning, promoting active engagement and the exchange of ideas.</p> <p>Simulations and Virtual Labs: Utilize computer-based simulations and virtual labs to supplement practical learning. These tools can provide interactive experiences and allow students to experiment with different AC machine configurations and operating conditions.</p> <p>Guest Lectures and Industry Visits: Invite industry experts or guest lecturers to share their practical experiences and insights related to AC machines. Arrange visits to relevant industrial facilities to provide students with exposure to real-world applications and challenges.</p> <p>Online Resources and Learning Management Systems: Provide access to online resources, including lecture notes, reference materials, and interactive tutorials. Utilize a learning management system to facilitate communication, assignment submissions, and online discussions.</p> <p>Assessments: Design a variety of assessments, including quizzes, assignments, and examinations, to evaluate students' understanding of the course material. Incorporate practical assessments, such as simulation-based projects, to assess hands-on skills.</p> <p>Feedback and Progress Monitoring: Provide timely and constructive feedback to students on their assignments and assessments. Monitor students' progress throughout the course and offer additional support or clarification when needed.</p> <p>Industry-Engaged Projects: Assign project work that requires students to apply their knowledge of AC machines to real-world problems or industry-related challenges. This could involve designing a motor control system, optimizing power flows, or analyzing the performance of a synchronous generator.</p> <p>By employing a combination of these learning and teaching strategies, students can develop a solid theoretical understanding of AC machines while also gaining practical skills and the ability to apply their knowledge in real-world scenarios.</p> |
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| Student Workload (SWL)                                                       |     |                                                                       |     |
|------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------|-----|
| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا                                      |     |                                                                       |     |
| <b>Structured SWL (h/sem)</b><br>المنتظم للطالب خلال الفصل %٥٠ الحمل الدرا   | 78  | <b>Structured SWL (h/w)</b><br>المنتظم للطالب أسبوع %٥٠ الحمل الدرا   | 5   |
| <b>Unstructured SWL (h/sem)</b><br>المنتظم للطالب خلال الفصل %٥٠ الحمل الدرا | 72  | <b>Unstructured SWL (h/w)</b><br>المنتظم للطالب أسبوع %٥٠ الحمل الدرا | 4.8 |
| <b>Total SWL (h/sem)</b><br>ال % للطالب خلال الفصل %٥٠ الحمل الدرا           | 150 |                                                                       |     |

| Module Evaluation     |                    |             |                  |          |                           |
|-----------------------|--------------------|-------------|------------------|----------|---------------------------|
| تقييم المادة الدراسية |                    |             |                  |          |                           |
|                       |                    | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes            | 3           | 15% (5)          | 2,7,14   | LO #1, 2-6, 7-11          |
|                       | Assignments        | 3           | 12% (4)          | 2 to 14  | LO # 2-6, 7,8,10,11       |
|                       | Projects / Lab.    | 0           | 0% (0)           | ----     | ----                      |
|                       | On-site assignment | 1           | 5%(5)            | 12       | 4                         |
|                       | Report             | 1           | 8% (05)          | 14       | All                       |
| Summative assessment  | Midterm Exam       | 1.5 hr      | 10% (10)         | 7        | LO # 1-6                  |
|                       | Final Exam         | 3hr         | 50% (50)         | 16       | All                       |
| Total assessment      |                    |             | 100% (100 Marks) |          |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                                                                                                         |
|                                 | Material Covered                                                                                                                                                        |
| Week 1                          | Introducing to rotating electrical machines and their classifications, Introducing to Rotating MMF Theorem.                                                             |
| Week 2                          | Construction and characteristics of 3-phase induction motors, Equivalent circuit of three-phase induction machines.                                                     |
| Week 3                          | Power and torques in three-phase induction machines, Maximum torque and Torque-Speed characteristics.                                                                   |
| Week 4                          | NEMA Design classes of induction motor rotors, Tests to obtain equivalent circuit parameters.                                                                           |
| Week 5                          | Speed control, starting and braking methods of three-phase induction motors.                                                                                            |
| Week 6                          | Introduction to Induction generators, Induction generators operating.                                                                                                   |
| Week 7                          | Construction and characteristics of 3-phase synchronous machines, Derive the equivalent circuit of the synchronous machines, and understand power and torques equations |
| Week 8                          | Phasor diagram of synchronous machines for different conditions                                                                                                         |
| Week 9                          | Operating synchronous generator alone (P-F and Q-V characteristics), Conditions and advantages of parallel operation of S.G, operating with another generator.          |
| Week 10                         | Parallel operation of S.G with infinite busbar, Understand the effect of Changing governor set point and changing of the field current                                  |
| Week 11                         | Rating Limitations of Synchronous generator.                                                                                                                            |
| Week 12                         | Synchronous motors, equivalent circuit, PF control, effect of load changing and field current changing on the motor variables.                                          |

|                |                                                                                                                    |
|----------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Week 13</b> | Phasor diagrams of synchronous machine and V-curves for different cases, Starting methods of Synchronous motors    |
| <b>Week 14</b> | Open and short circuit tests and obtain equivalent circuit parameters, Voltage regulation of synchronous generator |
| <b>Week 15</b> | General review.                                                                                                    |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                  | Available in the Library? |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Stephan J. Chapman., Electric Machinery Fundamentals, (5th Edition), McGraw-Hill, New York, 2012.                                                                                                                                                                     | AS PDF                    |
| <b>Recommended Texts</b> | J. Hindmarsh, <i>Electrical Machines and their applications</i> , (4 <sup>th</sup> Edition), Pergamon Press, Oxford. New York. 1977.<br><br>V.K Mehta and Rohit Mehta, <i>principles of electrical machines</i> , 2 <sup>nd</sup> edition 2008, S.Chand & company LTD | AS PDF                    |
| <b>Websites</b>          |                                                                                                                                                                                                                                                                       |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير           | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|-------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | أزمنة             | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | ب جداءج           | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جـد               | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط             | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول             | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | (د المعالجة) راسب | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب              | (0-44)    | Considerable amount of work required  |
|                                     |                         |                   |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54). The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

|                                           |                                                  |                                                                                                                                                                                                                                                                                    |                              |
|-------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Module Title</b>                       | Electrical Measurements<br>القياسات الكهربائية   | <b>Module Delivery</b>                                                                                                                                                                                                                                                             |                              |
| <b>Module Type</b>                        | B                                                | <input checked="" type="checkbox"/> <b>Theory</b><br><input type="checkbox"/> <b>Lecture</b><br><input type="checkbox"/> <b>Lab</b><br><input checked="" type="checkbox"/> <b>Tutorial</b><br><input type="checkbox"/> <b>Practical</b><br><input type="checkbox"/> <b>Seminar</b> |                              |
| <b>Module Code</b>                        | EEPM304                                          |                                                                                                                                                                                                                                                                                    |                              |
| <b>ECTS Credits</b>                       | 4                                                |                                                                                                                                                                                                                                                                                    |                              |
| <b>SWL (hr./sem)</b>                      | 100                                              |                                                                                                                                                                                                                                                                                    |                              |
| <b>Module Level</b>                       | 3                                                |                                                                                                                                                                                                                                                                                    |                              |
| <b>Administering Department</b>           | 2 - (Electrical Engineering)                     | <b>College</b>                                                                                                                                                                                                                                                                     | UoM2 - (Engineering)         |
| <b>Module Leader</b>                      | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbak   | <b>e-mail</b>                                                                                                                                                                                                                                                                      | o.yehya@uomosul.edu.iq       |
| <b>Module Leader's Acad. Title</b>        | Assistant Professor                              | <b>Module Leader's Qualification</b>                                                                                                                                                                                                                                               | الشهادة                      |
| <b>Module Tutor</b>                       | Dr. Wael Hashem Hamdon                           | <b>e-mail</b>                                                                                                                                                                                                                                                                      | Waelhashem_67@uomosul.edu.iq |
| <b>Peer Reviewer Name</b>                 | د. محمد ناطق عبدالقادر<br>Mohamad N. Abdul Kadir | <b>e-mail</b>                                                                                                                                                                                                                                                                      | makadr@uomosul.edu.iq        |
| <b>Scientific Committee Approval Date</b> | 01/06/2023                                       | <b>Version Number</b>                                                                                                                                                                                                                                                              | 1.0                          |

**Relation with s**

العلاقة مع المواد الدراسية الأخرى

|                             |                                    |                 |     |
|-----------------------------|------------------------------------|-----------------|-----|
| <b>Prerequisite module</b>  | Basics of Electrical Engineering I | <b>Semester</b> | One |
| <b>Co-requisites module</b> | None                               | <b>Semester</b> |     |

### Module Aims, Learning Outcomes and Indicative Contents

#### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <ol style="list-style-type: none"> <li>1. To understand what is the electrical measurements.</li> <li>2. To learn what is instrumentation system.</li> <li>3. To know what are the sources of errors in electrical measurements and how to fix them.</li> <li>4. To familiarize the students to various types of measuring instruments and their performance characteristics.</li> <li>5. To design the multi-range ammeters, voltmeters and ohmmeters for both AC and DC circuits.</li> <li>6. To learn the bridges and their types and how to use them in electrical measurements.</li> <li>7. To know the oscilloscopes and their applications</li> <li>8. To explain what are the transducers and their types and their usage in measurements.</li> </ol> |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | Student is able to understand the basic principles of measuring instruments related to Electrical Engineering and choose a proper measuring instrument suitable for any given application taking into consideration the operating conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p><b><u>Part A – Electrical Measurement Principle</u></b></p> <p>Basics, instruments classifications, linearity, Errors. Units<br/>[12 hrs.]<br/>Revision problem and tutorial classes [3 hrs.]<br/>Quizz [1 hr.]</p> <p><b><u>Part B- Electromechanical instruments</u></b></p> <p>Principle work, Torques types, PMMC, multi-range voltmeters, ammeters, ohmmeters, rectifier type voltmeter.<br/>[10 hrs.]</p>                                                                                                                                                                                                                                                                                          |
|                                                                  | <p>Revision problem and tutorial classes [3 hrs.]<br/>Quizz [1 hr.]<br/>Mid-term exam [2 hr.]</p> <p><b><u>Part C- Oscilloscope and bridges</u></b></p> <p>Oscilloscopes and their applications, DC and AC bridges.<br/>[12 hrs.]<br/>Revision problem and tutorial classes [3 hrs.]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

|  |                                                                                                                                                                                      |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Quizz [1 hr.]<br><b>Part D- Transducers</b><br>Transducers, types applications.<br>[8 hrs.]<br>Revision problem and tutorial classes [3 hrs.]<br>Quizz [1 hr.]<br>Final exam [3 hrs] |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                        |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials. |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |      |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4    |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 37  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 2.47 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |      |

| Module Evaluation     |                    |             |                  |          |                           |
|-----------------------|--------------------|-------------|------------------|----------|---------------------------|
| تقييم المادة الدراسية |                    |             |                  |          |                           |
|                       |                    | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes            | 3           | 15% (15)         | 2, 8, 12 | LO# 3, 4, 5 and 8         |
|                       | Assignments        | 3           | 12% (12)         | 2 to 15  | LO # 2, 4, 5, 7, and 8    |
|                       | Projects / Lab.    | 0           | 0 (0)            | -----    | -----                     |
|                       | Report             | 1           | 8% (8)           | 11       | 3,5                       |
|                       | On-site assignment | 1           | 5%(5)            | 12       | 4                         |
| Summative assessment  | Midterm Exam       | 1           | 10% (10)         | 9        | 1-6                       |
|                       | Final Exam         | 3hr         | 50% (50)         | 16       | ALL                       |
| Total assessment      |                    |             | 100% (100 Marks) |          |                           |

| Delivery Plan (Weekly Syllabus) |
|---------------------------------|
| المنهاج الاسبوعي النظري         |

|         | Material Covered                                                                                                                                               |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1  | Basic Concept of electrical measurements, what are the Instrument, Resolution. Accuracy, Precision, etc. What are the instrumentation system with some example |
| Week 2  | Classification of measurements instruments, the linearity of measurements instruments.                                                                         |
| Week 3  | Units and system of units, SI units, fundamental and derived units                                                                                             |
| Week 4  | Errors in electrical measurements, How to reduce them.                                                                                                         |
| Week 5  | Electromechanical instrument, How it is work, the torque types, Examples                                                                                       |
| Week 6  | Permanent magnet moving coil PMMC, Multi-range Voltmeter and Ammeter design. Examples.                                                                         |
| Week 7  | Series and shunt ohmmeter design, voltmeter-ammeter method to resistance measurement. Examples.                                                                |
| Week 8  | Rectifier type voltmeter. Examples.                                                                                                                            |
| Week 9  | Mid-term exam                                                                                                                                                  |
| Week 10 | Oscilloscope                                                                                                                                                   |
| Week 11 | Oscilloscope applications                                                                                                                                      |
| Week 12 | Direct current bridges                                                                                                                                         |
| Week 13 | Alternative current bridges                                                                                                                                    |
| Week 14 | Transducers, their types, how to classify them.                                                                                                                |
| Week 15 | Resistance, inductive, capacitive change transducers                                                                                                           |
| Week 16 | Final Exam                                                                                                                                                     |

## Learning and Teaching Resources

| مصادر التعلم والتدريس    |                                                                                 |                           |
|--------------------------|---------------------------------------------------------------------------------|---------------------------|
|                          | Text                                                                            | Available in the Library? |
| <b>Required Texts</b>    | Electronic Instrumentation And Measurements Techniques by William David copper. | Yes                       |
| <b>Recommended Texts</b> | Electrical and Electronic Measurements by Dr. Ahmed A. Montaser                 | No                        |
| <b>Websites</b>          |                                                                                 |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                              |                         |                     |           |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                       | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group</b>                                                                                                                                                                                                                                                                                                                                                                        | <b>A - Excellent</b>    | امتياز              | 90 - 100  | Outstanding Performance               |
| <b>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>B - Very Good</b>    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>C - Good</b>         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>D - Satisfactory</b> | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>E - Sufficient</b>   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br><b>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                        | <b>FX – Fail</b>        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>F – Fail</b>         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                             |                         |                     |           |                                       |
| <p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p> |                         |                     |           |                                       |

| Module Information                 |                                            |                               |                                                                                                                                                                                                                                                     |
|------------------------------------|--------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                            |                               |                                                                                                                                                                                                                                                     |
| Module Title                       | Power Electronics I<br>I إلكترونيات القدرة |                               | Module Delivery                                                                                                                                                                                                                                     |
| Module Type                        | Core                                       |                               | <input type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input checked="" type="checkbox"/> Seminar |
| Module Code                        | EEPM305                                    |                               |                                                                                                                                                                                                                                                     |
| ECTS Credits                       | 6                                          |                               |                                                                                                                                                                                                                                                     |
| SWL (hr./sem)                      | 150                                        |                               |                                                                                                                                                                                                                                                     |
| Module Level                       | 3                                          | Semester of Delivery          |                                                                                                                                                                                                                                                     |
| Administering Department           | 2 - (Electrical Engineering)               | College                       | UoM2 - (Engineering)                                                                                                                                                                                                                                |
| Module Leader                      | د. عمر شرف الدين يحيى                      | e-mail                        | o.yehya@uomosul.edu.iq                                                                                                                                                                                                                              |
|                                    | Dr. Omar Sh. Alyozbaky                     |                               |                                                                                                                                                                                                                                                     |
| Module Leader's Acad. Title        | Assistant Professor                        | Module Leader's Qualification | الشهادة                                                                                                                                                                                                                                             |
| Module Tutor                       | 1-Dr. Mohamad N. Abdul Kadir               | e-mail                        | makadr@uomosul.edu.iq                                                                                                                                                                                                                               |
| Peer Reviewer Name                 | Dr Yasir Muhammed Yonus                    | e-mail                        |                                                                                                                                                                                                                                                     |
| Scientific Committee Approval Date | 01/06/2023                                 | Version Number                | 1.0                                                                                                                                                                                                                                                 |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p> | <ol style="list-style-type: none"> <li>12. Introduce the undergraduate students to the principle of switch-based conversion in power electronics.</li> <li>13. The analysis of power components and important factors when dealing with nonsinusoidal quantities.</li> <li>14. To introduce the features and characteristics the common semiconductor power switching devices.</li> <li>15. To introduce the single-phase and three-phase phase-controlled power converter circuits.</li> <li>16. To relate the steady state and transient analysis of phase-controlled power converter circuits to the converter performance and design.</li> <li>17. To introduce the basics of AC controllers.</li> </ol> |
| <p><b>Module Learning Outcomes</b></p>                 | <p>By the completion of the course, the students should be able to:</p> <ol style="list-style-type: none"> <li>1. Define the scope, tools types and applications of power converters.</li> <li>2. Calculate the assess the figures of merits used to describe the quality of non-</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p>مخرجات التعلم للمادة الدراسية</p>                   | <p>ideal waveforms in power electronics converters.</p> <ol style="list-style-type: none"> <li>3. Describe the behavioral characteristics and ratings of power switching semiconductor devices such as diodes, Thyristors, MOSFETs and IGBTs.</li> <li>4. Analyze single-phase and three-phase power diode circuits, evaluate input- output performance parameters with idealized load models.</li> <li>5. Analyze single-phase and three-phase power SCR controlled rectifier circuits with various load models.</li> <li>6. Describe and Analyze the single-phase and three-phase-AC controller circuits with R and RL loads.</li> </ol>                                                                   |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p><b><u>Part A – Introduction, definitions and tools</u></b></p> <p>Power Electronics: definitions, approach and applications. [2 hrs.]</p> <p>Figures of Merits: Ripple factor, Total harmonic distortion, Form factor, Power factor (non-sinusoidal waveform), conversion efficiency. [4 hrs.]</p> <p>Review of circuit analysis tools [6 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part B- Semiconductor Switching Devices</u></b></p> <p>Ideal and semiconductor switching devices. Power losses in switching devices. [2hrs]</p> <p>Characteristics of power diodes and diode ratings, special power diodes. [2 hrs]</p> <p>SCR construction and principle of operation, characteristics, ratings and operation in basic circuits. Traics [4hrs]</p> <p>Fully controlled switching devices: GTOs, MOSFETs, IGBTs and smart power modules [3 hrs]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part C- Phase-controlled AC-DC converters</u></b></p> <p>Single-phase bridge rectifier with R, RL, C filter. Analysis of controlled rectifier with R, RLE loads. [6 hrs]</p> <p>Analysis of 6-pulse controlled rectifier with ideal and practical loads [10 hrs].</p> <p>The effect of line inductance [4 hrs], Dual converter [2 hrs]</p> <p>Determination of Devices ratings. [2 hrs.]</p> |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|  |                                                                                                                                                                                                                                                                   |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Quizzes [1 hr.]</p> <p><b>Part D- Phase-controlled AC-AC controllers</b></p> <p>Analysis of AC –Controller: Single phase with R/RL-Load, analysis of three-phase AC controller with R-Load [6 hrs].</p> <p>Integral –Cycle control, cycloconverter [6 hrs]</p> |
|  |                                                                                                                                                                                                                                                                   |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering some activities through a simple project to guide the students to self-learning, report writing and scientific debate skills.</p> |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا       |     |                                                                           |     |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|-----|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4.2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 87  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5.8 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 150 |                                                                           |     |

| Module Evaluation     |                    |             |                  |          |                           |
|-----------------------|--------------------|-------------|------------------|----------|---------------------------|
| تقييم المادة الدراسية |                    |             |                  |          |                           |
|                       |                    | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes            | 3           | 15% (15)         | 4,8,12   | 2, 3, 4, 5                |
|                       | Assignments        | 3           | 12% (12)         | 5,9,13   | 2, 3, 4, 6                |
|                       | Projects / Lab.    | 0           | 0 (0)            | -----    | ----                      |
|                       | On-site assignment | 1           | 5%(5)            | 12       | 4                         |
|                       | Report             | 1           | 5% (5)           | 11       | 1-5                       |
| Summative assessment  | Midterm Exam       | 1           | 10% (10)         | 9        | 1-4                       |
|                       | Final Exam         | 3hr         | 50% (50)         | 16       | 1-6                       |
| Total assessment      |                    |             | 100% (100 Marks) |          |                           |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| المنهاج الاسبوعي النظري         |                                                                                                                                                       |
|                                 | Material Covered                                                                                                                                      |
| Week 1                          | Introduction: Definitions, Power and Energy, Types of Conversion, Power Electronics Approach. The role of switch in power converter, Energy recovery. |
| Week 2                          | Power Computations: Mean, RMS, Figures of Merits                                                                                                      |
| Week 3                          | Methods of Analysis of switching circuits: closed form solution, discrete analysis, Fourier-based analysis                                            |
| Week 4                          | Power Diodes: Steady-state characteristics, basic parameters and ratings, transient characteristics, Special Diodes.                                  |

|                |                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------|
| <b>Week 5</b>  | SCRs: Steady-state characteristics, basic parameters and ratings, controlling SCR by gate pulses. |
| <b>Week 6</b>  | Half-wave diode rectifiers: R-load, RL-Load, freewheeling diode and capacitor filter.             |
| <b>Week 7</b>  | Full-Wave diode rectifier R, RL load and freewheeling diode.                                      |
| <b>Week 8</b>  | Controlled Full-Wave rectifier R, RL load and freewheeling diode.                                 |
| <b>Week 9</b>  | Three-phase three-pulse rectifier                                                                 |
| <b>Week 10</b> | Six-pulse diode rectifier with R and highly inductive load                                        |
| <b>Week 11</b> | Analysis of six-pulse rectifier with RLE load                                                     |
| <b>Week 12</b> | The effect of line inductance                                                                     |
| <b>Week 13</b> | Diodes and SCR sizing / voltage and current selection                                             |
| <b>Week 14</b> | AC –Controller: Single phase with R/RL-Load                                                       |
| <b>Week 15</b> | AC –Controller: Three - phase with R-Load                                                         |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                                                                                                                                                    | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Power Electronics by Daniel W. Hart, ISBN 978-0-07-338067-4. McGraw Hill (2010)                                                                                                                                                                                                                                                                                                                         | No                        |
| <b>Recommended Texts</b> | <p>-Power electronics Devices, circuits, and Applications (Fourth Edition) by Muhammad H. Rashid, ISBN 978-0-13-312590-0 , Pearson 2014</p> <p>-Power Electronics Basics, by Yuriy Rozanov, Sergey Ryvkin, Evgeny Chaplygin and Pavel Voronin. ISBN 978-1-4822-9880-2, CRC Press 2016</p> <p>-Power Electronics, Drives, and Advanced Applications, Kumar, Behera, Joshi and Bansal .CRC Press 2020</p> | No                        |
| <b>Websites</b>          | <a href="https://classroom.google.com">https://classroom.google.com</a>                                                                                                                                                                                                                                                                                                                                 |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

|                                                                                    |                                                        |                                      |                                                                                                                                                                                                                               |                        |   |
|------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---|
| <b>Module Title</b>                                                                | Power and Machines Lab. I<br>مختبرات القدرة والمكائن I |                                      | <b>Module Delivery</b>                                                                                                                                                                                                        |                        |   |
| <b>Module Type</b>                                                                 | Support                                                |                                      | <input type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                        |   |
| <b>Module Code</b>                                                                 | EPPM306                                                |                                      |                                                                                                                                                                                                                               |                        |   |
| <b>ECTS Credits</b>                                                                | 4                                                      |                                      |                                                                                                                                                                                                                               |                        |   |
| <b>SWL (hr./sem)</b>                                                               | 100                                                    |                                      |                                                                                                                                                                                                                               |                        |   |
| <b>Module Level</b>                                                                | 3                                                      | <b>Semester of Delivery</b>          |                                                                                                                                                                                                                               |                        | 5 |
| <b>Administering Department</b>                                                    | 2 - (Electrical Engineering)                           | <b>College</b>                       | UoM2 - (Engineering)                                                                                                                                                                                                          |                        |   |
| <b>Module Leader</b>                                                               | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbak         |                                      | <b>e-mail</b>                                                                                                                                                                                                                 | o.yehya@uomosul.edu.iq |   |
| <b>Module Leader's Acad. Title</b>                                                 | Assistant Professor                                    | <b>Module Leader's Qualification</b> | الشهادة                                                                                                                                                                                                                       |                        |   |
| <b>Module Tutor</b>                                                                | م. عمر تراث+كادر المختبر                               |                                      | <b>e-mail</b>                                                                                                                                                                                                                 |                        |   |
| <b>Peer Reviewer Name</b>                                                          | ا.م.د. ياسر محمد يونس                                  | <b>e-mail</b>                        | Yasir_752000@uomosul.edu.iq                                                                                                                                                                                                   |                        |   |
| <b>Scientific Committee Approval Date</b>                                          | 01/06/2023                                             | <b>Version Number</b>                | 1.0                                                                                                                                                                                                                           |                        |   |
| <p><b>Relation with other Modules</b></p> <p>العلاقة مع المواد الدراسية الأخرى</p> |                                                        |                                      |                                                                                                                                                                                                                               |                        |   |
| <b>Prerequisite module</b>                                                         | None                                                   |                                      | <b>Semester</b>                                                                                                                                                                                                               |                        |   |
| <b>Co-requisites module</b>                                                        | None                                                   |                                      | <b>Semester</b>                                                                                                                                                                                                               |                        |   |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ol style="list-style-type: none"> <li>1- Measure and analyze transformer circuit model parameters and Identify and comprehend the different connection types of three-phase transformers.</li> <li>2- Gain a basic understanding of the operation characteristics of DC generators.</li> <li>3- Control the speed of DC motors and understand the underlying principles.</li> <li>4- Apply triggering and gate drive approaches to power semiconductor devices and gain an understanding of rectifier, chopper, and inverter circuits. Additionally, explore the fundamentals of electrical machine drive systems.</li> <li>5- Gain a basic understanding of Programmable Logic Controllers (PLCs) and their applications.</li> <li>6- Develop foundational knowledge of electronic circuits, including decoders, encoders, and the 555IC.</li> </ol> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>Upon successful completion of the Power and Machine Lab I course, students will be able to:</p> <ol style="list-style-type: none"> <li>1- Measure and analyze the circuit model parameters of transformers, gaining a comprehensive understanding of their characteristics and performance. Identify and differentiate between various connection types of three-phase transformers, understanding their applications and operational considerations.</li> <li>2- Apply control methods to regulate the speed of DC motors, considering the underlying principles and techniques involved.</li> <li>3- Measure, analyze and Identify the operation of dc and ac generator</li> </ol>                                                                                                                                                                |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                              | <p>4- Utilize triggering and gate drive approaches for power semiconductor devices, while comprehending the basic principles and practical applications of rectifier, chopper, and inverter circuits. Additionally, develop a fundamental understanding of electrical machine drive systems.</p> <p>5- Demonstrate a basic understanding of Programmable Logic Controllers (PLCs), including their functionality, programming concepts, and application in automation and control systems.</p> <p>6- Acquire foundational knowledge in electronic circuits, specifically decoders, encoders, and the 555IC, comprehending their principles, applications, and integration into electronic systems.</p>                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p><b><u>Part A – power and machine</u></b></p> <p>Open and short circuit test for single-phase Transformer. Speed and direction control of D.C. shunt motor using voltage control method Three-phase Power measurement. Speed Control of D.C shunt Motor using field control method. Speed Control of DC Shunt Motor Using Armature Voltage Control Method. No load test of D.C. shunt generator. shunt generator load test. Single phase transformer load test. [32 hrs.]</p> <p>Revision problem and tutorial classes [10hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part B- Power Electronics</u></b></p> <p>Thyristor Controllable Rectification Circuit. Three phase full wave Rectifier. The triac light dimmer control circuit. DC-DC Converters. [12 hrs.]</p> <p>Revision problem and tutorial classes [6hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b><u>Part c- Electronics</u></b></p> <p>The operation Amplifier. Decoder, Encoder circuit. Integrating and differentiating circuit. Digital counter [12 hrs.]</p> <p>Revision problem and tutorial classes [6hrs.]</p> |
|                                                              | <p>Quizzes [1 hr.]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. Through hands-on experiments, projects, and laboratory work, students will gain practical skills and knowledge in the areas of power applications, electrical machines, power electronics, and electronic circuits. This course aims to provide students with a comprehensive understanding of measurement techniques, control methods, and practical applications in the field of electrical engineering. |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 37  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 2 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 100 |                                                                           |   |

## تقييم المادة الدراسية

### Module Evaluation

|                             |                       | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-----------------------------|-----------------------|-------------|----------------|----------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>        | 1           | 5% (5)         | 8        | All                       |
|                             | <b>Report</b>         | 10          | 15% (15)       | 1 to 15  | All                       |
|                             | <b>Practical Exam</b> | 1           | 20%(20)        | 8,15     | All                       |

|                             |                         |     |                  |    |     |
|-----------------------------|-------------------------|-----|------------------|----|-----|
| <b>Summative assessment</b> | <b>Theoretical Exam</b> | 1   | 10% (10)         | 7  | All |
|                             | <b>Final Exam</b>       | 3hr | 50% (50)         | 16 | All |
| <b>Total assessment</b>     |                         |     | 100% (100 Marks) |    |     |

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

|                | Material Covered                                                                       |
|----------------|----------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Speed and direction control of D.C. shunt motor using voltage control method.          |
| <b>Week 2</b>  | No-load test of D.C. shunt generator.                                                  |
| <b>Week 3</b>  | Open and short circuit test for single-phase Transformer.                              |
| <b>Week 4</b>  | Three-phase Power measurement.                                                         |
| <b>Week 5</b>  | Thyristor Controllable Rectification Circuit & The triac light dimmer control circuit. |
| <b>Week 6</b>  | Three phase full wave Rectifier.                                                       |
| <b>Week 7</b>  | Decoder and Encoder and 555IC .                                                        |
| <b>Week 8</b>  | Speed Control of D.C shunt Motor using field control method.                           |
| <b>Week 9</b>  | DC shunt generator load test.                                                          |
| <b>Week 10</b> | Single phase transformer load test.                                                    |
| <b>Week 11</b> | Three Phase Transformer connection.                                                    |
| <b>Week 12</b> | DC-DC Converters (boost).                                                              |
| <b>Week 13</b> | Triggering of SCR using OP-AMP 741 and Buck DC-DC Converter.                           |
| <b>Week 14</b> | The Operational Amplifier and Digital counter.                                         |
| <b>Week 15</b> | Exam                                                                                   |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                                                                | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | ELECTRICAL MACHINES-I LABORATORY MANUAL, BY Lab . staff                                                                                                                                                                                                                                                             | YES                       |
| <b>Recommended Texts</b> | 1- P. C. Sen, "Principles of Electrical machines and power electronics", 2nd edition, John Wiley & Sons.<br>2- M H Rashid, "Power Electronics – circuits, devices and applications", 3rd edition, Pearson Education.<br>3- Robert L. Boylestad , Louis Nashelsky Electronic Devices and Circuit Theory 10th Edition | No                        |
| <b>Websites</b>          |                                                                                                                                                                                                                                                                                                                     |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

### نموذج وصف المادة الدراسية

| Module Information                 |                                                  |                               |                                                                                                                        |
|------------------------------------|--------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                                  |                               |                                                                                                                        |
| Module Title                       | Numerical Analysis<br>التحليلات العددية          |                               | Module Delivery                                                                                                        |
| Module Type                        | Basic                                            |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br>Lab                       |
| Module Code                        | EEPM307                                          |                               |                                                                                                                        |
| ECTS Credits                       | 4                                                |                               | <input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| SWL (hr./sem)                      | 100                                              |                               |                                                                                                                        |
| Module Level                       | 3                                                | Semester of Delivery          | 6                                                                                                                      |
| Administering Department           | 2 - (Electrical Engineering)                     | College                       | UoM2 - (Engineering)                                                                                                   |
| Module Leader                      | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbak   | e-mail                        | o.yehya@uomosul.edu.iq                                                                                                 |
| Module Leader's Acad. Title        | Assistant Professor                              | Module Leader's Qualification | الشهادة                                                                                                                |
| Module Tutor                       | Dr. Riyadh Zaki Sabry                            | e-mail                        | riyadhzaki @uomosul.edu.iq                                                                                             |
| Peer Reviewer Name                 | د. محمد ناطق عبدالقادر<br>Mohamad N. Abdul Kadir | e-mail                        | makadr@uomosul.edu.iq                                                                                                  |
| Scientific Committee Approval Date | 10/06/2023                                       | Version Number                | 1.0                                                                                                                    |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | 1. Solving the 2 <sup>nd</sup> order differential equation and Bessel differential equations by series solutions.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                  | 2. Students learn the principals of the wave equation for one and two dimensions.<br>3. To introduce the fundamentals of numerical methods used for the solution of engineering problems and to improve the computer skills of the students.                                                                                                                                                                                                                                                                                                                              |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | Partial Differential Equations. One dimensional wave equation Separation of variables, Vibrating string, two-dimensional wave equation, transmission line, Introduction to Complex Variables Complex number system and its operations, Limits and sequences Continuous functions and their properties, Derivatives complex integration and Cauchy integral theorems.<br><br>Concepts and role for the numerical method in engineering, Numerical Solution of Nonlinear Algebraic Equations, Open Methods, Numerical Solution of linear algebraic equations, Curve Fitting |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                          |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Student Workload (SWL)

### الحمل الدراشي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |     |                                                                           |   |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراشي المنتظم للطالب خلال الفصل       | 100 | <b>Structured SWL (h/w)</b><br>الحمل الدراشي المنتظم للطالب أسبوعيا       | 3 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراشي غير المنتظم للطالب خلال الفصل | 92  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراشي غير المنتظم للطالب أسبوعيا | 6 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراشي الكلي للطالب خلال الفصل              | 200 |                                                                           |   |

### Module Evaluation

#### تقييم المادة الدراسية

|                             |                           | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
|-----------------------------|---------------------------|-------------|------------------|----------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>            | 3           | 15% (5)          |          |                           |
|                             | <b>Assignments</b>        | 3           | 12% (5)          |          |                           |
|                             | <b>Projects / Lab.</b>    | 0           | 0% (25)          |          |                           |
|                             | <b>On-site assignment</b> | 1           | 5%(5)            |          |                           |
|                             | <b>Report</b>             | 1           | 8% (8)           |          |                           |
| <b>Summative assessment</b> | <b>Midterm Exam</b>       | 1           | 10% (10)         |          |                           |
|                             | <b>Final Exam</b>         | 3hr         | 50% (50)         |          |                           |
| <b>Total assessment</b>     |                           |             | 100% (100 Marks) |          |                           |

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

|                | Material Covered                                                                                                                                                                                                                           |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Partial Differential Equations. One dimensional wave equation Laplace equation Derivatives                                                                                                                                                 |
| <b>Week 2</b>  | Separation of variables                                                                                                                                                                                                                    |
| <b>Week 3</b>  | vibrating string, two-dimensional wave equation, transmission line                                                                                                                                                                         |
| <b>Week 4</b>  | Introduction to Complex Variables                                                                                                                                                                                                          |
| <b>Week 5</b>  | Complex number system and its operations                                                                                                                                                                                                   |
| <b>Week 6</b>  | Limits and sequences Continuous functions and their properties                                                                                                                                                                             |
| <b>Week 7</b>  | complex integration and Cauchy integral theorems                                                                                                                                                                                           |
| <b>Week 8</b>  | Mid-term Exam                                                                                                                                                                                                                              |
| <b>Week 9</b>  | Concepts and role for the numerical method in engineering, approximations, and errors, the definition of Round-off error and truncation error, absolute and relative true/approximation error.                                             |
| <b>Week 10</b> | Numerical Solution of Nonlinear Algebraic Equations (Roots of Equations): Bracketing Methods (Bisection, and False-Position method)                                                                                                        |
| <b>Week 11</b> | Open Methods (Newton-Raphson and secant method).                                                                                                                                                                                           |
| <b>Week 12</b> | Numerical Solution of linear algebraic equations (system): the difference between the direct and indirect methods, Singular and ill/well-conditioned system, Partial and complete Pivoting, Convergence Criteria, Jacobi iterative method. |
| <b>Week 13</b> | The gauss-Seidel iterative method, Gauss-Seidel iterative with the relaxation factor method. Tri-diagonal systems and its solution.                                                                                                        |
| <b>Week 14</b> | Curve Fitting: Classification of Curve Fitting (Regression and Interpolation), the concepts of regression, and Least Square Criterion, Linear Regression.                                                                                  |
| <b>Week 15</b> | Introduction another to another methods (finite difference, finite volume, finite element method)                                                                                                                                          |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                                                                                                              |

## Learning and Teaching Resources

| مصادر التعلم والتدريس    |                                                                                                                                                                                        |                           |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                          | Text                                                                                                                                                                                   | Available in the Library? |
| <b>Required Texts</b>    | Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, Inc; 10th Ed.; 2011.<br>Applied Numerical Methods with MATLAB for Engineers and Scientists ,Steven C. Chapra,2018 | Yes                       |
| <b>Recommended Texts</b> | <b>1-</b> Numerical Analysis Using Matlab and Excel, Steven T. Karris, Third Edition, 2007.                                                                                            | YES                       |
| <b>Websites</b>          |                                                                                                                                                                                        |                           |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above

|  |          |      |        |                                      |
|--|----------|------|--------|--------------------------------------|
|  | F – Fail | راسب | (0-44) | Considerable amount of work required |
|  |          |      |        |                                      |

### نموذج وصف المادة الدراسية

| Module Information          |                                                 |                      |                                                                                                                                                                                                                                          |                            |
|-----------------------------|-------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| معلومات المادة الدراسية     |                                                 |                      |                                                                                                                                                                                                                                          |                            |
| Module Title                | Generation Systems<br>نظم التوليد               |                      | Module Delivery                                                                                                                                                                                                                          |                            |
| Module Type                 | Core                                            |                      | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                            |
| Module Code                 | EPPM308                                         |                      |                                                                                                                                                                                                                                          |                            |
| ECTS Credits                | 5                                               |                      |                                                                                                                                                                                                                                          |                            |
| SWL (hr./sem)               | 125                                             |                      |                                                                                                                                                                                                                                          |                            |
| Module Level                | 3                                               | Semester of Delivery |                                                                                                                                                                                                                                          | 6                          |
| Administering Department    | 2 - (Electrical Engineering)                    |                      | College                                                                                                                                                                                                                                  | UoM2 - (Engineering)       |
| Module Leader               | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbaky |                      | e-mail                                                                                                                                                                                                                                   | o.yehya@uomosul.edu.iq     |
| Module Leader's Acad. Title | لقبه العلمي                                     |                      | Module Leader's Qualification                                                                                                                                                                                                            | الشهادة                    |
| Module Tutor                | Dr. Saad Enad Mohammed                          |                      | e-mail                                                                                                                                                                                                                                   | saadmohamed@uomosul.edu.iq |
| Peer Reviewer Name          | د. محمد ناطق عبدالقادر<br>Mohamad N. Abdul      |                      | e-mail                                                                                                                                                                                                                                   | makadr@uomosul.edu.iq      |

|                                                                         |            |                       |     |
|-------------------------------------------------------------------------|------------|-----------------------|-----|
|                                                                         | Kadir      |                       |     |
| <b>Scientific Committee Approval Date</b>                               | 01/06/2023 | <b>Version Number</b> | 1.0 |
| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |            |                       |     |
| <b>Prerequisite module</b>                                              | None       | <b>Semester</b>       |     |
| <b>Co-requisites module</b>                                             | None       | <b>Semester</b>       |     |

|                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Module Aims</b><br>أهداف المادة الدراسية                                                                               | <ol style="list-style-type: none"> <li>Power Generation Technologies: The module aims to introduce students to different power generation technologies, such as thermal power plants, hydroelectric power plants, nuclear power plants, renewable energy sources (solar, wind, biomass, etc.), and their characteristics. It covers the principles of operation, components, efficiency, and environmental impacts of these power generation technologies.</li> <li>Power Distribution Systems: The module aims to familiarize students with the distribution of electrical power from the transmission grid to end-users. It covers distribution network design, components, and operation, including substations, distribution transformers, switchgear, and protection systems. Students learn about the challenges associated with distribution system operation, such as voltage regulation, power quality, and reliability.</li> </ol> |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                          | <p>Upon completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>Knowledge of Power Generation Technologies: Students will acquire a comprehensive understanding of various power generation technologies, including thermal, hydroelectric, nuclear, and renewable energy sources. They will grasp the principles of operation, components, efficiency, and environmental impacts associated with each technology.</li> <li>Familiarity with Power Distribution Systems: Students will gain a solid understanding of power distribution systems, including network design, components, and operation. They will become knowledgeable about substations, distribution transformers,</li> </ol>                                                                                                                                                                                                      |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                              | <p>switchgear, and protection systems. They will understand the challenges associated with voltage regulation, power quality, and system reliability in distribution networks.</p> <p>3. Students will be able to apply engineering principles and concepts to solve practical problems related to power generation and distribution systems. They will develop problem-solving skills and apply their knowledge to design efficient and reliable power systems, address system vulnerabilities, and optimize system performance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p><b>Generation Systems:</b> Introduction and Definitions of Primary and secondary energy, commercial and noncommercial Energy, renewable and non-renewable energy, Definitions: Load factor, utilization factor, capacity factor, diversity factor, demand factor, availability. Energy Generation in Power Plants: Hydro power plants, Thermal Power Plants, Steam Power Plant, Gas Power Plant, Combined Cycle Gas Power Plant, Nuclear Power Plant, Diesel Power Plants. Renewable Energy Systems: Solar energy system, Solar Thermal Power Plants, Wind energy systems, Geothermal systems, Biomass systems, Fuel Cell. [24 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]</p> <p>Quizzes [2 hr.]</p> <p><b>Distribution Systems:</b> Introduction, Classification of Distribution System, Methods of Connection, Comparison among Distribution Systems, Type of D.C Distributions: D.C Distributor fed at One End-Concentrated Loading, D.C Distributor fed at Both End- Concentrated Loading, D.C Distributor fed at One End with Uniformly Distributed Load, D.C Distributor fed at Both Ends with Uniformly Distributor Load, D.C Ring Distributor, Ring Distributor with Inter-Connector, Stepped Distributor, Classification of A. C. Distribution Systems. Methods of Connection, Single Phase Distribution Systems, Three Phase Distribution Systems. Types of A. C. Distribution Systems. A. C. Radial Systems: A. C. Distributor fed at one end. A. C. Distributor fed at both ends. A. C. Ring Systems Protection of Distribution Systems, Distribution Transformers, Types of Sub-Stations, Sub-Stations Measurements Devices. [24 hrs.]</p> <p>Revision problem and tutorial classes [6 hrs.]</p> <p>Quizzes [3 hr.]</p> |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

#### Strategies

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

|                                             |     |                                          |      |
|---------------------------------------------|-----|------------------------------------------|------|
| <b>Structured SWL (h/sem)</b>               | 63  | <b>Structured SWL (h/w)</b>              | 4    |
| الحمل الدراسي المنتظم للطالب خلال الفصل     |     | الحمل الدراسي المنتظم للطالب أسبوعيا     |      |
| <b>Unstructured SWL (h/sem)</b>             | 62  | <b>Unstructured SWL (h/w)</b>            | 4.13 |
| الحمل الدراسي غير المنتظم للطالب خلال الفصل |     | الحمل الدراسي غير المنتظم للطالب أسبوعيا |      |
| <b>Total SWL (h/sem)</b>                    | 125 |                                          |      |
| الحمل الدراسي الكلي للطالب خلال الفصل       |     |                                          |      |

## Module Evaluation

### تقييم المادة الدراسية

|  |                    | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|--|--------------------|-------------|----------------|----------|---------------------------|
|  | <b>Quizzes</b>     | 3           | 15% (15)       | 3, 8, 12 | LO # 1, 2, and 3          |
|  | <b>Assignments</b> | 3           | 12% (12)       | 2 to 15  |                           |

|                             |                           |     |                  |       |                  |
|-----------------------------|---------------------------|-----|------------------|-------|------------------|
| <b>Formative assessment</b> | <b>Projects / Lab.</b>    | 0   | 0 (0)            | ----- | ----             |
|                             | <b>Report</b>             | 1   | 8% (8)           | 11    | All              |
|                             | <b>On-site assignment</b> | 1   | 5%(5)            | 12    | 4                |
| <b>Summative assessment</b> | <b>Midterm Exam</b>       | 1   | 10% (10)         | 9     | LO # 1, 2, and 3 |
|                             | <b>Final Exam</b>         | 3hr | 50% (50)         | 16    | ALL              |
| <b>Total assessment</b>     |                           |     | 100% (100 Marks) |       |                  |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|                | Material Covered                                                                                                                                                                           |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction and Definitions of Primary and secondary energy.                                                                                                                              |
| <b>Week 2</b>  | commercial and noncommercial Energy.                                                                                                                                                       |
| <b>Week 3</b>  | renewable and non-renewable energy.                                                                                                                                                        |
| <b>Week 4</b>  | Definitions: Load factor, utilization factor, capacity factor, diversity factor, demand factor, availability.                                                                              |
| <b>Week 5</b>  | Energy Generation in Power Plants: Hydro power plants, Thermal Power Plants, Steam Power Plant, Gas Power Plant, Combined Cycle Gas Power Plant, Nuclear Power Plant, Diesel Power Plants. |
| <b>Week 6</b>  | Renewable Energy Systems: Solar energy system, Solar Thermal Power Plants, Wind energy systems, Geothermal systems, Biomass systems. Fuel Cell.                                            |
| <b>Week 7</b>  | Introduction to Distribution Systems.                                                                                                                                                      |
| <b>Week 8</b>  | Classification of DC Distribution Systems.                                                                                                                                                 |
| <b>Week 9</b>  | Comparison among Distribution Systems.                                                                                                                                                     |
| <b>Week 10</b> | Classification of AC Distribution Systems.                                                                                                                                                 |
| <b>Week 11</b> | Single Phase Distribution Systems.                                                                                                                                                         |
| <b>Week 12</b> | three Phase Distribution Systems.                                                                                                                                                          |
| <b>Week 13</b> | Distribution Transformers.                                                                                                                                                                 |
| <b>Week 14</b> | Types of Sub-Stations.                                                                                                                                                                     |
| <b>Week 15</b> | Sub-Stations Measurements Devices.                                                                                                                                                         |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                                                              |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                       | Available in the Library? |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | 3. Power Distribution Planning Reference Book by H. Lee willis, 2014.<br>4. Electrical Distribution Systems by Dale R. Patrick and Stephen W. Fardo, 2009. | Yes                       |
| <b>Recommended Texts</b> | 5. Electrical Engineering Fundamentals by S. Bobby Rauf, 2020.                                                                                             | No                        |
| <b>Websites</b>          |                                                                                                                                                            |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so .the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above

نموذج وصف المادة الدراسية

| Module Information                 |                                                      |                               |                                                                                                                                                                                                                                          |   |
|------------------------------------|------------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| معلومات المادة الدراسية            |                                                      |                               |                                                                                                                                                                                                                                          |   |
| Module Title                       | Electrical Machines Drives<br>مسوقات المكين الكهربية |                               | Module Delivery                                                                                                                                                                                                                          |   |
| Module Type                        | Core                                                 |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |   |
| Module Code                        | EPEM309                                              |                               |                                                                                                                                                                                                                                          |   |
| ECTS Credits                       | 5                                                    |                               |                                                                                                                                                                                                                                          |   |
| SWL (hr./sem)                      | 125                                                  |                               |                                                                                                                                                                                                                                          |   |
| Module Level                       | 3                                                    | Semester of Delivery          |                                                                                                                                                                                                                                          | 6 |
| Administering Department           | 2 - (Electrical Engineering)                         | College                       | UoM2 - (Engineering)                                                                                                                                                                                                                     |   |
| Module Leader                      | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbak       | e-mail                        | o.yehya@uomosul.edu.iq                                                                                                                                                                                                                   |   |
| Module Leader's Acad. Title        | Assistant Professor                                  | Module Leader's Qualification | الشهادة                                                                                                                                                                                                                                  |   |
| Module Tutor                       | Dr. Yasir M.Y. Ameen                                 | e-mail                        | Yasir_752000@uomosul.edu.iq                                                                                                                                                                                                              |   |
| Peer Reviewer Name                 | د. القادر محمد ناطق ع<br>Mohamad N. Abdul Kadir      | e-mail                        | makadr@uomosul.edu.iq                                                                                                                                                                                                                    |   |
| Scientific Committee Approval Date | 01/06/2023                                           | Version Number                | 1.0                                                                                                                                                                                                                                      |   |
| Relation with other Modules        |                                                      |                               |                                                                                                                                                                                                                                          |   |
| العلاقة مع المواد الدراسية الأخرى  |                                                      |                               |                                                                                                                                                                                                                                          |   |
| Prerequisite module                | Basics of Electrical Engineering II                  |                               | Semester                                                                                                                                                                                                                                 | 2 |
| Co-requisites module               | None                                                 |                               | Semester                                                                                                                                                                                                                                 |   |

Module Aims, Learning Outcomes and Indicative Contents

|  |  |
|--|--|
|  |  |
|--|--|

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>13- To introduce students to the fundamental concepts, theories, and principles of electrical machine drives.</p> <p>14- To introduce students to the types of mechanical loads and understand steady state stability points in different operation quadrants.</p> <p>15- To develop students' understanding of the different types of electrical machines and their operating characteristics.</p> <p>16- To equip students with knowledge of power electronic converters used in electrical machine drives.</p> <p>17- To familiarize students with control strategies for efficient and reliable operation of electrical machine drives.</p> <p>18- To enable students to analyze and evaluate the performance of electrical machine drive systems.</p> <p>19- To encourage critical thinking and problem-solving skills through real-world case studies in the field of speed control, starting and braking of the electrical machines such as DC, induction and synchronous motors.</p> <p>20- To promote awareness of emerging trends and technologies in the field of electrical machine drives, such as the field of electrical vehicles.</p> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>Upon successful completion of this module, students will be able to: Demonstrate a clear understanding of the fundamental concepts, theories, and principles underlying electrical machine drives.</p> <p>1- Identify and classify different types of mechanical loads and comprehend the steady-state stability points associated with various operation quadrants.</p> <p>2- Differentiate between different types of electrical machines, including DC, induction, and synchronous motors, and evaluate their operating characteristics.</p> <p>3-</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                             | <p>4- Explain the functioning and operation of power electronic converters used in electrical machine drives.</p> <p>5- Apply control strategies to ensure efficient and reliable operation of electrical machine drives.</p> <p>6- Analyze and evaluate the performance of electrical machine drive systems.</p> <p>7- Utilize critical thinking and problem-solving skills through real-world case studies focused on speed control, starting, and braking of electrical machines, such as DC, induction, and synchronous motors.</p> <p>8- Demonstrate awareness of emerging trends and technologies in the field of electrical machine drives, particularly in areas like electric vehicles, and discuss their potential impact and applications.</p>                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                             | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• <b>Introduction to Electrical Machine Drives</b> <ul style="list-style-type: none"> <li>• Overview of electrical machine drives and their importance in various industries</li> <li>• Introduction to fundamental concepts, theories, and principles of electrical machine drives</li> <li>• Introduction to mechanical loads and steady-state stability points in</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|                                                      |   |                                                                                                                       |
|------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------|
| <b>Indicative Contents</b><br>إشارات الإرشاد المقامة |   | different operation quadrants                                                                                         |
|                                                      | • | Types of Electrical Machines                                                                                          |
|                                                      | • | Classification and characteristics of electrical machines, including DC, induction, and synchronous motors            |
|                                                      | • | Operating principles, construction, and key features of each type of electrical machine                               |
|                                                      | • | Analysis of the operating characteristics, performance parameters, and limitations of electrical machines             |
|                                                      | • | Power Electronic Converters                                                                                           |
|                                                      | • | Introduction to power electronic converters and their role in electrical machine drives                               |
|                                                      | • | Detailed study of converter topologies and their applications in different types of electrical machines               |
|                                                      | • | Understanding the functioning and control of power electronic converters in electrical machine drive systems          |
|                                                      | • | Control Strategies for Electrical Machine Drives                                                                      |
|                                                      | • | Overview of control strategies for efficient and reliable operation of electrical machine drives                      |
|                                                      | • | Study of speed control techniques, starting methods, and braking mechanisms for DC, induction, and synchronous motors |
|                                                      | • | Application of control strategies to optimize the performance of electrical machine drives                            |
|                                                      | • | Performance Analysis of Electrical Machine Drives                                                                     |
|                                                      | • | Analysis and evaluation of the performance parameters of electrical machine drive systems                             |
|                                                      | • | Examination of efficiency, power factor, and torque production, of electrical machine drives                          |
|                                                      | • | Techniques for assessing and improving the overall performance and reliability of electrical machine drive systems    |
|                                                      | • | Emerging Trends and Technologies                                                                                      |
|                                                      | • | Exploration of emerging trends and technologies in the field of electrical machine drives                             |
|                                                      | • | Investigation of advancements in electric vehicles and their impact on electrical machine drives                      |
|                                                      | • | Discussion of cutting-edge research, innovations, and future directions in electrical machine drives                  |

## Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p>Lectures: Conduct regular lectures to deliver theoretical concepts and foundational knowledge. Use multimedia presentations, diagrams, and examples to enhance understanding. Encourage student participation through discussions and questions.</p> <p>Practical Laboratory Sessions in cooperation with the Course of the Power and Machine Lab to provide students with practical experience in operating Electrical machines drives .</p> <p>Case Studies and Problem-Solving Exercises: Assign case studies and problem-solving exercises that simulate real-world scenarios related to Electrical machines drives . Encourage students to apply their theoretical knowledge to analyze and solve these problems, fostering critical thinking and problem-solving skills.</p> <p>Group Discussions and Peer Learning: Organize group discussions and collaborative learning activities where students can discuss and share their understanding of AC machines. Encourage peer-to-peer teaching and learning, promoting active engagement and the exchange of ideas.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                   | <p>Simulations and Virtual Labs: Utilize computer-based simulations and virtual labs to supplement practical learning. These tools can provide interactive experiences and allow students to experiment with different AC machine configurations and operating conditions.</p> <p>Guest Lectures and Industry Visits: Invite industry experts or guest lecturers to share their practical experiences and insights related to Electrical machines drives . Arrange visits to relevant industrial facilities to provide students with exposure to real-world applications and challenges.</p> <p>Online Resources and Learning Management Systems: Provide access to online resources, including lecture notes, reference materials, and interactive tutorials. Utilize a learning management system to facilitate communication, assignment submissions, and online discussions.</p> <p>Assessments: Design a variety of assessments, including quizzes, assignments, and examinations, to evaluate students' understanding of the course material. Incorporate practical assessments, such as simulation-based projects, to assess hands-on skills.</p> <p>Feedback and Progress Monitoring: Provide timely and constructive feedback to students on their assignments and assessments. Monitor students' progress throughout the course and offer additional support or clarification when needed.</p> <p>Industry-Engaged Projects: Assign project work that requires students to apply their knowledge of AC machines to real-world problems or industry-related challenges. This could involve designing a motor control system, optimizing power flows, or analyzing the performance of a synchronous generator.</p> <p>By employing a combination of these learning and teaching strategies, students can develop a solid theoretical understanding of Electrical machines drives while also gaining practical skills and the ability to apply their knowledge in real-world scenarios.</p> |

### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|                               |    |                             |   |
|-------------------------------|----|-----------------------------|---|
| <b>Structured SWL (h/sem)</b> | 63 | <b>Structured SWL (h/w)</b> | 4 |
|-------------------------------|----|-----------------------------|---|

|                                                                               |     |                                                                        |     |
|-------------------------------------------------------------------------------|-----|------------------------------------------------------------------------|-----|
| المنتظم للطالب خلال الفصل % 50 الحمل الدرا                                    |     | المنتظم للطالب أسبوع % 50 الحمل الدرا                                  |     |
| <b>Unstructured SWL (h/sem)</b><br>المنتظم للطالب خلال الفصل % 50 الحمل الدرا | 72  | <b>Unstructured SWL (h/w)</b><br>المنتظم للطالب أسبوع % 50 الحمل الدرا | 4.8 |
| <b>Total SWL (h/sem)</b><br>المنتظم للطالب خلال الفصل % 50 الحمل الدرا        | 150 |                                                                        |     |

| Module Evaluation     |                    |             |                  |          |                           |
|-----------------------|--------------------|-------------|------------------|----------|---------------------------|
| تقييم المادة الدراسية |                    |             |                  |          |                           |
|                       |                    | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes            | 3           | 15% (15)         | 2, 8, 12 | LO #1-7                   |
|                       | Assignments        | 3           | 12% (12)         | 2 to 15  | All                       |
|                       | Projects / Lab.    | 0           | 0 (0)            | -----    | ----                      |
|                       | Report             | 1           | 8% (8)           | 11       | All                       |
|                       | On-site assignment | 1           | 5%(5)            | 12       | 4                         |
| Summative assessment  | Midterm Exam       | 1           | 10% (10)         | 9        | 1-6                       |
|                       | Final Exam         | 3hr         | 50% (50)         | 16       | ALL                       |
| Total assessment      |                    |             | 100% (100 Marks) |          |                           |

| Delivery Plan (Weekly Syllabus) |                  |
|---------------------------------|------------------|
| المنهاج الاسبوعي النظري         |                  |
|                                 | Material Covered |

|                |                                                                                                                                                                                                                                                                              |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Overview for electrical drives, concept, classification, parts and advantages of electrical drives, applications of electrical drives in electrical vehicles                                                                                                                 |
| <b>Week 2</b>  | Dynamic of the motor load system, components of load torques, electrical braking, steady state stability, ratings of converters and motors, speed control and multi quadrant operation, drive specifications                                                                 |
| <b>Week 3</b>  | Characteristics of dc motors, types of dc motors, steady-state speed torque relations, methods of speed control, starting, braking, multi quadrant operation of separately excited dc motor                                                                                  |
| <b>Week 4</b>  | Power electronics drives classification, overview of semiconductor switching devices, single-phase dc drive( half-wave converter, semi converter, full-converter, dual converter)                                                                                            |
| <b>Week 5</b>  | Three-phase dc drives (half-wave converter, semi converter, full-converter)                                                                                                                                                                                                  |
| <b>Week 6</b>  | Chopper drives (principle of power control, principle of regenerative control, principle of rheostatic brake control,                                                                                                                                                        |
| <b>Week 7</b>  | Chopper drives, two and four quadrant drives, and General review of dc drives and evaluation the dc part                                                                                                                                                                     |
| <b>Week 8</b>  | AC drives (classifications, induction motor drives, speed control methods, stator voltage control                                                                                                                                                                            |
| <b>Week 9</b>  | Induction motor drives speed control using frequency control, V/f control,                                                                                                                                                                                                   |
| <b>Week 10</b> | Speed control and starting methods of synchronous motors                                                                                                                                                                                                                     |
| <b>Week 11</b> | Course projects about Synchronous Motor Drives (speed control and introductions to types of SM, cylindrical rotor, salient-pole, reluctance, permanent-magnet , switched reluctance , brushless dc and ac motors), stepper motor drives, and scalar and vector control of IM |
| <b>Week 12</b> | Modern drives of EV (Reports)                                                                                                                                                                                                                                                |
| <b>Week 13</b> | Projects discussion                                                                                                                                                                                                                                                          |
| <b>Week 14</b> | Projects discussion                                                                                                                                                                                                                                                          |
| <b>Week 15</b> | AC drive review.                                                                                                                                                                                                                                                             |
|                |                                                                                                                                                                                                                                                                              |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                       | <b>Text</b>                                                                                                                               | <b>Available in the Library?</b> |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>Required Texts</b> | 1- “Fundamentals of Electric Drives”, Gopal K Dubey, Narosa<br>2- “Power Electronics”, P.S. Bimbhra                                       | AS PDF                           |
|                       |                                                                                                                                           |                                  |
|                       | 1- “Power Electronics”, M. H. Rashid<br>2- “Electric Motor Drives – Modeling, Analysis and Control,” R. Krishnan, Prentice-Hall of India. |                                  |

|                          |                                                                                        |        |
|--------------------------|----------------------------------------------------------------------------------------|--------|
| <b>Recommended Texts</b> | 3- “Electric Drives – Concepts and Applications”, Vedam Subrahmanyam, Tata McGraw Hill | AS PDF |
| <b>Websites</b>          |                                                                                        |        |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                              |                         |                   |           |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                                |                         |                   |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                       | Grade                   | التقدير           | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                         | <b>A</b> - Excellent    | أزمنة             | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>B</b> - Very Good    | ب جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>C</b> - Good         | ج                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>D</b> - Satisfactory | متوسط             | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>E</b> - Sufficient   | مقبول             | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                              | <b>FX</b> – Fail        | (د المعالجة) راسب | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>F</b> – Fail         | راسب              | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                             |                         |                   |           |                                       |
| <p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p> |                         |                   |           |                                       |

نموذج وصف المادة الدراسية

| Module Information                 |                                                |                               |                                                                                                                                                                                                                                                     |                        |
|------------------------------------|------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| معلومات المادة الدراسية            |                                                |                               |                                                                                                                                                                                                                                                     |                        |
| Module Title                       | Power Electronics II<br>II إلكترونيات القدرة   |                               | Module Delivery                                                                                                                                                                                                                                     |                        |
| Module Type                        | Core                                           |                               | <input type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input checked="" type="checkbox"/> Seminar |                        |
| Module Code                        | EETPM310                                       |                               |                                                                                                                                                                                                                                                     |                        |
| ECTS Credits                       | 6                                              |                               |                                                                                                                                                                                                                                                     |                        |
| SWL (hr./sem)                      | 150                                            |                               |                                                                                                                                                                                                                                                     |                        |
| Module Level                       | 3                                              | Semester of Delivery          |                                                                                                                                                                                                                                                     | Six                    |
| Administering Department           | 2 - (Electrical Engineering)                   | College                       | UoM2 - (Engineering)                                                                                                                                                                                                                                |                        |
| Module Leader                      | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbak |                               | e-mail                                                                                                                                                                                                                                              | o.yehya@uomosul.edu.iq |
| Module Leader's Acad. Title        | Assistant Professor                            | Module Leader's Qualification | الشهادة                                                                                                                                                                                                                                             |                        |
| Module Tutor                       | 1-Dr. Mohamad N. Abdul Kadir                   | e-mail                        | makadr@uomosul.edu.iq                                                                                                                                                                                                                               |                        |
| Peer Reviewer Name                 | Dr Yasir Muhammed Yonus                        | e-mail                        | Yasir_752000@uomosul.edu.iq                                                                                                                                                                                                                         |                        |
| Scientific Committee Approval Date | 01/06/2023                                     | Version Number                | 1.0                                                                                                                                                                                                                                                 |                        |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |
|----------------------------------------------------------|
| Module Aims, Learning Outcomes and Indicative Contents   |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <p>This course is designed as the second part of Power Electronics I (EEPM305) course. In EEPM305 the students introduced to power switching devices and phase-controlled converters. This course focuses on PWM control applied to dc-dc and dc-ac converters with emphasis on design part.</p> <p>1- DC-DC and DC-AC power conversion. The operating principles, design, characteristics and application of these electronic power converter circuits are treated, with the goal of equipping the students with capability to analyze and design such power supplies.</p> <p>2- Various important topologies of power converter circuits for specific types of applications are covered and analyzed. These include DC-DC converters and inverters.</p> <p>3- The course also analyze the qualities of waveforms at input and output ends of these converters. The quality of these waveforms is of major concern to users of modern power converter circuits.</p> <p>4- The course covers some aspects of the design and application.</p> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>By the completion of the course, the students should be able to:</p> <ol style="list-style-type: none"> <li>1. Perform analysis of single- and multi-quadrant DC-DC chopper, and identify the fundamental control methods (current mode/voltage mode).</li> <li>2. Analyze non-isolated DC-supply circuits: Buck, Boost, Buck-Boost and Cuk converters.</li> <li>3. Perform a basic design (topology and components selection) of dc-supply circuit for a given application.</li> <li>4. Describe the role of the transformer isolation and analyze the basic transformer-isolated dc-dc converters.</li> <li>5. Present single-phase VSI half and full-bridges implementations.</li> <li>6. Analyze the single-phase inverter operation in square-wave, quasi-square wave and PWM modes.</li> <li>7. Define three-phase VSI, switching variables and operations as six step inverter.</li> <li>8. Present carrier comparison control of three phase inverter.</li> </ol>                                                                 |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Indicative content includes the following.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                             | <p><b><u>Chapter 1: DC Choppers: (3 weeks)</u></b></p> <p>First quadrant, second quadrant, first and second quadrants, first and fourth quadrants and four</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>quadrants choppers. Bridge Circuit switching function</p> <p><b><u>Chapter 2: non-isolated D.C power supply circuits: (4 weeks)</u></b></p> <p>Buck, boost, buck-boost, and Cuk regulators.</p> <p><b><u>Chapter 3: Transformer-Isolated DC supplies (2 weeks):</u></b></p> <p>Feedforward and flyback.</p> <p><b><u>Chapter 4: Single-phase and three-phase inverters. (6weeks)</u></b></p> <p>Square wave mode (half and full bridge circuits), quasi square wave operation and PWM of single-phase inverter</p> <p>Three phase inverter and its switching variables</p> <p>Pulse width modulation (PWM) strategies of three-phase inverter.</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                                 | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering some activities through a simple project to guide the students to self-learning, software use, report writing and scientific debate skills.</p> |

### Student Workload (SWL)

الحمل الدراشي للطالب محسوب لـ ١٥ أسبوعا

|                                                                                |     |                                                                           |     |
|--------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------|-----|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراشي المنتظم للطالب خلال الفصل       | 63  | <b>Structured SWL (h/w)</b><br>الحمل الدراشي المنتظم للطالب أسبوعيا       | 4   |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراشي غير المنتظم للطالب خلال الفصل | 87  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراشي غير المنتظم للطالب أسبوعيا | 5.8 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراشي الكلي للطالب خلال الفصل              | 150 |                                                                           |     |

### Module Evaluation

تقييم المادة الدراسية

|                      |                    | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
|----------------------|--------------------|-------------|------------------|----------|---------------------------|
| Formative assessment | Quizzes            | 3           | 15% (15)         | 2, 8, 12 | LO# 2, 5 and 7            |
|                      | Assignments        | 3           | 12% (12)         | 2 to 15  | LO # 1, 3, and 6          |
|                      | Projects / Lab.    | 0           | 0 (0)            | -----    | ----                      |
|                      | Report             | 1           | 8% (8)           | 13       | ALL                       |
|                      | On-site assignment | 1           | 5%(5)            | 11       | 3                         |
| Summative assessment | Midterm Exam       | 1           | 10% (10)         | 9        | 1-4                       |
|                      | Final Exam         | 3hr         | 50% (50)         | 16       | ALL                       |
| Total assessment     |                    |             | 100% (100 Marks) |          |                           |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|                | Material Covered                                                                                      |
|----------------|-------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction: PWM control explanation through an idealized converter.                                 |
| <b>Week 2</b>  | One and two dc quadrant choppers: topology and analysis.                                              |
| <b>Week 3</b>  | Four-quadrant chopper: analysis; voltage and current control.                                         |
| <b>Week 4</b>  | <b>Non-isolated DC Power supply circuits</b><br>Buck Converter, Boost Converter                       |
| <b>Week 5</b>  | Buck-Boost, Cuk converter                                                                             |
| <b>Week 6</b>  | DC power supply circuits: discontinuous mode analysis                                                 |
| <b>Week 7</b>  | DC power supply circuits comparison and design aspects                                                |
| <b>Week 8</b>  | Transformer Isolated DC supply circuit. The operation and analysis of transformer in power converters |
| <b>Week 9</b>  | Fly-back Converter<br>Forward Converter                                                               |
| <b>Week 10</b> | (Mid-term exam) Chapter<br>6: AC Inverters<br>Single –Phase half-bridge inverter Square wave mode     |
| <b>Week 11</b> | Single –Phase full-bridge Inverter Square wave mode Single –<br>Phase Quasi square wave mode          |
| <b>Week 12</b> | Single-Phase Inverter: PWM control                                                                    |

|                |                                                                                                             |
|----------------|-------------------------------------------------------------------------------------------------------------|
|                | Implementation and analysis using Fourier series analysis                                                   |
| <b>Week 13</b> | Three –Phase VSI: Square Wave Mode (six-step inverter)                                                      |
| <b>Week 14</b> | Session 1:<br>Three –Phase VSI: Sinusoidal PWM Session<br>2:<br>Three-Phase VSI: Carrier Comparison methods |
| <b>Week 15</b> | Analysis and design of three-phase inverter.                                                                |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                  | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | INTRODUCTION TO MODERN POWER ELECTRONICS (third edition) by<br>Andrzej M. Trzynadlowski; Wiley (2016)                                                                                                                                 | No                        |
| <b>Recommended Texts</b> | -- Power Electronics: Converters, Applications and Design; by Mohan, Undeland and Robbins 3rd Edition (Wiley)<br><br>-Fundamentals of Power Electronics, by Robert W. Erickson and Dragan Maksimović, Third Edition, Springer (2020). | No                        |
| <b>Websites</b>          | <a href="https://classroom.google.com/c/NDA5MDI4MDc5MzQz">https://classroom.google.com/c/NDA5MDI4MDc5MzQz</a>                                                                                                                         |                           |

## Grading Scheme

### مخطط الدرجات

| Group                           | Grade                   | التقدير             | Marks (%) | Definition                            |
|---------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group (50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                 | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                 | <b>C</b> – Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                 | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                 | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b>               | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |

|                                                                                                                                                                                                                                                                                                                                                                                             |          |      |        |                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|--------|--------------------------------------|
| (0 – 49)                                                                                                                                                                                                                                                                                                                                                                                    | F – Fail | راسب | (0-44) | Considerable amount of work required |
|                                                                                                                                                                                                                                                                                                                                                                                             |          |      |        |                                      |
| <p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p> |          |      |        |                                      |

## نموذج وصف المادة الدراسية

| Module Information                 |                                                 |                                                                                                                                                                |                            |
|------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| معلومات المادة الدراسية            |                                                 |                                                                                                                                                                |                            |
| Module Title                       | Programmable controllers<br>متحكمات مبرمجة      |                                                                                                                                                                | Module Delivery            |
| Module Type                        | Core                                            | <input type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial |                            |
| Module Code                        | EEPM311                                         |                                                                                                                                                                |                            |
| ECTS Credits                       | 2                                               |                                                                                                                                                                |                            |
| SWL (hr./sem)                      | 50                                              | <input type="checkbox"/> Practical<br><input checked="" type="checkbox"/> Seminar                                                                              |                            |
| Module Level                       | 3                                               | Semester of Delivery                                                                                                                                           | Six                        |
| Administering Department           | 2 - (Electrical Engineering)                    | College                                                                                                                                                        | UoM2 - (Engineering)       |
| Module Leader                      | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbaky | e-mail                                                                                                                                                         | o.yehya@uomosul.edu.iq     |
| Module Leader's Acad. Title        | Assistant Professor                             | Module Leader's Qualification                                                                                                                                  | الشهادة                    |
| Module Tutor                       | 1-                                              | e-mail                                                                                                                                                         | @uomosul.edu.iq            |
| Peer Reviewer Name                 | Fawaz Yaseen<br>Abdullah                        | e-mail                                                                                                                                                         | fawaazyasen@uomosul.edu.iq |
| Scientific Committee Approval Date | 01/06/2023                                      | Version Number                                                                                                                                                 | 1.0                        |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br><br>أهداف المادة الدراسية                      | <p>An introductory course on programmable logic controllers (PLCs) and their basic applications. Topics include an overview of PLCs, PLC hardware components, basics of PLC programming, development of fundamental PLC ladder programming, timers and counters, data manipulation, concepts in analog data I/O advanced programming techniques, PLC sensors and actuators, and PLC communication Networks. Classroom instruction is supported by laboratory activities through which students use PLCs to perform</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                      | <p>industrial control functions, troubleshooting, and networking PLCs in situations of typical industrial projects</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Module Learning Outcomes</b><br><br>مخرجات التعلم للمادة الدراسية | <p>By the end of successful completion of this course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Apply modern PLC programming tools to develop functional ladder diagrams</li> <li>2. Design a ladder program to control sequential processes.</li> <li>3. Design a ladder program for timer and counter based systems</li> <li>4. Assess communication links between computers, PLCs and various I/O devices</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Indicative Contents</b><br><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p><b>Competency 1:</b> The student will demonstrate an understanding of the building blocks of basic Boolean algebra by:</p> <ol style="list-style-type: none"> <li>1. Applying basic number conversation to and from different numbers systems, such as: binary, decimal, hexadecimal, anecdotal</li> <li>2. Describing and implementing basic logical operators such as: and, or and not</li> <li>3. Simplifying Boolean functions using K-Maps</li> <li>4. Converting Boolean functions into digital circuits and generating the corresponding truth tables</li> <li>5. Describing and implementing the one's and two's complement binary notation</li> </ol> <p><b>Competency 2:</b> The student will demonstrate an understanding of basic programmable logic controller (PLC) technology and the industrial control devices used currently in automation by:</p> <ol style="list-style-type: none"> <li>1. Defining and describing a PLC</li> <li>2. Describing the functions of all the devices in a PLC system</li> <li>3. Describing the differences and similarities among relay ladder logic and PLC ladder logic</li> </ol> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>4. Describing the differences between personal computers and PLCs</p> <p>5. Designing and implementing basic ladder logic programs</p> <p>6. Describing the electrical safety issues related to working with PLCs</p> <p><b>Competency 3:</b> The student will demonstrate an understanding of the basic operation of electro-mechanical input devices by:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|  | <p>1. Identifying and describing various manually operated switches typically used in PLCs such as: toggle, push button, selector, and push wheel</p> <p>2. Identifying and describing the following output devices: solenoids, relays, contactors, and alarms</p> <p>3. Interfacing basic input/output devices to a PLC system</p> <p>4. Troubleshooting basic input/output devices in a PLC system</p> <p><b>Competency 4:</b> The student will demonstrate an understanding of the operation of basic electronic and mechanical timers by:</p> <p>1. Describing the main differences among mechanical and electronic timing relays</p> <p>2. Identifying and describing the operation of a mechanical timing relay</p> <p>3. Identifying and describing the operation of timer -on delay (TON) and timer -of delay (TOF) timer instructions</p> <p>4. Troubleshooting input/output modules with timer instructions</p> <p><b>Competency 5:</b> The student will demonstrate an understanding of the operation of basic electronic and mechanical counters by:</p> <p>1. Describing the main differences between mechanical and electronic counters</p> <p>2. Identifying and describing the operation of a mechanical counter</p> <p>3. Designing and analyzing ladder diagrams for the up/down counter typically implemented in industrial automation</p> <p>4. Designing and implementing, using a PLC system, the done bit, enable bit and overflow/underflow bit counters</p> <p>5. Troubleshooting counters in a ladder logic design</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>Competency 6:</b> The student will demonstrate an understanding of the operation and function of electromechanical sequencing devices by:</p> <ol style="list-style-type: none"> <li>1. Identifying and describing the operation and function of electro-mechanical sequencing devices</li> <li>2. Describing the basic PLC sequencer function</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|  | <ol style="list-style-type: none"> <li>3. Designing and implementing the ladder logic diagram for the operation of a PLC sequencer with timing</li> <li>4. Designing, describing and implementing the technique of cascading sequencers</li> <li>5. Troubleshooting ladder logic rungs using sequencer instructions</li> </ol> <p><b>Competency 7:</b> The student will demonstrate an understanding of the operation and function of analog sensors by:</p> <ol style="list-style-type: none"> <li>1. Describing the operation and function of analog devices such as temperature, pressure, flow and position sensors</li> <li>2. Enumerating and describing the components of an infrared system and their operations</li> <li>3. Explaining the general closed-loop block diagram and stating the purpose of each of the blocks</li> <li>4. Describing and explaining the general characteristics that differ between effective and ineffective control systems</li> <li>5. Troubleshooting basic input/output analog devices</li> </ol> |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                            |  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>Strategies</b> | <ul style="list-style-type: none"> <li>-Active Learning: Through class discussions and real world problems.</li> <li>- Coordination with lab classes to provide a parallel hands-on experience.</li> <li>-Use google classroom platform to enhance learning and provide supplementary material.</li> </ul> |  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

### الحمل الدراسي للطلاب محسوب لـ ١٥ أسبوعا

| Structured SWL (h/sem)                      |    | Structured SWL (h/w)                     |      |
|---------------------------------------------|----|------------------------------------------|------|
| الحمل الدراسي المنتظم للطلاب خلال الفصل     | 33 | الحمل الدراسي المنتظم للطلاب أسبوعيا     | 2.2  |
| Unstructured SWL (h/sem)                    |    | Unstructured SWL (h/w)                   |      |
| الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 17 | الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 1.13 |

|                                       |    |
|---------------------------------------|----|
| <b>Total SWL (h/sem)</b>              |    |
| الحمل الدراسي الكلي للطالب خلال الفصل | 50 |

| Module Evaluation     |                    |             |                  |          |                           |
|-----------------------|--------------------|-------------|------------------|----------|---------------------------|
| تقييم المادة الدراسية |                    |             |                  |          |                           |
|                       |                    | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
| Formative assessment  | Quizzes            | 3           | 15% (15)         | 2, 8, 12 | LO# 2, 5 and 7            |
|                       | Assignments        | 3           | 12% (12)         | 2 to 15  | LO # 1, 3, and 6          |
|                       | Projects / Lab.    | 0           | 0 (0)            | -----    | ----                      |
|                       | Report             | 1           | 8% (8)           | 13       | ALL                       |
|                       | On-site assignment | 1           | 5%(5)            | 11       | 3                         |
| Summative assessment  | Midterm Exam       | 1           | 10% (10)         | 9        | 1-4                       |
|                       | Final Exam         | 3hr         | 50% (50)         | 16       | ALL                       |
| Total assessment      |                    |             | 100% (100 Marks) |          |                           |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

|                | Material Covered                                                                                                               |
|----------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction to PLCs.                                                                                                          |
| <b>Week 2</b>  | PLC basics                                                                                                                     |
| <b>Week 3</b>  | PLC Addressing.                                                                                                                |
| <b>Week 4</b>  | <b>Basic Ladder Logic Programming</b>                                                                                          |
| <b>Week 5</b>  | Basic Instructions                                                                                                             |
| <b>Week 6</b>  | Programming word level logic instructions, Relation of digital gate logic to contact/coil logic, Relay logic, Relay Sequencers |
| <b>Week 7</b>  | Programming word level logic instructions, Relation of digital gate logic to contact/coil logic, Relay logic, Relay Sequencers |
| <b>Week 8</b>  | PLC Timer Functions                                                                                                            |
| <b>Week 9</b>  | ladder diagram elements. Instructions: Relay type instructions,                                                                |
| <b>Week 10</b> | (Mid-term exam)                                                                                                                |
| <b>Week 11</b> | Instruction addressing, Branch Instructions,                                                                                   |
| <b>Week 12</b> | Internal Relay Instructions, Programming                                                                                       |
| <b>Week 13</b> | PLC I/O Module Types                                                                                                           |
| <b>Week 14</b> | PLC I/O Module Types and PLC Trainer Configuration                                                                             |
| <b>Week 15</b> | Tutorial Class Discussion.                                                                                                     |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                           | Available in the Library? |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Gary Dunning, "Introduction to Programmable Logic Controllers", Thomson, 2nd Edition                                                                                                                                                                                           | No                        |
| <b>Recommended Texts</b> | -- John W. Webb, Ronald A. Reis, "Programmable Logic Controllers: Principles and Application", PHI Learning, New Delhi, 5th Edition<br>- John R. Hackworth, Frederick D., Hackworth Jr., "Programmable Logic Controllers Programming Methods and Applications", PHI Publishers | No                        |
| <b>Websites</b>          | <a href="https://classroom.google.com">https://classroom.google.com</a>                                                                                                                                                                                                        |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> - Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> - Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

| Module Information                 |                                                          |                               |                                                                                                                                                                                                                               |
|------------------------------------|----------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                                          |                               |                                                                                                                                                                                                                               |
| Module Title                       | Power and Machines Lab. II<br>مختبرات القدرة والمكائن II |                               | Module Delivery                                                                                                                                                                                                               |
| Module Type                        | Core                                                     |                               | <input type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | EEPM312                                                  |                               |                                                                                                                                                                                                                               |
| ECTS Credits                       | 4                                                        |                               |                                                                                                                                                                                                                               |
| SWL (hr./sem)                      | 100                                                      |                               |                                                                                                                                                                                                                               |
| Module Level                       | 3                                                        | Semester of Delivery          |                                                                                                                                                                                                                               |
| Administering Department           | 2 - (Electrical Engineering)                             | College                       | UoM2 - (Engineering)                                                                                                                                                                                                          |
| Module Leader                      | د. عمر شرف الدين يحيى                                    | e-mail                        | البريد الالكتروني لرئيس ال<br>Power and Machines Lab. II قسم                                                                                                                                                                  |
| Module Leader's Acad. Title        | Assistant Professor                                      | Module Leader's Qualification | الشهادة                                                                                                                                                                                                                       |
| Module Tutor                       | م. عمر تراث+كادر المختبر                                 | e-mail                        |                                                                                                                                                                                                                               |
| Peer Reviewer Name                 | ا.م.د. ياسر محمد يونس                                    | e-mail                        | Yasir_752000@uomosul.edu.iq                                                                                                                                                                                                   |
| Scientific Committee Approval Date | 01/06/2023                                               | Version Number                | 1.0                                                                                                                                                                                                                           |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>                      | <ul style="list-style-type: none"> <li>7- Understand parallel operation and zig-zag connection of transformer.</li> <li>8- Understand how the speed of dc motors can be controlled.</li> <li>9- Understand the load test of dc motors.</li> <li>10- Understand how to find Induction motor parameters.</li> <li>11- Understand the triggering approaches of MOSFET transistor and learning the basic of the chopper and inverter circuits.</li> <li>12- Apply the principles of electrical drives to real-world applications in industrial and commercial settings</li> <li>13- Understand the basic of: Integrating and differentiating circuit., Shift Registers. Op-Amp and PLC.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>Upon completion of Lab 2, students will be able to:</p> <ul style="list-style-type: none"> <li>1- Demonstrate a comprehensive understanding of the parallel operation and zig-zag connection of transformers, including their benefits, challenges, and practical applications.</li> <li>2- Apply load test to the DC machines.</li> <li>3- Conduct load tests on DC machine, analyze the performance characteristics, and interpret the results.</li> <li>4- Determine the parameters of induction motors through practical experiments, including measurements and calculations, allowing for a thorough understanding of their operating characteristics.</li> <li>5- Utilize triggering approaches for MOSFET transistors, applying the principles to design and analyze basic chopper and inverter circuits. Understand the advantages, limitations, and applications of these circuits.</li> <li>6- Apply the principles of electrical drives to real-world applications in industrial and commercial settings, considering factors such as motor selection, control strategies, and energy efficiency.</li> <li>7- Gain a basic understanding of integrating and differentiating circuits, shift registers, operational amplifiers (Op-Amp), and Programmable Logic Controllers (PLCs), including their principles, functionalities, and applications in electronic systems.</li> </ul> |
|                                                                             | <p>Indicative content includes the following.</p> <p><b><u>Part A – power and machine</u></b></p> <p>Determination of regulation of an alternator by Synchronous Impedance Method</p> <p>Three-phase induction motor (No-load &amp; Locked rotor test) parallel Operation of Two Single-</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p> | <p>phase Transformers. Load test of D.C. series generator Three-phase induction motor. (Directional control and star -delta starting ) Three-phase Synchronous generator (Load test) [32 hrs.]</p> <p>Revision problem and tutorial classes [10hrs.]<br/>Quizzes [1 hr.]</p> <p><b><u>Part B- Power Electronics</u></b></p> <p>PWM signal generation to control a D.C. chopper using Arduino Motor drive [12 hrs.]</p> <p>Revision problem and tutorial classes . full Bridge Inverter Automatic Control of Motor Drive ACH555 [12hrs.]</p> |
|                                                              | <p>Revision problem and tutorial classes [6hrs.]<br/>Quizzes [1 hr.]</p> <p><b><u>Part c- Electronics</u></b></p> <p>Design of a timer using the IC-555 Shift Registers . The concept of Analog to digital converter (ADC ) using Arduino Introduction to PLC and Ladder Logic Programming [12 hrs.]</p> <p>Revision problem and tutorial classes [6hrs.]<br/>Quizzes [1 hr.]</p>                                                                                                                                                           |

| <p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                          | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. Through hands-on experiments, projects, and laboratory work, students will gain practical skills and knowledge in the areas of power applications, electrical machines, power electronics, and electronic circuits. This course aims to provide students with a comprehensive understanding of measurement techniques, control methods, and practical applications in the field of electrical engineering.</p> |

## Student Workload (SWL)

الحمل الدراشي للطالب محسوب لـ ١٥ اسبوعا

|                                                                                |    |                                                                           |   |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراشي المنتظم للطالب خلال الفصل       | 63 | <b>Structured SWL (h/w)</b><br>الحمل الدراشي المنتظم للطالب أسبوعيا       | 4 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراشي غير المنتظم للطالب خلال الفصل | 37 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراشي غير المنتظم للطالب أسبوعيا | 2 |

|                                                                   |     |
|-------------------------------------------------------------------|-----|
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل | 100 |
|-------------------------------------------------------------------|-----|

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                         |                    |                       |                 |                                  |
|---------------------------------------------------|-------------------------|--------------------|-----------------------|-----------------|----------------------------------|
|                                                   |                         | <b>Time/Number</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning Outcome</b> |
| <b>Formative assessment</b>                       | <b>Quizzes</b>          | 1                  | 5% (5)                | 8               | All                              |
|                                                   | <b>Report</b>           | 10                 | 15% (15)              | 1 to 15         | All                              |
|                                                   | <b>Practical Exam</b>   | 1                  | 20%(20)               | 8,15            | All                              |
| <b>Summative assessment</b>                       | <b>Theoretical Exam</b> | 1                  | 10% (10)              | 7               | All                              |
|                                                   | <b>Final Exam</b>       | 3hr                | 50% (50)              | 16              | All                              |
| <b>Total assessment</b>                           |                         |                    | 100% (100 Marks)      |                 |                                  |

| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                                              |
|-------------------------------------------------------------------------|------------------------------------------------------------------------------|
|                                                                         | <b>Material Covered</b>                                                      |
| <b>Week 1</b>                                                           | Determination of regulation of an alternator by Synchronous Impedance Method |
| <b>Week 2</b>                                                           | Three-phase induction motor (No-load & Locked rotor test)                    |
| <b>Week 3</b>                                                           | parallel Operation of Two Single-phase Transformers                          |
| <b>Week 4</b>                                                           | PWM signal generation to control a D.C. chopper using Arduino                |

|                |                                                                              |
|----------------|------------------------------------------------------------------------------|
| <b>Week 5</b>  | Motor drive                                                                  |
| <b>Week 6</b>  | Design of a timer using the IC-555<br>Or PLC applications                    |
| <b>Week 7</b>  | (starting of synchronous motor                                               |
| <b>Week 8</b>  | Mid-term Exam                                                                |
| <b>Week 9</b>  | Load test of D.C. series generator                                           |
| <b>Week 10</b> | Three-phase induction motor. (Directional control and star -delta starting ) |
| <b>Week 11</b> | Three-phase Synchronous generator (Load test)                                |
| <b>Week 12</b> | full Bridge Inverter                                                         |
| <b>Week 13</b> | Automatic Control of Motor Drive ACH555                                      |
| <b>Week 14</b> | The concept of Analog to digital converter (ADC ) using Arduino              |
| <b>Week 15</b> | Final Exam                                                                   |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                            | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | ELECTRICAL MACHINES -II LABORATORY MANUAL, BY Lab . staff                                                                                                                                                                       | YES                       |
| <b>Recommended Texts</b> | <ul style="list-style-type: none"> <li>- P. C. Sen, "Principles of Electrical machines and power electronics", 2nd edition, John Wiley &amp; Sons.</li> <li>- M H Rashid, "Power Electronics – circuits, devices and</li> </ul> | No                        |

|  |                                                |  |
|--|------------------------------------------------|--|
|  | applications”, 3rd edition, Pearson Education. |  |
|--|------------------------------------------------|--|

|          |                                                                                            |  |
|----------|--------------------------------------------------------------------------------------------|--|
|          | - Robert L. Boylestad , Louis Nashelsky Electronic Devices and Circuit Theory 10th Edition |  |
| Websites |                                                                                            |  |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                              |                         |                     |           |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                       | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group</b><br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group</b><br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                             |                         |                     |           |                                       |
| <p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p> |                         |                     |           |                                       |

نموذج وصف المادة الدراسية

| Module Information                 |                                                                       |                                                                                                                                                                                                                                          |                        |
|------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| معلومات المادة الدراسية            |                                                                       |                                                                                                                                                                                                                                          |                        |
| Module Title                       | Engineering Project Design & Planning<br>تصميم وتخطيط المشروع الهندسي |                                                                                                                                                                                                                                          | Module Delivery        |
| Module Type                        | C                                                                     | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                        |
| Module Code                        | EEPM313                                                               |                                                                                                                                                                                                                                          |                        |
| ECTS Credits                       | 2                                                                     |                                                                                                                                                                                                                                          |                        |
| SWL (hr./sem)                      | 50                                                                    |                                                                                                                                                                                                                                          |                        |
| Module Level                       | 3                                                                     |                                                                                                                                                                                                                                          | Semester of Delivery   |
| Administering Department           | 2 - (Electrical Engineering)                                          | College                                                                                                                                                                                                                                  | UoM2 - (Engineering)   |
| Module Leader                      | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbaky                       | e-mail                                                                                                                                                                                                                                   | o.yehya@uomosul.edu.iq |
| Module Leader's Acad. Title        | استاذ مساعد                                                           | Module Leader's Qualification                                                                                                                                                                                                            | الشهادة                |
| Module Tutor                       |                                                                       | e-mail                                                                                                                                                                                                                                   |                        |
| Peer Reviewer Name                 | د. محمد ناطق عبدالقادر<br>Mohamad N. Abdul Kadir                      | e-mail                                                                                                                                                                                                                                   | makadr@uomosul.edu.iq  |
| Scientific Committee Approval Date |                                                                       | Version Number                                                                                                                                                                                                                           |                        |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;"><b>Module Aims</b></p> <p style="text-align: center;">أهداف المادة الدراسية</p>                      | <p>The student should be able to:</p> <ol style="list-style-type: none"> <li>1. Select a realistic engineering project idea that serves their field of specialization.</li> <li>2. Formulate the project problem, objectives, and outcomes in a scientific manner.</li> <li>3. Prepare a preliminary design or an initial simulation model to verify the feasibility of the idea.</li> <li>4. Learn how to use certain laboratory equipment and how to handle or operate it properly.</li> <li>5. Prepare a work plan (timeline and implementation plan) that leads to the completion of the engineering project.</li> <li>6. Write a project proposal and deliver a preliminary presentation.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <p style="text-align: center;"><b>Module Learning Outcomes</b></p> <p style="text-align: center;">مخرجات التعلم للمادة الدراسية</p> | <p>After completing the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Formulate a well-structured proposal for the graduation project.</li> <li>2. Select appropriate simulation/design tools according to the specialization.</li> <li>3. Create a system block diagram, circuit diagram, or flowchart.</li> <li>4. Interpret preliminary simulation results and identify the required improvements.</li> <li>5. Prepare a timeline and organize the tasks of the project team.</li> <li>6. Write a concise engineering report and deliver a clear presentation.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p style="text-align: center;"><b>Indicative Contents</b></p> <p style="text-align: center;">المحتويات الإرشادية</p>                | <p><b>First: Theoretical Component</b></p> <ol style="list-style-type: none"> <li>1. The concept of the graduation project, its specifications, and success criteria.</li> <li>2. Selecting a project idea and linking it to the needs of society and/or industry.</li> <li>3. Formulating the Problem Statement, Objectives, and Scope.</li> <li>4. Collecting scientific sources and managing references (IEEE style).</li> <li>5. Fundamentals of the Engineering Design Process.</li> <li>6. Requirements and constraints analysis (cost, time, availability of components, safety).</li> <li>7. Comparing solutions and selecting the optimal alternative (Decision Matrix).</li> <li>8. Introduction to modeling and simulation for electrical engineering projects.</li> <li>9. Preparing an implementation plan (WBS + Gantt chart) through a Work Breakdown Structure by dividing the project into smaller parts (main tasks and sub-tasks) to make execution clear and manageable.</li> <li>10. Writing the project proposal and a concise technical report.</li> <li>11. Principles of testing and verification (Test Plan).</li> <li>12. Overview of research ethics (citation, originality, plagiarism).</li> </ol> |
|                                                                                                                                     | <ol style="list-style-type: none"> <li>13. Introduction to fundamental international standards in electrical engineering (IEC, IEEE, ISO, NFPA, ANSI, BS) and their impact on safety and design/execution</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>quality.</p> <p><b>Second: Practical Component</b></p> <ol style="list-style-type: none"> <li>1. Selecting a practical applied or computer-based project for each group (2–4 students).</li> <li>2. Preparing a concise proposal.</li> <li>3. Conducting a preliminary literature review (12–15 references).</li> <li>4. Developing an initial simulation model (according to the specialization).</li> <li>5. Identifying the tools and components required for the project.</li> <li>6. Preparing a timeline with milestones, delivering a progress presentation, and a preliminary final presentation for the graduation project.</li> </ol> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <ol style="list-style-type: none"> <li>1. Interactive lectures</li> <li>2. Group mentoring and guidance sessions</li> <li>3. Simulation, design, and hands-on laboratory sessions</li> <li>4. Project-Based Learning (PBL)</li> <li>5. Short weekly discussions and presentations</li> </ol> |

| <b>Student Workload (SWL)</b><br>الحمل الدراشي للطالب محسوب لـ ١٥ اسبوعا |    |                                      |   |
|--------------------------------------------------------------------------|----|--------------------------------------|---|
| <b>Structured SWL (h/sem)</b>                                            | 33 | <b>Structured SWL (h/w)</b>          | 3 |
| الحمل الدراشي المنتظم للطالب خلال الفصل                                  |    | الحمل الدراشي المنتظم للطالب أسبوعيا |   |

|                                                                                |    |                                                                           |      |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|------|
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراشي غير المنتظم للطالب خلال الفصل | 17 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراشي غير المنتظم للطالب أسبوعيا | 1.13 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراشي الكلي للطالب خلال الفصل              | 50 |                                                                           |      |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                           |                    |                       |                 |                                  |
|---------------------------------------------------|---------------------------|--------------------|-----------------------|-----------------|----------------------------------|
|                                                   |                           | <b>Time/Number</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning Outcome</b> |
| <b>Formative assessment</b>                       | <b>Quizzes</b>            | 3                  | 12% (4)               | 3,7,11          | 1, 3, 4                          |
|                                                   | <b>Assignments</b>        | 2                  | 4 % (2)               | 4,12            | 2,5                              |
|                                                   | <b>Projects / Lab.</b>    | 5                  | 20% (4)               | 2-12            | All                              |
|                                                   | <b>On-site assignment</b> | 1                  | 4%(4)                 | 9               | All                              |
|                                                   | <b>Report</b>             |                    |                       |                 |                                  |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>       | 1                  | 10%                   | 10              | 1-5                              |
|                                                   | <b>Final Exam</b>         | 1                  | 50%                   | 16              | All                              |
| <b>Total assessment</b>                           |                           |                    | 100                   |                 |                                  |

## المناهج الاسبوعي النظري

|                | Material Covered                                                                                                                                           |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Week 1</b>  | Introduction to the Engineering Project: concept of a project, types of engineering projects, project life cycle, and the role of the electrical engineer. |
| <b>Week 2</b>  | Defining the project idea and formulating the engineering problem (Problem Definition) and analyzing technical requirements.                               |
| <b>Week 3</b>  | Engineering solution generation (Concept Generation) and comparison of alternatives using engineering and economic criteria.                               |
| <b>Week 4</b>  | Engineering Design Process and its application to electrical engineering projects.                                                                         |
| <b>Week 5</b>  | Preparing the Project Proposal: objectives, scope, deliverables, and constraints.                                                                          |
| <b>Week 6</b>  | Project planning: Work Breakdown Structure (WBS) and defining activities and tasks.                                                                        |
| <b>Week 7</b>  | Project scheduling: Gantt charts, networks (PERT/CPM), and time estimation.                                                                                |
| <b>Week 8</b>  | Resource and cost management: cost estimation, budgeting, and human/technical resources.                                                                   |
| <b>Week 9</b>  | Risk management in engineering projects: risk identification, analysis, and mitigation strategies.                                                         |
| <b>Week 10</b> | Technical considerations in electrical projects: standards (IEC, IEEE), safety, reliability, and sustainability.                                           |
| <b>Week 11</b> | Quality management and engineering documentation: technical reports, drawings, and specifications.                                                         |
| <b>Week 12</b> | Teamwork and engineering communication: team management, presentations, and engineering ethics.                                                            |
| <b>Week 13</b> | Project implementation and monitoring: progress tracking, change control, and performance evaluation.                                                      |
| <b>Week 14</b> | Project presentations and final evaluation: discussion of results, lessons learned, and future improvements.                                               |
| <b>Week 15</b> | Introduction to the Engineering Project: concept of a project, types of engineering projects, project life cycle, and the role of the electrical engineer. |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                                                              |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Available in the Library? |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | Hugh Jack, Engineering Design, Planning, and Management, 2nd Edition, 2021. ( <a href="#">Elsevier Shop</a> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           |
| <b>Recommended Texts</b> | <ol style="list-style-type: none"> <li>1. Christopher S. Coulston &amp; Ralph M. Ford, Design for Electrical and Computer Engineers, 2024. (<a href="#">open.umn.edu</a>)</li> <li>2. Graeme Dandy, David Walker &amp; Trevor Daniell, Planning and Design of Engineering Systems, 2018. (<a href="#">Routledge</a>)</li> <li>3. C. Lessard, Project Management for Engineering Design. (<a href="#">Springer Link</a>)</li> <li>4. Engineering Capstone Design: Project Planning, Organizing, and Executing. (<a href="#">Wiley</a>)</li> <li>5. Project Management, Planning and Control. (<a href="#">drnishikantjha.com</a>)</li> </ol> <p>وعاءات، <math>VU6</math> امل لتخطيط وإدارة المعاملات، الدليل المدفوع <math>e f^d</math>، الحسن أم <math>e f^d</math> ستور (2022 م).<br/> علم إدارة المشاريع الهندسة من 7 مل، إضاءات عجب قند الله ذاء<br/> التصميم إلى التنفذ، 2020. (<a href="#">Google Books</a>)</p> <ol style="list-style-type: none"> <li>8. Garold D. Oberlender, Project Management for Engineering and Construction. (<a href="#">tempo.io</a>)</li> <li>9. Project Management Institute (PMI), PMBOK® Guide. (<a href="#">cciedump.spoto.net</a>)</li> </ol> |                           |
| <b>Websites</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54). The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

نموذج وصف المادة الدراسية

| Module Information                 |                                                  |                      |                                                                                                                                                                                                                                          |                        |     |
|------------------------------------|--------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----|
| معلومات المادة الدراسية            |                                                  |                      |                                                                                                                                                                                                                                          |                        |     |
| Module Title                       | English language 3<br>اللغة الانكليزية 3         |                      | Module Delivery                                                                                                                                                                                                                          |                        |     |
| Module Type                        | S                                                |                      | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input checked="" type="checkbox"/> Seminar |                        |     |
| Module Code                        | EPPM314                                          |                      |                                                                                                                                                                                                                                          |                        |     |
| ECTS Credits                       | 2                                                |                      |                                                                                                                                                                                                                                          |                        |     |
| SWL (hr/sem)                       | 50                                               |                      |                                                                                                                                                                                                                                          |                        |     |
| Module Level                       | 3                                                | Semester of Delivery |                                                                                                                                                                                                                                          |                        | Six |
| Administering Department           | 2 - (Electrical Engineering)                     | College              | UoM2 - (Engineering)                                                                                                                                                                                                                     |                        |     |
| Module Leader                      | د. عمر شرف الدين يحيى<br>Dr. Omar Sh. Alyozbaky  |                      | e-mail                                                                                                                                                                                                                                   | o.yehya@uomosul.edu.iq |     |
| Module Leader's Acad. Title        | Assistant Professor                              |                      | Module Leader's Qualification                                                                                                                                                                                                            | Doctor                 |     |
| Module Tutor                       |                                                  |                      | e-mail                                                                                                                                                                                                                                   |                        |     |
| Peer Reviewer Name                 | د. محمد ناطق عبدالقادر<br>Mohamad N. Abdul Kadir |                      | e-mail                                                                                                                                                                                                                                   | makadr@uomosul.edu.iq  |     |
| Scientific Committee Approval Date | 10/06/2023                                       | Version Number       | 1.0                                                                                                                                                                                                                                      |                        |     |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b>                                                   | The aims of the module are to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| المادة الدراسية                                                      | <ol style="list-style-type: none"> <li>1. Foster the development of problem-solving skills, with a particular emphasis on speaking, reading, writing, and listening, while also gaining a comprehensive understanding of the English language as a foreign language through the utilization of various techniques.</li> <li>2. Comprehend the fundamental principles of the English language.</li> <li>3. Explore the foundational concepts essential for learning the key principles of English grammar and expanding English vocabulary.</li> <li>4. Establish a solid foundation for proficient English writing and speaking.</li> <li>5. Gain a comprehensive understanding of constructing grammatically accurate English sentences.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Module Learning Outcomes</b><br><br>مخرجات التعلم للمادة الدراسية | <p>Upon completing the course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate proficiency in utilizing main and auxiliary verbs, as well as possessive pronouns.</li> <li>2. Compile a comprehensive list of words associated with questions and various subject pronouns.</li> <li>3. Engage in conversations concerning social expressions and personal information, particularly regarding jobs, using affirmative, negative, and interrogative sentences.</li> <li>4. Discuss the usage of adjectives and their placement within sentences.</li> <li>5. Construct simple present sentences using "I," "we," "you," and "they," and accurately define the usage of articles.</li> <li>6. Describe the present simple tense utilizing "he" and "she," and explore adverbs of frequency.</li> <li>7. Identify basic question words and demonstrative pronouns, and effectively apply them in different contexts.</li> <li>8. Examine the usage of "there is/are" and various prepositions.</li> <li>9. Analyze the structure of simple past sentences and irregular verbs.</li> <li>10. Explain the negative and interrogative structures of simple past tense sentences, along with adverbs associated with the past tense.</li> <li>11. Recognize the usage of multiple adverbs and the use of "can/can't" in sentences, while explaining requests and offers.</li> </ol> |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | <p>12. Elaborate on the usage of "like" and "would you like," as well as the application of "some" and "any" in various expressions.</p> <p>13. Discuss the application of the present continuous tense and distinguish it from the present simple tense.</p> <p>14. Explain the structures employed to refer to future plans.</p>                                                                                                                                                                                |
| <b>Indicative Contents</b><br>المحتويات الإرشادية | <p>The indicative content of the course comprises the following:</p> <ol style="list-style-type: none"> <li>1. Introduction to the significance of English language acquisition and its role in social communication.</li> </ol>                                                                                                                                                                                                                                                                                  |
|                                                   | <ol style="list-style-type: none"> <li>2. Application and practice of various tenses, such as present and past tenses.</li> <li>3. Comprehensive exploration of key concepts, including offers, requests, future, personal expressions, and different tenses.</li> <li>4. Utilization of a range of skills to facilitate English language learning, including listening, reading, writing, and speaking. Additionally, providing diverse examples to enhance understanding of concepts and structures.</li> </ol> |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <p>The main strategies adopted in delivering this module include:</p> <ul style="list-style-type: none"> <li>• Encouraging active participation and fostering critical thinking skills through engaging students in discussions.</li> <li>• Applying the communicative approach to enhance students' English language learning skills and enable effective communication.</li> <li>• Incorporating authentic materials in the classroom to create a realistic and immersive learning experience.</li> <li>• Emphasizing student motivation and promoting their engagement in the learning process.</li> <li>• Enhancing interaction and communication skills to achieve greater success in English language proficiency.</li> </ul> |

| <b>Student Workload (SWL)</b> |
|-------------------------------|
|-------------------------------|

| الحمل الدراسي للطالب                                                           |    |                                                                           |   |
|--------------------------------------------------------------------------------|----|---------------------------------------------------------------------------|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 33 | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 2 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 17 | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 1 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 50 |                                                                           |   |

## Module Evaluation

### تقييم المادة الدراسية

|                      |                    | Time/Number | Weight (Marks)   | Week Due | Relevant Learning Outcome |
|----------------------|--------------------|-------------|------------------|----------|---------------------------|
| Formative assessment | Quizzes            | 3           | 15% (15)         | 1, 5, 10 | LO# 3, 4, 5 and 8         |
|                      | Assignments        | 3           | 12% (12)         | 2, 6, 12 | LO # 2, 4, 5, 7, and 8    |
|                      | Projects / Lab.    | 0           | 0 (0)            | -----    | ----                      |
|                      | Report             | 1           | 8% (8)           | 13       | LO #5, 8, 9, and 10       |
|                      | On-site assignment | 1           | 5%(5)            | 12       |                           |
| Summative assessment | Midterm Exam       | 1           | 10% (10)         | 9        | LO #1 - 7                 |
|                      | Final Exam         | 3hr         | 50% (50)         | 16       | ALL                       |
| Total assessment     |                    |             | 100% (100 Marks) |          |                           |

## Delivery Plan (Weekly Syllabus)

### المنهاج الأسبوعي النظري

|         | Material Covered                                                                                                                         |
|---------|------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1  | Develops further knowledge of the grammar and of essential vocabulary in order to lead the students to an advanced level of proficiency. |
| Week 2  | Emphasis is placed on developing listening                                                                                               |
| Week 3  | Emphasis is placed on developing speaking,                                                                                               |
| Week 4  | Emphasis is placed on developing reading                                                                                                 |
| Week 5  | Emphasis is placed on developing writing                                                                                                 |
| Week 6  | grammar and fundamental writing skills                                                                                                   |
| Week 7  | <b>Midterm Exam</b>                                                                                                                      |
| Week 8  | Understand the main ideas of a variety of written and spoken texts                                                                       |
| Week 9  | Participate effectively in a short conversation using appropriate language.                                                              |
| Week 10 | Select appropriate vocabulary to talk about feelings and experiences.                                                                    |
| Week 11 | Select appropriate vocabulary to talk about opinions and experiences.                                                                    |
| Week 12 | Recognize, understand and use a number of phrasal verbs and collocations.                                                                |
| Week 13 | Effective organizational strategies that include introductions, and paragraphs.                                                          |
| Week 14 | Effective organizational strategies that include transitions, and conclusion.                                                            |
| Week 15 | <b>Revision</b>                                                                                                                          |
| Week 16 | <b>Preparatory week before the final Exam</b>                                                                                            |

### Delivery Plan (Weekly Lab. Syllabus)

المناهج الاسبوعي للمختبر

|        | Material Covered |
|--------|------------------|
| Week 1 |                  |
| Week 2 |                  |
| Week 3 |                  |
| Week 4 |                  |
| Week 5 |                  |
| Week 6 |                  |

|               |  |
|---------------|--|
| <b>Week 7</b> |  |
|---------------|--|

| <b>Learning and Teaching Resources</b><br><b>مصادر التعلم والتدريس</b> |                                                                                                        |                                  |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                        | <b>Text</b>                                                                                            | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                                  | John and liz Soar. (New Headway Beginner) 4 <sup>th</sup> edition.<br>Oxford: Oxford University Press. | Yes                              |
| <b>Recommended Texts</b>                                               |                                                                                                        | No                               |
| <b>Websites</b>                                                        |                                                                                                        |                                  |

## Grading Scheme

### مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 – 100)</b> | <b>A</b> – Excellent    | امتياز              | 90 – 100  | Outstanding Performance               |
|                                     | <b>B</b> – Very Good    | جيد جدا             | 80 – 89   | Above average with some errors        |
|                                     | <b>C</b> – Good         | جيد                 | 70 – 79   | Sound work with notable errors        |
|                                     | <b>D</b> – Satisfactory | متوسط               | 60 – 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> – Sufficient   | مقبول               | 50 – 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>      | <b>FX</b> – Fail        | (راسب) قيد المعالجة | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| Module Information                                              |                                    |                               |                                                                                                                                                                                                                                          |                               |       |
|-----------------------------------------------------------------|------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------|
| معلومات المادة الدراسية                                         |                                    |                               |                                                                                                                                                                                                                                          |                               |       |
| <b>Module Title</b>                                             | Control systems I<br>I نظم السيطرة |                               | <b>Module Delivery</b>                                                                                                                                                                                                                   |                               |       |
| <b>Module Type</b>                                              | Core                               |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                               |       |
| <b>Module Code</b>                                              | EEP407                             |                               |                                                                                                                                                                                                                                          |                               |       |
| <b>Number of Credit Hours (Total) / Number of Units (Total)</b> | 4/3                                |                               |                                                                                                                                                                                                                                          |                               |       |
| <b>Module Level</b>                                             |                                    | Fourth-P&M                    | <b>Semester of Delivery</b>                                                                                                                                                                                                              |                               | Seven |
| <b>Administering Department</b>                                 |                                    | Department of Electrical Eng. | <b>College</b>                                                                                                                                                                                                                           | Engineering                   |       |
| <b>Module Leader</b>                                            | Dr.Omar Sh. Alyozbaky              |                               | <b>e-mail</b>                                                                                                                                                                                                                            | o.yehya@uomosul.edu.iq        |       |
| <b>Module Leader's Acad. Title</b>                              |                                    | Head of Dept.                 | <b>Module Leader's Qualification</b>                                                                                                                                                                                                     |                               | PhD   |
| <b>Module Tutor</b>                                             | Dr. Mohammed Obaid Mustafa         |                               | <b>e-mail</b>                                                                                                                                                                                                                            | mohammed.obaid@uomosul.edu.iq |       |
| <b>Peer Reviewer Name</b>                                       |                                    | Dr. Mohammed Obaid Mustafa    | <b>e-mail</b>                                                                                                                                                                                                                            | mohammed.obaid@uomosul.edu.iq |       |
| <b>Scientific Committee Approval Date</b>                       |                                    |                               | <b>Version Number</b>                                                                                                                                                                                                                    | 1.1                           |       |

| Relation with other Modules       |      |                 |  |
|-----------------------------------|------|-----------------|--|
| العلاقة مع المواد الدراسية الأخرى |      |                 |  |
| <b>Prerequisite module</b>        | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>       | None | <b>Semester</b> |  |

| Module Aims, Learning Outcomes and Indicative Contents   |                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                             |
| <b>Module Aims</b><br>أهداف المادة الدراسية              | The aim of this course is to provide students with a solid understanding of the <b>analysis, modeling, and design of control systems</b> . The course develops the ability to analyze system behavior, assess stability and performance, and design appropriate controllers for engineering |

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>applications.</p> <ol style="list-style-type: none"> <li>1. Develop a strong foundation in <b>mathematical modeling of dynamic systems</b> using differential equations, transfer functions, and state-space representations.</li> <li>2. Enable students to analyze the <b>time-domain and frequency-domain behavior</b> of control systems, including transient and steady-state performance.</li> <li>3. Provide systematic methods for assessing <b>stability</b> using classical and modern techniques.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p><b>1-Model</b> dynamic systems using differential equations, transfer functions, and state-space representations.</p> <p><b>2- Analyze</b> system behavior in the time and frequency domains.</p> <p><b>3- Evaluate</b> system stability using classical and modern stability criteria.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p><b>W1-W3 Introduction and concept of control systems</b></p> <ul style="list-style-type: none"> <li>• Definition and classification of control systems</li> <li>• Basic components of a control system</li> <li>• Open-loop vs. closed-loop control systems</li> <li>• Advantages and disadvantages of feedback</li> <li>• Review of Laplace transform fundamentals</li> <li>• Basic matrix operations</li> <li>• Concept and definition of transfer functions</li> </ul> <p><b>W4-W5 Modelling of Control Systems and Transfer function</b></p> <ul style="list-style-type: none"> <li>• Block diagram representation of systems</li> <li>• Feedback loop representation</li> <li>• Concept of signal-flow graphs</li> <li>• Conversion between block diagrams and SFGs</li> </ul> <p><b>W6-W9 Representation of control systems as matrix form</b></p> <ul style="list-style-type: none"> <li>• Concept of state variables</li> <li>• State-space representation</li> <li>• State equations in vector–matrix form</li> <li>• Compact representation of multi-variable systems</li> <li>• Input, state, and output matrices</li> <li>• Examples of MIMO systems</li> </ul> <p><b>W10-W13 Analysis of control systems</b></p> <ul style="list-style-type: none"> <li>• Characteristic equation of state-space systems</li> <li>• Concept and importance of controllability</li> <li>• Controllability tests</li> <li>• Concept and importance of observability</li> <li>• Observability tests</li> </ul> <p><b>W14-W15 Time-Domain Analysis of Control Systems</b></p> <ul style="list-style-type: none"> <li>• Time response specifications</li> <li>• Analysis of first-order systems</li> <li>• Stability considerations</li> </ul> |

|  |                                                                                                                                                                                                                                                                                   |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>• Time-domain performance indices</li> <li>• Steady-state error analysis</li> <li>• Error constants</li> <li>• Transient response of second-order systems</li> <li>• Damping ratio, natural frequency, overshoot, settling time</li> </ul> |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p><b>1. Lectures</b></p> <ul style="list-style-type: none"> <li>• Structured lectures introduce fundamental concepts, theories, and analytical techniques in control systems.</li> <li>• Emphasis is placed on conceptual understanding, mathematical formulation, and physical interpretation.</li> </ul> <p><b>2. Problem-Solving Sessions</b></p> <ul style="list-style-type: none"> <li>• Guided tutorials focus on solving numerical and analytical problems.</li> <li>• Students practice stability analysis, controller design, and performance evaluation.</li> <li>• Active student participation is encouraged through in-class discussions.</li> </ul> <p><b>3. Project-Based Learning</b></p> <ul style="list-style-type: none"> <li>• Individual or group mini-projects involve modeling, analysis, and controller design for selected systems.</li> </ul> <p><b>4. Self-Directed Learning</b></p> <ul style="list-style-type: none"> <li>• Students are encouraged to engage in independent study through textbooks, research papers, and online resources.</li> <li>• Homework assignments and reading tasks support deeper understanding.</li> </ul> <p><b>5. Continuous Feedback</b></p> <ul style="list-style-type: none"> <li>• Regular formative feedback is provided through assignments, quizzes, and reports.</li> <li>• Feedback helps students identify strengths and areas for improvement.</li> </ul> |

| <b>Module Evaluation</b><br><b>تقييم المادة الدراسية</b> |                    |                 |                |           |                              |
|----------------------------------------------------------|--------------------|-----------------|----------------|-----------|------------------------------|
| As                                                       |                    | Time/<br>Number | Weight (Marks) | Week Due  | Relevant Learning<br>Outcome |
| <b>Formative<br/>assessment</b>                          | <b>Quizzes</b>     | 1/3             | 10             | CONTINUES | 1                            |
|                                                          | <b>Assignments</b> | 1/3             | 5              | CONTINUES | 1-2                          |
|                                                          | <b>CLASSWORK</b>   | 1/1             | 5              | CONTINUES | 1,3                          |
|                                                          | <b>Report</b>      | 1/1             | 10             | CONTINUES | 1-2                          |

|                      |              |       |     |           |       |
|----------------------|--------------|-------|-----|-----------|-------|
| Summative assessment | Midterm Exam | 1.5/1 | 10  | CONTINUES | 1-2   |
|                      | Final Exam   | 3/1   | 60  | CONTINUES | 1-2-3 |
| Total assessment     |              |       | 100 |           |       |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المناهج الاسبوعي النظري |                                                                                                                                                   |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Week                                                              | Material Covered                                                                                                                                  |
| Week 1                                                            | Basic Components of a Control system, open-Loop Control systems, Closed-closed Loop Control Systems, Laplace Transform, Matrix, Transfer function |
| Week 2                                                            | Theoretical Foundation and Background<br>Material: Modeling of Dynamic Systems                                                                    |
| Week 3                                                            | Introduction to Modeling of Simple Electrical Systems                                                                                             |
| Week 4                                                            | Block Diagrams                                                                                                                                    |
| Week 5                                                            | Signal-Flow Graphs (SFGs)                                                                                                                         |
| Week 6                                                            | State Variable Analysis                                                                                                                           |
| Week 7                                                            | Vector-Matrix Representation of State Equations                                                                                                   |
| Week 8                                                            | Transfer Functions, Relationship between State Equations and Transfer Function                                                                    |
| Week 9                                                            | From Differential Equations to State Diagram                                                                                                      |
| Week 10                                                           | <b>Exam</b>                                                                                                                                       |
| Week 11                                                           | State-Transition Matrix , State-Transition Equation                                                                                               |
| Week 12                                                           | Characteristic Equations, Similarity Transformation                                                                                               |
| Week 13                                                           | Controllability and Observability of Control Systems                                                                                              |
| Week 14                                                           | Time-Domain Analysis of Control Systems                                                                                                           |
| Week 15                                                           | Steady-State Error, Transient Response of a Second-Order System                                                                                   |
| Week 16                                                           | Preparatory week before the final Exam                                                                                                            |

| Learning and Teaching Resources<br>مصادر التعلم والتدريس |                                                                                                                                        |                           |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                          | Text                                                                                                                                   | Available in the Library? |
| Required Texts                                           | 1. Automatic Control Systems, (9th Edition), By: Golnaraghi and B. C. Kuo.                                                             |                           |
| Recommended Texts                                        | 2. Modern Control Engineering, (5th Edition), By: Katsuhiko Ogata.<br>3. Control Systems Engineering, (6th Edition) By: Norman S. Nise |                           |
| Websites                                                 |                                                                                                                                        |                           |

| Grading Scheme<br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 - 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |

نموذج وصف المادة الدراسية

| Module Information                                       |                                               |                                    |                                                                                                                                                                                                                                                                                 |                               |     |
|----------------------------------------------------------|-----------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----|
| معلومات المادة الدراسية                                  |                                               |                                    |                                                                                                                                                                                                                                                                                 |                               |     |
| Module Title                                             | Power System Analysis I<br>I تحليل نظم القدرة |                                    | Module Delivery                                                                                                                                                                                                                                                                 |                               |     |
| Module Type                                              | Core                                          |                                    | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar <div style="text-align: right;"><input type="checkbox"/> Lab</div> |                               |     |
| Module Code                                              | EEP401                                        |                                    |                                                                                                                                                                                                                                                                                 |                               |     |
| Number of Credit Hours (Total) / Number of Units (Total) | 3/3                                           |                                    |                                                                                                                                                                                                                                                                                 |                               |     |
|                                                          |                                               |                                    |                                                                                                                                                                                                                                                                                 |                               |     |
| Module Level                                             |                                               | 4                                  | Semester of Delivery                                                                                                                                                                                                                                                            |                               | 7   |
| Administering Department                                 |                                               | 2 - (Electrical Engineering)       | College                                                                                                                                                                                                                                                                         | UoM2 - (Engineering)          |     |
| Module Leader                                            | Dr. Omar Sh. AL-Yozbaky                       |                                    | e-mail                                                                                                                                                                                                                                                                          | o.yehya@uomosul.edu.iq        |     |
| Module Leader's Acad. Title                              |                                               | Assistant Prof.                    | Module Leader's Qualification                                                                                                                                                                                                                                                   |                               | PhD |
| Module Tutor                                             | Dr. Saad Enad Mohammed                        |                                    | e-mail                                                                                                                                                                                                                                                                          | saadmohamed@uomosul.edu.iq    |     |
| Peer Reviewer Name                                       |                                               | Prof. Dr. Ahmed Nasser B. Alsammak | e-mail                                                                                                                                                                                                                                                                          | ahmed_alsammak@uomosul.edu.iq |     |
| Scientific Committee Approval Date                       |                                               | 01/12/2025                         | Version Number                                                                                                                                                                                                                                                                  |                               | 1.0 |

| Relation with other Modules<br>العلاقة مع المواد الدراسية الأخرى |      |          |  |
|------------------------------------------------------------------|------|----------|--|
| Prerequisite module                                              | None | Semester |  |
| Co-requisites module                                             | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents<br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                                                                        | <p>The objective of Power system analysis is for designing entire power systems consisting of generators, transformers, capacitor banks, shunt elements, transmission lines and so on. Power system analysis makes sure the equipment works together so that the required power is delivered to the load centers at the prescribed voltage and frequency, and no component in the network is overloaded and no-fault condition jeopardizes the system.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                   | <ol style="list-style-type: none"> <li>1. Acquiring knowledge of modern techniques that support the development of electrical power stations.</li> <li>2. Understanding the basic concepts of troubleshooting in electrical power stations and transmission lines.</li> <li>3. Understanding the fundamentals of electrical power transmission and distribution.</li> <li>4. Understanding the basics of dealing with electrical power systems.</li> <li>5. Building the scientific foundation for students in the field of designing and constructing power systems and transmission lines.</li> <li>6. Training students on modern techniques in electrical fault diagnosis and repair.</li> <li>7. Studying the fundamental concepts of building high-quality power systems.</li> <li>8. Equipping students with scientific and practical skills to diagnose and repair faults in electrical power systems.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                                                                  | <p>Indicative content includes the following.</p> <p><b>Part A -</b><br/>Introduction; Syllabus; basic components of a power system, single line diagram, per unit analysis, generator, transformer, transmission line and load representation for different power system, Construction of Y-bus and Z-bus, Power-flow problem and equations [12 hrs.]<br/>Revision problem and tutorial classes [3 hrs.]<br/>Quizzes [1 hr.]</p> <p><b>Part B-</b><br/>Gauss-Seidel method for solving power-flow equations, Newton-Raphson method for solving power-flow equations, balanced three-phase fault, short-circuit capacity, Bus impedance matrix, Fault analysis using bus impedance matrix, Symmetrical components and unbalanced faults (Review), Economical Operation of Power System neglecting generator limits and line losses [15 hrs.]<br/>Revision problem and tutorial classes [4 hrs.]<br/>Quizzes [1 hr.]</p> <p><b>Part C-</b><br/>Economical Operation of Power System with generator limits and line losses. Introduction, Classification of Power System Stability. Dynamic Equation of Synchronous Machine, Stability Analysis Swing equation, Multi machine system, Machines swinging in unison or coherently Power flow under steady state, Steady-state Stability, Transient Stability-Equal area criterion Transient Stability Applications of sudden change in power input, Critical clearing angle and critical clearing time, Application of equal area criterion 1- Sudden loss of one parallel line 2-</p> |

|  |                                                                                                                                                                                                                           |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>sudden short circuit on one of parallel lines a) Short circuit at one end of line b) Short circuit at the middle of a line. [15 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]</p> <p>Quizzes [1 hr.]</p> |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>1- Electronic illustration tools, such as presentations, slides, images, videos, and others, can be used to clarify concepts and scientific information to students. These tools can be used to illustrate examples and practical applications, present graphs and charts to clarify relationships and processes, and demonstrate results and statistical data.</p> <p>2- Surprise daily tests can be conducted without prior notice to students to motivate them to regularly review the materials and prepare well for any test. These daily tests can be sudden and short-term, aiming to test students' immediate understanding of the study materials and concepts.</p> <p>As for weekly tests, they can be announced in advance to students, giving them sufficient time to prepare. The purpose of weekly tests is to assess the overall progress of students and their understanding of the study materials over a longer period.</p> <p>3- Students can be given the opportunity to participate in open discussion sessions on the study topics. These sessions can be organized to allow students to discuss scientific materials, exchange ideas and opinions, ask questions, and clarify any doubts. These discussion sessions can be organized as part of the lessons or as independent activities.</p> <p>Additionally, students can be assigned research tasks to explore the latest applications of the scientific subject matter.</p> |

| Module Evaluation     |                 |                 |                  |            |                           |
|-----------------------|-----------------|-----------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية |                 |                 |                  |            |                           |
| As                    |                 | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment  | Quizzes         | 3               | 10               | 4,8,12     | 1-2                       |
|                       | Assignments     | 5               | 10               | 2 to 12    | All                       |
|                       | Projects / Lab. | 0               | 0                | ----       | ----                      |
|                       | Report          | 1               | 10               | Continuous | All                       |
| Summative assessment  | Midterm Exam    | 1.5hr           | 10               | 8          | All                       |
|                       | Final Exam      | 3hr             | 60               | 16         | All                       |
| Total assessment      |                 |                 | 100% (100 Marks) |            |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br><b>المنهاج الاسبوعي النظري</b> |                                                                                                      |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <b>Week</b>                                                              | <b>Material Covered</b>                                                                              |
| <b>Week 1</b>                                                            | Introduction: Need for system planning and operational studies - basic components of a power system. |
| <b>Week 2</b>                                                            | Introduction is restructuring - single line diagram-per phase.                                       |
| <b>Week 3</b>                                                            | Per unit analysis - generator – transformer representation for different power system: studies.      |

|                |                                                                                                              |
|----------------|--------------------------------------------------------------------------------------------------------------|
| <b>Week 4</b>  | Transmission line and load Primitive Network: Construction of Y-bus using inspection transformation methods. |
| <b>Week 5</b>  | Construction of Z-bus using inspection transformation methods.                                               |
| <b>Week 6</b>  | Power Flow Analysis: Importance of power flow analysis to planning and operation of power systems.           |
| <b>Week 7</b>  | Statement of power flow problem.                                                                             |
| <b>Week 8</b>  | Mid-term EXAM                                                                                                |
| <b>Week 9</b>  | classification of buses.                                                                                     |
| <b>Week 10</b> | development of power flow model in complex variables form.                                                   |
| <b>Week 11</b> | Iterative solution using Gauss Seidel method.                                                                |
| <b>Week 12</b> | Numerical Solution of power flow using Newton- Raphson method.                                               |
| <b>Week 13</b> | Iterative solution using fast De-couple method.                                                              |
| <b>Week 14</b> | MATLAB Applications in Load Flow Analysis                                                                    |
| <b>Week 15</b> | Final Exam.                                                                                                  |

| <b>Learning and Teaching Resources</b><br><b>مصادر التعلم والتدريس</b> |                                                                                                                                                                                                                                                                                                            |                                  |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                        | <b>Text</b>                                                                                                                                                                                                                                                                                                | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                                  | Power system analysis<br>by Hadi Saadat<br><a href="http://powerunit-ju.com/wp-content/uploads/2016/11/Power-System-Analysis-by-Hadi-Saadat-Electrical-Engineering-libre.pdf">http://powerunit-ju.com/wp-content/uploads/2016/11/Power-System-Analysis-by-Hadi-Saadat-Electrical-Engineering-libre.pdf</a> | NO                               |
| <b>Recommended Texts</b>                                               | Power System Analysis<br>By Emeritus John J. Grainger and William D. Stevenson                                                                                                                                                                                                                             | NO                               |
| <b>Websites</b>                                                        |                                                                                                                                                                                                                                                                                                            |                                  |

| <b>Grading Scheme</b><br><b>مخطط الدرجات</b> |                         |                     |                  |                                       |
|----------------------------------------------|-------------------------|---------------------|------------------|---------------------------------------|
| <b>Group</b>                                 | <b>Grade</b>            | <b>التقدير</b>      | <b>Marks (%)</b> | <b>Definition</b>                     |
| <b>Success Group<br/>(50 - 100)</b>          | <b>A - Excellent</b>    | امتياز              | 90 - 100         | Outstanding Performance               |
|                                              | <b>B - Very Good</b>    | جيد جدا             | 80 - 89          | Above average with some errors        |
|                                              | <b>C - Good</b>         | جيد                 | 70 - 79          | Sound works with notable errors       |
|                                              | <b>D - Satisfactory</b> | متوسط               | 60 - 69          | Fair but with major shortcomings      |
|                                              | <b>E - Sufficient</b>   | مقبول               | 50 - 59          | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>               | <b>FX – Fail</b>        | راسب (قيد المعالجة) | (45-49)          | More work required but credit awarded |
|                                              | <b>F – Fail</b>         | راسب                | (0-44)           | Considerable amount of work required  |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

### نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                                 |                                                                                                                                                                                                        |
|------------------------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module Title                                         | Power System Protection I<br>I نظم حماية القدرة | Module Delivery                                                                                                                                                                                        |
| Module Type                                          | Core                                            | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab 7<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical |
| Module Code                                          | EEP402                                          |                                                                                                                                                                                                        |
| Number of Credit Hours (Total) / Number of Units     | 3/2                                             |                                                                                                                                                                                                        |

|                                    |                                       |                               |  |                                  |
|------------------------------------|---------------------------------------|-------------------------------|--|----------------------------------|
| (Total)                            |                                       |                               |  |                                  |
|                                    |                                       |                               |  | <input type="checkbox"/> Seminar |
| Module Level                       | UGx11 4                               | Semester of Delivery          |  | 7                                |
| Administering Department           | 2 - (Electrical Engineering)          | College                       |  | UoM2 - (Engineering)             |
| Module Leader                      | Dr. Omar Sh. AL-Yozbaky               | e-mail                        |  | o.yehya@uomosul.edu.iq           |
| Module Leader's Acad. Title        | Prof                                  | Module Leader's Qualification |  | PhD                              |
| Module Tutor                       | Dr. Shaker Mahmood Khudher            | e-mail                        |  | shakeralhyane@uomosul.edu.iq     |
| Peer Reviewer Name                 | Prof. Dr. Ahmed Nasser<br>B. Alsammak | e-mail                        |  | ahmed_alsammak@uomosul.edu.iq    |
| Scientific Committee Approval Date | 01/12/2025                            | Version Number                |  | 1.0                              |

| Relation with other Modules<br>العلاقة مع المواد الدراسية الأخرى                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |  |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--|
| Prerequisite module                                                                                                | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Semester |  |
| Co-requisites module                                                                                               | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Semester |  |
| Module Aims, Learning Outcomes and Indicative Contents<br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |  |
| Module Aims<br>أهداف المادة الدراسية                                                                               | <p>The aim of this course is to:</p> <ul style="list-style-type: none"> <li>• The development and applications of switchgear and protective relaying systems.</li> <li>• The construction, operation, and characteristics of H.R.C. fuses.</li> <li>• Circuit breakers as protective and isolating equipment.</li> <li>• The philosophy and requirements of protective devices in power systems.</li> <li>• The role and operation of current transformers and voltage transformers.</li> <li>• Overcurrent and earth-fault protection principles and requirements.</li> <li>• Directional protection for looped circuits.</li> <li>• High-impedance and low-impedance differential protection principles.</li> <li>• Power transformer protection schemes.</li> <li>• Bus-bar differential protection principles and applications..</li> </ul> |          |  |
| Module Learning Outcomes                                                                                           | Upon successful completion of this module, students will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |  |

مخرجات التعلم للمادة  
الدراسية

1. **Explain** the fundamental principles, evolution, and applications of switchgear and protective relaying systems in modern power networks.
2. **Describe and analyze** the construction, operation, and performance characteristics of protective devices such as H.R.C. fuses and circuit breakers.
3. **Evaluate** the philosophy of power system protection, including selectivity, sensitivity, reliability, speed, and stability.
4. **Apply** the principles of current transformers (CTs) and voltage transformers (VTs) for measurement and protection purposes, including ratio selection and error analysis.
5. **Design and assess** overcurrent and earth-fault protection schemes based on system requirements and fault conditions.
6. **Analyze** directional protection techniques for looped and interconnected power systems.
7. **Compare and justify** the use of high-impedance and low-impedance differential protection schemes for various power system components.
8. **Develop** appropriate protection schemes for power transformers, considering different types of internal and external faults.
9. **Design and evaluate** bus-bar protection schemes using differential relaying techniques.
10. **Integrate** multiple protection strategies to ensure coordinated and reliable protection of electrical power systems.

#### CLO Reference

**CLO1:** Explain the fundamentals, classification, and development of switchgear and protective relaying systems in modern power systems.

**CLO2:** Describe the construction, operation, and performance characteristics of H.R.C. fuses and evaluate their applications in fault protection.

**CLO3:** Analyze the operating principles, types, and arc extinction methods of circuit breakers as protective and isolating devices.

**CLO4:** Evaluate the philosophy of power system protection, including selectivity, sensitivity, reliability, speed, and stability.

**CLO5:** Apply the principles of current transformers (CTs) and voltage transformers (VTs), including ratio selection, errors, and their role in protection schemes.

**CLO6:** Design and assess overcurrent and earth-fault protection schemes,

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           | <p>including relay characteristics and coordination requirements.</p> <p><b>CLO7:</b> Analyze directional protection schemes for looped and interconnected power systems.</p> <p><b>CLO8:</b> Compare and apply high-impedance and low-impedance differential protection schemes for various power system components.</p> <p><b>CLO9:</b> Develop appropriate protection schemes for power transformers, including differential and restricted earth fault (REF) protection.</p> <p><b>CLO10:</b> Design and evaluate bus-bar differential protection schemes for reliable and fast fault clearance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p style="text-align: center;"><b>Part A – Switchgear and Fundamental Protection Concepts</b></p> <p>Overview of switchgear and protective relaying systems, including their development and role in modern power systems.<br/>H.R.C. fuses: construction, operation, and characteristics.<br/>Circuit breakers: types, operating mechanisms, and their use as protective and isolating equipment.<br/>Protection philosophy: selectivity, sensitivity, reliability, speed, and stability.<br/>[10 hrs.]</p> <p style="text-align: right;"><b>Revision problems and tutorial classes</b> [2 hrs.]<br/><b>Quizzes</b> [1 hr.]</p> <p style="text-align: center;"><b>Part B – Instrument Transformers and Overcurrent Protection</b></p> <p>Current transformers (CTs) and voltage transformers (VTs): construction, principles, errors, and applications in protection.<br/>Overcurrent and earth-fault protection: principles, relay characteristics, grading, and coordination.<br/>Directional protection for looped and interconnected systems.<br/>[11 hrs.]</p> <p style="text-align: right;"><b>Revision problems and tutorial classes</b> [2 hrs.]</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p style="text-align: right;"><b>Quizzes</b> [1 hr.]</p> <p style="text-align: center;"><b>Part C – Differential Protection and Power System Equipment Protection</b></p> <p>Differential protection principles: high-impedance and low-impedance schemes, stability considerations, and applications.<br/> Power transformer protection: differential protection, restricted earth fault (REF), Buchholz relay, and overfluxing protection.<br/> Bus-bar protection: differential protection schemes, zone selection, and high-speed fault clearance.<br/> Integration and coordination of protection systems in modern power networks.<br/> [6 hrs.]</p> <p style="text-align: right;"><b>Revision problems and tutorial classes</b> [1 hr.]<br/> <b>Quizzes</b> [1 hr.]</p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Strategies</b>                                                      | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through</p> <ol style="list-style-type: none"> <li>1. Formal face-to-face lectures, which provide you with a focus on the core analytical material in the course, together with qualitative, alternative explanations to aid your understanding.</li> <li>2. Tutorials, which allow for exercises in problem solving and allow time for you to resolve problems in understanding of lecture material.</li> </ol> |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |                 |                  |            |                           |
|---------------------------------------------------|------------------------|-----------------|------------------|------------|---------------------------|
| As                                                |                        | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| <b>Formative assessment</b>                       | <b>Quizzes</b>         | 3               | 8% (8)           | 4,8,12     | LO #1–2, 3–5, 6–8         |
|                                                   | <b>Assignments</b>     | 4               | 5% (5)           | 2 to 12    | LO #1–2, 3–5              |
|                                                   | <b>Projects / Lab.</b> | 0               | 0                |            |                           |
|                                                   | <b>Report</b>          | 1               | 7% (7)           | Continuous | All                       |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b>    | 1.5 hr          | 20% (20)         | 8          | LO #1–5                   |
|                                                   | <b>Final Exam</b>      | 3hr             | 60% (60)         | 16         | All                       |
| <b>Total assessment</b>                           |                        |                 | 100% (100 Marks) |            |                           |

|                                        |
|----------------------------------------|
| <b>Delivery Plan (Weekly Syllabus)</b> |
|----------------------------------------|

| المناهج الاسبوعي النظري |                                                                                                                   |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|
| Week                    | Material Covered                                                                                                  |
| Week 1                  | Overview of switch-gears and protective relaying systems and their developments                                   |
| Week 2                  | Overview of switch-gears and protective relaying systems and their developments                                   |
| Week 3                  | H.R.C. Fuse: Construction and characteristics                                                                     |
| Week 4                  | H.R.C. Fuse: Construction and characteristics                                                                     |
| Week 5                  | Circuit Breakers as protective isolating equipment                                                                |
| Week 6                  | Circuit Breakers as protective isolating equipment                                                                |
| Week 7                  | Protective devices and their philosophy of protection, including                                                  |
| Week 8                  | Mid-Semester Exam                                                                                                 |
| Week 9                  | Current and voltage transformers CTs & VTs                                                                        |
| Week 10                 | Current and voltage transformers CTs & VTs                                                                        |
| Week 11                 | Overcurrent and earth fault protection and their requirements                                                     |
| Week 12                 | Protection of looped circuits using directional                                                                   |
| Week 13                 | High impedance and low impedance differential current protective relaying principles of operation and application |
| Week 14                 | Power transformer protection                                                                                      |
| Week 15                 | Bus-bar differential current protective relay                                                                     |

| Learning and Teaching Resources |                                                                                                                                                                          |                     |           |                                       |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------|---------------------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                                          |                     |           |                                       |
|                                 | Text                                                                                                                                                                     |                     |           | Available in the Library?             |
| Required Texts                  | حماية نظم القدرة /د عبدالغني عبدالرزاق                                                                                                                                   |                     |           | Yes                                   |
| Recommended Texts               | 1- FUNDAMENTALS OF POWER SYSTEM PROTECTION by Y.G. Paithankar and S.R. Bhide,2003.<br>2- TRANSMISSION NETWORK PROTECTION: THEORY AND PRACTICE by Yeshwant G. Paithankar. |                     |           | No                                    |
| Grading Scheme                  |                                                                                                                                                                          |                     |           |                                       |
| مخطط الدرجات                    |                                                                                                                                                                          |                     |           |                                       |
| Group                           | Grade                                                                                                                                                                    | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)     | A - Excellent                                                                                                                                                            | امتياز              | 90 - 100  | Outstanding Performance               |
|                                 | B - Very Good                                                                                                                                                            | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                 | C - Good                                                                                                                                                                 | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                 | D - Satisfactory                                                                                                                                                         | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                 | E - Sufficient                                                                                                                                                           | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)          | FX – Fail                                                                                                                                                                | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                 | F – Fail                                                                                                                                                                 | راسب                | (0-44)    | Considerable amount of work required  |
|                                 |                                                                                                                                                                          |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

### نموذج وصف المادة الدراسية

| Module Information                                       |                                                     |                               |                                                                                                                                                                                                                                          |  |
|----------------------------------------------------------|-----------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| معلومات المادة الدراسية                                  |                                                     |                               |                                                                                                                                                                                                                                          |  |
| Module Title                                             | High Voltage Engineering I<br>هندسة الضغط العالي II |                               | Module Delivery                                                                                                                                                                                                                          |  |
| Module Type                                              | Core                                                |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |  |
| Module Code                                              | EEP404                                              |                               |                                                                                                                                                                                                                                          |  |
| Number of Credit Hours (Total) / Number of Units (Total) | 3/2                                                 |                               |                                                                                                                                                                                                                                          |  |
|                                                          |                                                     |                               |                                                                                                                                                                                                                                          |  |
| Module Level                                             | UGx11 4                                             | Semester of Delivery          | 7                                                                                                                                                                                                                                        |  |
| Administering Department                                 | 2 - (Electrical Engineering)                        | College                       | Engineering                                                                                                                                                                                                                              |  |
| Module Leader                                            | Dr. Omar Sh. AL-Yozbak                              | e-mail                        | o.yehya@uomosul.edu.iq                                                                                                                                                                                                                   |  |
| Module Leader's Acad. Title                              | Assistant Prof.                                     | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                                                    |  |

|                                           |                                    |                       |                               |
|-------------------------------------------|------------------------------------|-----------------------|-------------------------------|
| <b>Module Tutor</b>                       | Dr. Dawood Najem Saleh             | <b>e-mail</b>         | dnsaij@uomosul.edu.iq         |
| <b>Peer Reviewer Name</b>                 | Prof. Dr. Ahmed Nasser B. Alsammak | <b>e-mail</b>         | ahmed_alsammak@uomosul.edu.iq |
| <b>Scientific Committee Approval Date</b> | 01/12/2025                         | <b>Version Number</b> | 1.0                           |

| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |      |                 |  |
|-------------------------------------------------------------------------|------|-----------------|--|
| <b>Prerequisite module</b>                                              | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>                                             | None | <b>Semester</b> |  |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                                                                               | <p><b>The module's aims can be inferred from the course description and objectives:</b></p> <ol style="list-style-type: none"> <li>1- To introduce students to the <b>fundamentals of high voltage engineering</b> and its applications.</li> <li>2- To develop an understanding of <b>electrical insulation behavior and design</b> under high voltage stress.</li> <li>3- To study <b>breakdown mechanisms</b> in gases, liquids, and solid materials.</li> <li>4- To provide knowledge of <b>high voltage generation techniques</b> (AC, DC, and impulse).</li> <li>5- To emphasize <b>safety, testing methods, and protection systems</b> in high voltage environments.</li> <li>6- To prepare students for <b>practical and industrial applications</b> in power systems and related fields.</li> </ol>                                                                                                                                                                                                                          |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                          | <p><b>By the end of the course, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. <b>Understand High Voltage Fundamentals</b> <ol style="list-style-type: none"> <li>a. Explain principles of high voltage generation and measurement.</li> <li>b. Analyze electric field distribution and breakdown mechanisms.</li> </ol> </li> <li>2. <b>Study Insulation Materials &amp; Techniques</b> <ol style="list-style-type: none"> <li>a. Evaluate insulation materials and their behavior.</li> <li>b. Apply insulation coordination in system design.</li> </ol> </li> <li>3. <b>Learn High Voltage Testing &amp; Safety</b> <ol style="list-style-type: none"> <li>a. Apply standard testing methods for HV equipment.</li> <li>b. Follow safety procedures in HV laboratories.</li> </ol> </li> <li>4. <b>Explore High Voltage Equipment &amp; Applications</b> <ol style="list-style-type: none"> <li>a. Describe operation of transformers, circuit breakers, and surge arresters.</li> </ol> </li> </ol> |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           | <p>b. Identify industrial and power system applications.</p> <p>5. <b>Analyze Overvoltages &amp; Protection Techniques</b></p> <p>a. Explain lightning and switching overvoltages.</p> <p>b. Apply protection methods such as grounding and shielding.</p> <p>6. <b>Prepare for Industry &amp; Research</b></p> <p>a. Solve practical high voltage engineering problems.</p> <p>b. Understand modern trends like HVDC and smart grids.</p>                                                                                                                                        |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p><b>The indicative contents are based on the course topics:</b></p> <ul style="list-style-type: none"> <li>• Electric field in high voltage engineering</li> <li>• Electrical breakdown theory</li> <li>• Breakdown in gases</li> <li>• Breakdown in liquids</li> <li>• Breakdown in solid materials</li> <li>• Generation of high voltages <ul style="list-style-type: none"> <li>o AC high voltages</li> <li>o DC high voltages</li> <li>o Impulse voltages</li> </ul> </li> <li>• High voltage applications and systems</li> <li>• Tutorial and revision sessions</li> </ul> |

| <p><b>Learning and Teaching Strategies</b><br/>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                       | <ol style="list-style-type: none"> <li>1. Lectures: Traditional lectures can be used to deliver theoretical concepts, principles, and foundational knowledge of high voltage engineering. Instructors can present information using visual aids, multimedia presentations, and demonstrations to enhance understanding.</li> <li>2. Laboratory Work: Practical laboratory sessions allow students to apply theoretical knowledge to real-world scenarios. Hands-on experiments involving high voltage equipment, measurement techniques, and diagnostic tools can help students gain practical skills and reinforce theoretical concepts.</li> <li>3. Case Studies: Engaging students in case studies and real-world examples can provide a deeper understanding of high voltage engineering principles. Analyzing and solving problems encountered in actual high voltage systems can develop critical thinking and problem-solving skills.</li> <li>4. Group Discussions and Brainstorming: Encouraging students to participate in group discussions and brainstorming sessions fosters active learning. It promotes collaboration, idea sharing, and the exploration of different perspectives on high voltage engineering topics.</li> <li>5. Simulations and Virtual Laboratories: Utilizing computer-based simulations and virtual laboratories can provide a safe and interactive learning environment. Students can simulate high voltage systems, perform experiments, and observe the outcomes, allowing for experimentation and exploration of different scenarios.</li> <li>6. Guest Lectures and Industry Experts: Inviting guest lecturers from industry or research institutions can provide valuable insights into practical applications, current trends, and</li> </ol> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>emerging technologies in high voltage engineering. It offers students exposure to real-world experiences and industry perspectives.</p> <ol style="list-style-type: none"> <li>7. Problem-Solving Exercises: Assigning problem sets and exercises related to high voltage engineering challenges students to apply their knowledge and skills to solve specific problems. These exercises can range from calculations and design tasks to analyzing system failures and proposing solutions.</li> <li>8. Field Trips and Site Visits: Organizing field trips or site visits to high voltage substations, power plants, or testing facilities allows students to observe high voltage equipment in operation and gain a practical understanding of the engineering practices in real-world settings.</li> <li>9. Multimedia Resources and Online Platforms: Utilizing multimedia resources, such as video lectures, online tutorials, and interactive learning platforms, can supplement classroom teaching and provide students with additional resources for self-study and revision.</li> <li>10. Assessment and Feedback: Regular assessments, including quizzes, exams, and projects, help gauge students' understanding and progress. Providing constructive feedback on their performance enables them to identify areas for improvement and reinforce their learning.</li> </ol> |
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| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |                 |                  |            |                              |
|---------------------------------------------------|------------------------|-----------------|------------------|------------|------------------------------|
|                                                   | As                     | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning<br>Outcome |
| <b>Formative<br/>assessment</b>                   | <b>Quizzes</b>         | 3               | 10               | 3, 6, 10   | LO #1, 2,3, and 4            |
|                                                   | <b>Assignments</b>     | 4               | 10               | 4, 7, 12   | LO #2, 3, 5, 6, 7            |
|                                                   | <b>Projects / Lab.</b> | 0               | 0                |            |                              |
|                                                   | <b>Report</b>          | 1               | 10               | Continuous | All                          |
| <b>Summative<br/>assessment</b>                   | <b>Midterm Exam</b>    | 1.5             | 10               | 8          | LO # 1-8                     |
|                                                   | <b>Final Exam</b>      | 3               | 60               | 16         | All                          |
| <b>Total assessment</b>                           |                        |                 | 100% (100 Marks) |            |                              |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                              |
|-------------------------------------------------------------------|----------------------------------------------|
| Week                                                              | Material Covered                             |
| Week 1                                                            | Electrical field in high voltage engineering |
| Week 2                                                            | Electrical field in high voltage engineering |
| Week 3                                                            | Electrical breakdown theory                  |
| Week 4                                                            | Breakdown mechanism of gases                 |
| Week 5                                                            | Breakdown mechanism of gases                 |
| Week 6                                                            | Breakdown mechanism of gases                 |
| Week 7                                                            | Breakdown mechanism of liquids               |
| Week 8                                                            | Breakdown mechanism of solid materials       |
| Week 9                                                            | Generation of high voltages                  |
| Week 10                                                           | Generation of high AC voltages               |

|                |                                                              |
|----------------|--------------------------------------------------------------|
| <b>Week 11</b> | Generation of high AC voltages                               |
| <b>Week 12</b> | Generation of high DC voltages                               |
| <b>Week 13</b> | Generation of high impulse voltages                          |
| <b>Week 14</b> | Tutorial and revision                                        |
| <b>Week 15</b> | Final review / preparation (or final assessment if required) |
| <b>Week 16</b> | <b>Final Exam</b>                                            |

| <b>Learning and Teaching Resources</b><br><b>مصادر التعلم والتدريس</b> |                                                                                                                                                                     |                                  |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                                                                        | <b>Text</b>                                                                                                                                                         | <b>Available in the Library?</b> |
| <b>Required Texts</b>                                                  | 1. Andreas Küchler, High voltage Engineering, Springer-Verlag GmbH Germany, 2018.<br>2. C.L. Wadhwa, High Voltage Engineering, 2nd ed., New Age International, 2007 | Yes                              |
| <b>Recommended Texts</b>                                               | E. Kuffel, W.S. Zaengl, and J. Kuffel, High Voltage Engineering: Fundamentals, 2nd edition, Butterworth Heinemann, 2000.                                            | No                               |
| <b>Websites</b>                                                        |                                                                                                                                                                     |                                  |

| <b>Grading Scheme</b><br><b>مخطط الدرجات</b>                                                                                                                                                                                                                                                                                                                                         |                         |                     |                  |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|------------------|---------------------------------------|
| <b>Group</b>                                                                                                                                                                                                                                                                                                                                                                         | <b>Grade</b>            | <b>التقدير</b>      | <b>Marks (%)</b> | <b>Definition</b>                     |
| <b>Success Group (50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                      | <b>A - Excellent</b>    | امتياز              | 90 - 100         | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B - Very Good</b>    | جيد جدا             | 80 - 89          | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C - Good</b>         | جيد                 | 70 - 79          | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D - Satisfactory</b> | متوسط               | 60 - 69          | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E - Sufficient</b>   | مقبول               | 50 - 59          | Work meets minimum criteria           |
| <b>Fail Group (0 - 49)</b>                                                                                                                                                                                                                                                                                                                                                           | <b>FX – Fail</b>        | راسب (قيد المعالجة) | (45-49)          | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F – Fail</b>         | راسب                | (0-44)           | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |                  |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |                  |                                       |

نموذج وصف المادة الدراسية

**Module Information**

| معلومات المادة الدراسية                                  |                                                        |                                                               |                                                                                                                                                                                                                                                                                             |                                                                  |     |
|----------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----|
| Module Title                                             | Special Electrical Machines I<br>I مكائن كهربائية خاصة |                                                               | Module Delivery                                                                                                                                                                                                                                                                             |                                                                  |     |
| Module Type                                              | Core                                                   |                                                               | <div><input checked="" type="checkbox"/> Theory</div> <div><input type="checkbox"/> Lecture</div> <div><input type="checkbox"/> Lab</div> <div><input checked="" type="checkbox"/> Tutorial</div> <div><input type="checkbox"/> Practical</div> <div><input type="checkbox"/> Seminar</div> |                                                                  |     |
| Module Code                                              | EEP403                                                 |                                                               |                                                                                                                                                                                                                                                                                             |                                                                  |     |
| Number of Credit Hours (Total) / Number of Units (Total) | 2/3                                                    |                                                               |                                                                                                                                                                                                                                                                                             |                                                                  |     |
|                                                          |                                                        |                                                               |                                                                                                                                                                                                                                                                                             |                                                                  |     |
| Module Level                                             |                                                        | UGx11 4                                                       | Semester of Delivery                                                                                                                                                                                                                                                                        |                                                                  | 7   |
| Administering Department                                 |                                                        | 2 - (Electrical Engineering)                                  | College                                                                                                                                                                                                                                                                                     | UoM2 - (Engineering)                                             |     |
| Module Leader                                            |                                                        | Dr. Omar Sh. AL-Yozbak                                        | e-mail                                                                                                                                                                                                                                                                                      | o.yehya@uomosul.edu.iq                                           |     |
| Module Leader's Acad. Title                              |                                                        | Ass. Prof.                                                    | Module Leader's Qualification                                                                                                                                                                                                                                                               |                                                                  | PhD |
| Module Tutor                                             |                                                        | Prof. Dr. Ahmed Nasser B. Alsammak<br>Mr. Omar Turath Tawfeeq | e-mail                                                                                                                                                                                                                                                                                      | ahmed_alsammak@uomosul.edu.iq<br>omartawfeeq_1981@uomosul.edu.iq |     |
| Peer Reviewer Name                                       |                                                        | Prof. Dr. Ahmed Nasser B. Alsammak                            | e-mail                                                                                                                                                                                                                                                                                      | ahmed_alsammak@uomosul.edu.iq                                    |     |
| Scientific Committee Approval Date                       |                                                        | 01/12/2025                                                    | Version Number                                                                                                                                                                                                                                                                              |                                                                  | 1.0 |

| Relation with other Modules<br>العلاقة مع المواد الدراسية الأخرى |      |          |  |
|------------------------------------------------------------------|------|----------|--|
| Prerequisite module                                              | None | Semester |  |
| Co-requisites module                                             | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents<br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module Aims<br>أهداف المادة الدراسية                                                                               | 1. To develop skills and understanding of principles of operation single-phase machines.<br>2. To develop skills and knowledge of the construction of single-phase machines. |

|                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                      | <ol style="list-style-type: none"> <li>To perform equivalent circuit analysis of a single-phase Phase Induction Motor (SPIM).</li> <li>To perform cross-field and double-field revolving theory of SPIM.</li> <li>To understand starting problem of SPIM.</li> <li>This course deals with all operating conditions of SPIM.</li> <li>To improve the starting condition of SPIM.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Module Learning Outcomes</b><br><br>مخرجات التعلم للمادة الدراسية | <p style="text-align: right;"><b>At the end of this course, students can:</b></p> <ol style="list-style-type: none"> <li>Explain electro-mechanical energy conversion concepts and their application in electrical machines.</li> <li>Categorize various types of electrical machines and it is starting.</li> <li>Analyze electrical machines individually.</li> <li>Recognize SPIM and its applications.</li> <li>Discuss the various operating conditions of SPIM.</li> <li>Explain the two field theories that were used to start SPIM.</li> <li>Explain the Analysis equivalent circuit of the SPIM in different cases.</li> <li>Explain the starting torque of the SPIM.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Indicative Contents</b><br><br>المحتويات الإرشادية                | <p>Indicative content includes the following.</p> <p><b><u>Part A – Starting Problems and distributed field</u></b><br/> Introduction, Single phase induction motors (SPIM): Principal of operations, Types of SPIM, Motors with main winding only, Cross field theory, Rotating field theory (Double-field revolving theory), Transformer voltage, Rotational voltage, Torque speed characteristic, Fields in SPIM. [14 hrs.]</p> <p>Revision problem and tutorial classes [5 hrs.]<br/> Quizzes [1 hr.]</p> <p><b><u>Part B- Equivalent Circuit and Modeling Cases</u></b><br/> Equivalent circuit, Power diagram, Two phase induction motor, Symmetrical two-phase motor supplied from two-phase balance system, Symmetrical two-phase motor supplied from two phase unbalance system, Unsymmetrical two-phase motor supplied from two phase unbalance system. [16 hrs.]</p> <p style="text-align: right;">Revision problem and tutorial classes [12 hrs.]<br/> Quizzes [1 hr.]</p> <p><b><u>Part C- Special cases and starting Torque</u></b><br/> Special cases, SPIM with main and auxiliary windings, Improvement of torque production in SPIM, starting torque, adding resistance with auxiliary winding, adding capacitor with auxiliary winding, and performance improvement. [6 hrs.]</p> <p>Revision problem and tutorial classes [4 hrs.]<br/> Quizzes [1 hr.]</p> |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                 |                 |                  |            |                              |
|---------------------------------------------------|-----------------|-----------------|------------------|------------|------------------------------|
| As                                                |                 | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning<br>Outcome |
| Formative<br>assessment                           | Quizzes         | 3               | 10               | 3, 10, 12  | LO #3,5, and 8               |
|                                                   | Assignments     | 3               | 10               | 2 to 12    | LO #1, 2, 6, 7 and 8         |
|                                                   | Projects / Lab. | 0               | 0                | ----       | ----                         |
|                                                   | Report          | 1               | 10               | Continuous | All                          |
| Summative<br>assessment                           | Midterm Exam    | 2 hr            | 10               | 8          | LO # 1-8                     |
|                                                   | Final Exam      | 3hr             | 60               | 16         | All                          |
| Total assessment                                  |                 |                 | 100% (100 Marks) |            |                              |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                   |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Week                                                              | Material Covered                                                                  |
| Week 1                                                            | Introduction, single-phase induction motors (SPIM): Principal of operations       |
| Week 2                                                            | Types of SPIM, motors with main winding only,                                     |
| Week 3                                                            | Cross-field theory, rotating field theory (Double-field revolving theory)         |
| Week 4                                                            | Transformer voltage, rotational voltage, Torque speed characteristic,             |
| Week 5                                                            | Fields in SPIM.                                                                   |
| Week 6                                                            | Equivalent circuit in SPIM                                                        |
| Week 7                                                            | Power diagram in SPIM                                                             |
| Week 8                                                            | Symmetrical two-phase motor supplied from two-phase balance system                |
| Week 9                                                            | Symmetrical two-phase motor supplied from two phase unbalance system              |
| Week 10                                                           | Unsymmetrical two-phase motor supplied from two phase unbalance system.           |
| Week 11                                                           | Improvement of torque production in SPIM, starting torque,                        |
| Week 12                                                           | Effect of adding resistance with auxiliary winding on the starting torque of SPIM |
| Week 13                                                           | Special cases of SPIM with main and auxiliary windings,                           |
| Week 14                                                           | Effect of adding capacitor with auxiliary winding on the starting torque of SPIM  |
| Week 15                                                           | Performance improvement of SPIM                                                   |
| Week 16                                                           | Preparatory week before the final Exam                                            |

| Learning and Teaching Resources |                                                                                                                                                                                                                                     |                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                                                                                                     |                           |
|                                 | Text                                                                                                                                                                                                                                | Available in the Library? |
| Required Texts                  | 1- Rotating electrical machine, S.K. Sen, 1975<br>2- Alternating current machines, M.G. Say, 1984<br>3- Electric Machinery and their Application, J.Hindmarsh 3rd, 1979<br>مكائن التيار المتناوب ، د.باسل محمد و د.ضياء علي، 1989-4 | Yes                       |
| Recommended Texts               | 1- Electrical Machinery, A. E. Fitzgerald, Charles Kingsley, Jr., Stephen D. Umans, 2003.<br>2- Electric Machinery Fundamentals, Stephen J. Chapman, 2005<br>3- Electric Motors and Drives, Austin Hughes, 3rd, 2006                | No                        |
| Websites                        | Electromechanical Motion Devices, Second Edition, Paul Krause, Oleg Wasynczuk, Steven Pekarek, Wiley-IEEE Press, Year: 2012                                                                                                         | NO                        |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                  |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
|                                                                                                                                                                                                                                                                                                                                                                                      | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |

نموذج وصف المادة الدراسية

| Module Information                                       |                                                                       |                              |                                                                                                                                                                                                                                          |                                                                    |   |
|----------------------------------------------------------|-----------------------------------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|---|
| معلومات المادة الدراسية                                  |                                                                       |                              |                                                                                                                                                                                                                                          |                                                                    |   |
| Module Title                                             | Electrical Power Generation Stations<br>محطات توليد القدرة الكهربائية |                              | Module Delivery                                                                                                                                                                                                                          |                                                                    |   |
| Module Type                                              | Core learning activity                                                |                              | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                                                                    |   |
| Module Code                                              | EEP406                                                                |                              |                                                                                                                                                                                                                                          |                                                                    |   |
| Number of Credit Hours (Total) / Number of Units (Total) | 3/2                                                                   |                              |                                                                                                                                                                                                                                          |                                                                    |   |
|                                                          |                                                                       |                              |                                                                                                                                                                                                                                          |                                                                    |   |
| Module Level                                             |                                                                       | 4                            | Semester of Delivery                                                                                                                                                                                                                     |                                                                    | 7 |
| Administering Department                                 |                                                                       | 2 - Department of Electrical | College                                                                                                                                                                                                                                  | Engineering                                                        |   |
| Module Leader                                            | Dr.Omar Sh. Alyozbak                                                  |                              | e-mail                                                                                                                                                                                                                                   | <a href="mailto:o.yehya@uomosul.edu.iq">o.yehya@uomosul.edu.iq</a> |   |

|                                           |                              |                                      |                                                                                              |
|-------------------------------------------|------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------|
| <b>Module Leader's Acad. Title</b>        | Head of Dept.                | <b>Module Leader's Qualification</b> | PhD                                                                                          |
| <b>Module Tutor</b>                       | Dr. Mohammad A. A. Aljuboori | <b>e-mail</b>                        | <a href="mailto:mohammadalijuboori66@uomosul.edu.iq">mohammadalijuboori66@uomosul.edu.iq</a> |
| <b>Peer Reviewer Name</b>                 | Dr. Mohammad A. A. Aljuboori | <b>e-mail</b>                        | <a href="mailto:mohammadalijuboori66@uomosul.edu.iq">mohammadalijuboori66@uomosul.edu.iq</a> |
| <b>Scientific Committee Approval Date</b> | 1/12/2025                    | <b>Version Number</b>                | 1.1                                                                                          |

### Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                             |             |                 |  |
|-----------------------------|-------------|-----------------|--|
| <b>Prerequisite module</b>  | AC Machines | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None        | <b>Semester</b> |  |

### Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | This unit aims to introduce students to various power generation technologies, such as thermal power plants, hydroelectric power plants, nuclear power plants, and others in addition to direct generation systems. It covers their characteristics, operating principles, components, efficiency, primary energy sources, and provides examples of power generation calculations. The unit also explains voltage and frequency regulation in power plants.                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1- Define about primary energy sources, their classifications, generator construction and operation.</li> <li>2- Understand and study the equipment attached to power plants.</li> <li>3- Study the construction, operation, and components of thermal power plants, and calculate efficiency and fuel quantities.</li> <li>4- understand the construction and operation of gas turbines and diesel generators, fuel calculations, and work within combined cycle power plants.</li> <li>5- Identify hydropower plants, study their classifications according to height, its parts and operation and calculations with examples.</li> <li>6- Study the operation and installation of nuclear power plants.</li> <li>7- Understand the direct energy generation systems in general.</li> </ol> |

|                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                | <p>8- Define Magneto-hydrodynamic generator (MHD): its structure and operation with its open-cycle and combined systems.</p> <p>9- understand the DC, AC, and static excitation systems.</p> <p>10- Define voltage regulators (AVR) and their components, and control speed and frequency using a speed governor. Also, understand the operation of a SCADA system.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p>                      | <p>W1-W2 Primary energy sources and generation principles</p> <ul style="list-style-type: none"> <li>• Generation concepts and types of power plants</li> <li>• Primary energy sources and their classifications</li> <li>• Energy equivalents and its conversions</li> </ul> <p>W3-W9 Power generation plants: types, construction, operating principles, efficiency, characteristics and energy calculations-</p> <ul style="list-style-type: none"> <li>• Thermal power plants</li> <li>• Gas generating stations</li> <li>• Hydroelectric power stations</li> <li>• Diesel power plants</li> <li>• Nuclear power plants</li> <li>• Direct energy generation systems</li> <li>• Magneto-hydrodynamic generator (MHD)</li> </ul> <p>W10-W15 Station equipment and regulation of voltage and frequency</p> <ul style="list-style-type: none"> <li>• Main equipment for stations</li> <li>• DC, AC And Static excitation system</li> <li>• AVR Concept</li> <li>• Frequency and active power control</li> <li>• Governor system</li> <li>• SCADA system</li> </ul> |
| <p><b>Learning and Teaching Strategies</b><br/>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p><b>Strategies</b></p>                                                       | <p>1. Lectures</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>Fundamental concepts, theories, and technologies in power generation plants are taught through structured lectures.</li> <li>Emphasis is placed on the structure, operation, and calculation applications.</li> </ul> <p><b>2. Problem-Solving Sessions</b></p> <ul style="list-style-type: none"> <li>The practical aspects of power plants are clarified through solving problems related to voltage and frequency regulation calculations, efficiency, and power generation.</li> <li>Students learn about the factors that influence power generation, efficiency, and voltage and frequency stability in power plants.</li> <li>Active student participation is encouraged through class discussions.</li> </ul> <p><b>3. Self-Study</b></p> <ul style="list-style-type: none"> <li>Students are encouraged to prepare individual or group reports on power plant details based on independent study using textbooks, research, and online resources.</li> <li>Homework and reading assignments contribute to a deeper understanding.</li> </ul> <p><b>4. Ongoing Feedback</b></p> <ul style="list-style-type: none"> <li>Regular formative feedback is provided through assignments, tests, and reports.</li> <li>Feedback helps students identify their strengths and areas for improvement.</li> </ul> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                        |                 |                  |           |                              |
|---------------------------------------------------|------------------------|-----------------|------------------|-----------|------------------------------|
|                                                   | As                     | Time/<br>Number | Weight (Marks)   | Week Due  | Relevant Learning<br>Outcome |
| <b>Formative<br/>assessment</b>                   | <b>Quizzes</b>         | 1/3             | 10               | 4,6,13    | 1,2                          |
|                                                   | <b>Assignments</b>     | 1/3             | 10               | 5,11,12   | 3,4                          |
|                                                   | <b>Projects / Lab.</b> | 1/1             | 0                | 0         | --                           |
|                                                   | <b>Report</b>          | 1/1             | 10               | CONTINUES | All                          |
| <b>Summative<br/>assessment</b>                   | <b>Midterm Exam</b>    | 1.5/1           | 10               | 7         | All                          |
|                                                   | <b>Final Exam</b>      | 3/1             | 60               | 16        | All                          |
| <b>Total assessment</b>                           |                        |                 | 100% (100 Marks) |           |                              |

| Delivery Plan (Weekly Syllabus) |                                                                                                                                                                                                                                                                                        |                           |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| المناهج الاسبوعي النظري         |                                                                                                                                                                                                                                                                                        |                           |
| Week                            | Material Covered                                                                                                                                                                                                                                                                       |                           |
| Week 1                          | Primary energy sources and their classifications, Energy equivalents and its conversions and generation principles                                                                                                                                                                     |                           |
| Week 2                          | Thermal power plants                                                                                                                                                                                                                                                                   |                           |
| Week 3                          | Gas generating stations                                                                                                                                                                                                                                                                |                           |
| Week 4                          | Hydroelectric power stations                                                                                                                                                                                                                                                           |                           |
| Week 5                          | Diesel power plants                                                                                                                                                                                                                                                                    |                           |
| Week 6                          | Nuclear power plants                                                                                                                                                                                                                                                                   |                           |
| Week 7                          | Midterm Exam                                                                                                                                                                                                                                                                           |                           |
| Week 8                          | Direct energy generation systems                                                                                                                                                                                                                                                       |                           |
| Week 9                          | Magneto-hydrodynamic generator (MHD)                                                                                                                                                                                                                                                   |                           |
| Week 10                         | The major equipment of power plants                                                                                                                                                                                                                                                    |                           |
| Week 11                         | Automatic Voltage Regulation (AVR) Concept                                                                                                                                                                                                                                             |                           |
| Week 12                         | DC excitation system , AC excitation system, and Static excitation system                                                                                                                                                                                                              |                           |
| Week 13                         | Frequency and active power control                                                                                                                                                                                                                                                     |                           |
| Week 14                         | Speed Governing Basics                                                                                                                                                                                                                                                                 |                           |
| Week 15                         | Supervisory Control and Data Acquisition (SCADA)                                                                                                                                                                                                                                       |                           |
| Week 16                         | Preparatory week before the final Exam                                                                                                                                                                                                                                                 |                           |
| Learning and Teaching Resources |                                                                                                                                                                                                                                                                                        |                           |
| مصادر التعلم والتدريس           |                                                                                                                                                                                                                                                                                        |                           |
|                                 | Text                                                                                                                                                                                                                                                                                   | Available in the Library? |
| Required Texts                  | 1. 1. Anderson, P.M and Fouad, A., Power System Control and Stability, (2nd Edition), Wiley-IEEE Press, New Jersey, 2002.<br>2. Casazza, J and Delea, F., Understanding Electric Power Systems: An Overview of The Technology and The Marketplace, Wiley-IEEE Press, New Jersey, 2003. |                           |
| Recommended Texts               | 3. 3. Ilic, M and Zaborszky, J., Dynamics and Control of Large Electric Power Systems, Wiley Press, New York, 2000.                                                                                                                                                                    |                           |
| Websites                        |                                                                                                                                                                                                                                                                                        |                           |

| Grading Scheme              |               |         |           |                                |
|-----------------------------|---------------|---------|-----------|--------------------------------|
| مخطط الدرجات                |               |         |           |                                |
| Group                       | Grade         | التقدير | Marks (%) | Definition                     |
| Success Group<br>(50 - 100) | A – Excellent | امتياز  | 90 - 100  | Outstanding Performance        |
|                             | B - Very Good | جيد جدا | 80 - 89   | Above average with some errors |

|                                |                         |                     |         |                                       |
|--------------------------------|-------------------------|---------------------|---------|---------------------------------------|
|                                | <b>C – Good</b>         | جيد                 | 70 - 79 | Sound work with notable errors        |
|                                | <b>D - Satisfactory</b> | متوسط               | 60 - 69 | Fair but with major shortcomings      |
|                                | <b>E – Sufficient</b>   | مقبول               | 50 - 59 | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b> | <b>FX – Fail</b>        | راسب (قيد المعالجة) | (45-49) | More work required but credit awarded |
|                                | <b>F – Fail</b>         | راسب                | (0-44)  | Considerable amount of work required  |
|                                |                         |                     |         |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

### نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                                            |                                                                     |
|------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------|
| <b>Module Title</b>                                  | Power and Machines Lab. III<br>مختبرات القدرة والمكائن III | <b>Module Delivery</b>                                              |
| <b>Module Type</b>                                   | Core                                                       | <input type="checkbox"/> Theory<br><input type="checkbox"/> Lecture |
| <b>Module Code</b>                                   | EEP408                                                     |                                                                     |

|                                                                 |                                    |                                      |                                                                                                                                         |  |
|-----------------------------------------------------------------|------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>Number of Credit Hours (Total) / Number of Units (Total)</b> | 4/2                                |                                      | <input checked="" type="checkbox"/> <b>Lab</b><br><input type="checkbox"/> <b>Tutorial</b><br><input type="checkbox"/> <b>Practical</b> |  |
| <b>Module Level</b>                                             | UGx11 4                            | <b>Semester of Delivery</b>          | 7                                                                                                                                       |  |
| <b>Administering Department</b>                                 | 2 - (Electrical Engineering)       | <b>College</b>                       | UoM2 - (Engineering)                                                                                                                    |  |
| <b>Module Leader</b>                                            | Dr.Omar Sh. Alyozbak               | <b>e-mail</b>                        | o.yehya@uomosul.edu.iq                                                                                                                  |  |
| <b>Module Leader's Acad. Title</b>                              | Prof. ( Head of Dept)              | <b>Module Leader's Qualification</b> | PhD                                                                                                                                     |  |
| <b>Module Tutor</b>                                             | Prof. Ahmed Nasser Bahjat Alsammak | <b>e-mail</b>                        | <a href="mailto:ahmed_alsammak@uomosul.edu.iq">ahmed_alsammak@uomosul.edu.iq</a>                                                        |  |
| <b>Peer Reviewer Name</b>                                       | Prof. Ahmed Nasser Bahjat Alsammak | <b>e-mail</b>                        | <a href="mailto:ahmed_alsammak@uomosul.edu.iq">ahmed_alsammak@uomosul.edu.iq</a>                                                        |  |
| <b>Scientific Committee Approval Date</b>                       |                                    | <b>Version Number</b>                |                                                                                                                                         |  |

### Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

### Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية | <p>Power and Machines lab consists of a sum of laboratories that can be listed below:-</p> <p><b>1- Machines Laboratory.</b><br/>In this lab. A student can conduct a series of experiments on different types of special machines (I). This lab. is given by (Dr. Wael Hashem, Dr. Saad Enad).</p> <p><b>2- Control Laboratory.</b><br/>Demonstrate his/her understanding of the basics of control system laboratory including: Basics of transfer function of any control system and represented in MATLAB software, realization and implementation of control system in time domain and frequency domain response such step response, bode plot response, Nichols. PID controller. A state space model represents the transfer function of a control system. Implement a controller, such as a state-variable feedback design or a root-locus design, for speed control of a DC servo motor. Principle of Arduino microcontroller with many applications. This lab. is given by (Dr. Ibrahim Ismael, Dr. Hasan Adnan).</p> <p><b>3- Transmission Line Laboratory.</b><br/>To study the behavior of the transmission line under open and short circuit tests and show the Ferranti effect of the Long Transmission Line model in order to calculate the transmission line</p> |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             | <p>parameters for PI representation. This lab. is given by (Dr. Shakir Mahmood).</p> <p><b>4- Renewable Energy Laboratory.</b><br/>Recently, renewable energy has been more popular in household and rural locations due to the reduction of conventional energy sources. This laboratory helps the student to understand and design different types of renewable energy, such as photovoltaic energy systems, wind energy systems, etc. This lab. is given by (Dr. Omer Sharafaldeen ).</p> <p><b>5- High Voltage Laboratory.</b><br/>The first course provides principle knowledge associated with high voltage engineering methods, techniques and equipment. It is divided into two sections. The first section presents the fundamentals of the failure mechanisms of gaseous insulation at high voltages. It also discusses consequent design principles for high-voltage equipment, for the generation of high direct, alternating, and impulse voltages for testing high-voltage equipment. This lab. is given by Dr. Dawood Najem Saleh and Dr. Riyadh Zaki).</p> |
| <p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>Upon completing this course, the student should be able to:</p> <ol style="list-style-type: none"> <li>15. Understand the operation of the transmission line.</li> <li>16. Simulate and analyze all the input and output ratings of the transmission line.</li> <li>17. Investigate the effect of the faults that occur in the transmission line and the protection device performance.</li> <li>18. device performance.</li> <li>19. Learn about spatial types of machines used in real life and understand their applications.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>                | <p>Dividing and organizing the students into sum of groups and teams.<br/>No load and blocked rotor tests of single phase induction motor<br/>Variable load variable capacitor tests of single phase induction motor<br/>Study the control system's transfer function.<br/>Block diagram reduction of a control system in MATLAB.The power station and transmission system model short circuit and no-load test on a logic line<br/>Possibility of compensation and voltage regulation of T.L<br/>Study of a photovoltaic energy system<br/>Breakdown of air in uniform &amp; non-uniform AC Field Review<br/>Exam<br/>No load and short circuit tests three phase synchronous generator<br/>Determine the zero and negative sequence impedance of three phase synchronous generator<br/>State space model of a control system in MATLAB.<br/>Root locus design in MATLAB.<br/>Load flow analysis of a power system<br/>Symmetrical and unsymmetrical fault analysis of T.L Study of wind energy system<br/>Breakdown of air in uniform &amp; non-uniform DC Field</p>     |

| <p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p> |                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategies</b></p>                                                          | <p>Focus on bridging theoretical concepts with practical application through hands-on experiments, such as testing motors, transformers, and generators. Key strategies include active engagement in troubleshooting, analyzing circuit performance, and collaborative learning to develop technical skills in electrical energy conversion and control</p> |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                  |                 |                  |          |                            |
|---------------------------------------------------|------------------|-----------------|------------------|----------|----------------------------|
| As                                                |                  | Time/<br>Number | Weight (Marks)   | Week Due | Relevant Learning Outcomes |
| Formative assessment                              | Quizzes          | 1               | 10               | 8        | All                        |
|                                                   | Report           | 10              | 20               | 1 to 15  | All                        |
|                                                   | Practical Exam   | 1               | 20               | 8,15     | All                        |
| Summative assessment                              | Theoretical Exam | 1               | 10               | 7        | All                        |
|                                                   | Final Exam       | 3hr             | 40               | 16       | All                        |
| Total assessment                                  |                  |                 | 100% (100 Marks) |          |                            |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                    |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Week                                                              | Material Covered                                                                                   |
| Week 1                                                            | Dividing and organizing the students into sum of groups and teams.                                 |
| Week 2                                                            | No load and blocked rotor tests of single phase induction motor                                    |
| Week 3                                                            | No load and short circuit teste three phase synchronous generator                                  |
| Week 4                                                            | Study the control system's transfer function.                                                      |
| Week 5                                                            | Block diagram reduction of a control system in MATLAB.                                             |
| Week 6                                                            | The power station and transmission system model short circuit and no-load test on a logic line     |
| Week 7                                                            | Possibility of compensation and voltage regulation of T.L                                          |
| Week 8                                                            | Study of a photovoltaic energy system                                                              |
| Week 9                                                            | Breakdown of air in uniform & non-uniform AC Field                                                 |
| Week 10                                                           | <b>Review</b>                                                                                      |
| Week 11                                                           | <b>Exam</b>                                                                                        |
| Week 12                                                           | Variable load variable capacitor tests of single phase induction motor ( load tests)               |
| Week 13                                                           | Determine the zero and negative sequence impedance <sup>of</sup> three phase synchronous generator |
| Week 14                                                           | State space model of a control system in MATLAB.                                                   |
| Week 15                                                           | Root locus design in MATLAB.                                                                       |
| Week 16                                                           | Preparatory week before the final Exam                                                             |
| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس   |                                                                                                    |
|                                                                   | <div>Text</div> <div>Available in the Library?</div>                                               |

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Required Texts</b>    | 1- Induction Machines Handbook Transients, Control Principles, Design and Testing, ION BOLDEA.<br>2- SYNCHRONOUS GENERATORS, ION BOLDEA.<br>3- Feedback Group Company. www.feedback.group.com.<br>4- Roland S. Burns, " Advanced Control Engineering", University of Plymouth. UK., 2001.<br>5- B.M. Weedy, Electric Power System, 5th edition, John Wiley and Sons, 2012.<br>6- William D. Stevenson, Jr, Elements of Power System Analysis, 4th Edition, McGraw Hill, 1982.<br>7- John Twidell and Tony Weir "Renewable Energy Resources " second edition<br>8- Wim Turkenburg "Renewable Energy".<br>9- JP Holtzhausen , WL Vosloo "High Voltage Engineering Practice and Theory" 2018 | Yes |
| <b>Recommended Texts</b> | Electric Circuits Tenth Edition (James W. Nilsson) 2015                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | No  |
| <b>Websites</b>          | Fundamentals of Electric Circuits (Charles K. Alexander) 2009                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |
|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

### نموذج وصف المادة الدراسية

| Module Information                                       |                                      |                               |                                                                                                                                                                                                                                          |                               |
|----------------------------------------------------------|--------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| معلومات المادة الدراسية                                  |                                      |                               |                                                                                                                                                                                                                                          |                               |
| Module Title                                             | Control systems II<br>II نظم السيطرة |                               | Module Delivery                                                                                                                                                                                                                          |                               |
| Module Type                                              | Core                                 |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                               |
| Module Code                                              | EEP417                               |                               |                                                                                                                                                                                                                                          |                               |
| Number of Credit Hours (Total) / Number of Units (Total) | 4/3                                  |                               |                                                                                                                                                                                                                                          |                               |
|                                                          |                                      |                               |                                                                                                                                                                                                                                          |                               |
| Module Level                                             |                                      | Fourth-P&M                    | Semester of Delivery                                                                                                                                                                                                                     | 8                             |
| Administering Department                                 |                                      | Department of Electrical Eng. | College                                                                                                                                                                                                                                  | Engineering                   |
| Module Leader                                            | Dr.Omar Sh. Alyozbak                 |                               | e-mail                                                                                                                                                                                                                                   | o.yehya@uomosul.edu.iq        |
| Module Leader's Acad. Title                              |                                      | Head of Dept.                 | Module Leader's Qualification                                                                                                                                                                                                            | PhD                           |
| Module Tutor                                             | Dr. Mohammed Obaid Mustafa           |                               | e-mail                                                                                                                                                                                                                                   | mohammed.obaid@uomosul.edu.iq |
| Peer Reviewer Name                                       |                                      | Dr. Mohammed Obaid Mustafa    | e-mail                                                                                                                                                                                                                                   | mohammed.obaid@uomosul.edu.iq |

|                                    |  |                |     |
|------------------------------------|--|----------------|-----|
| Scientific Committee Approval Date |  | Version Number | 1.1 |
|------------------------------------|--|----------------|-----|

| Relation with other Modules<br>العلاقة مع المواد الدراسية الأخرى |      |          |  |
|------------------------------------------------------------------|------|----------|--|
| Prerequisite module                                              | None | Semester |  |
| Co-requisites module                                             | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents<br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                                                                        | <p>The aim of this course is to provide students with a solid understanding of the <b>analysis, modeling, and design of control systems</b>. The course develops the ability to analyze system behavior, assess stability and performance, and design appropriate controllers for engineering applications.</p> <ol style="list-style-type: none"> <li>Provide systematic methods for assessing <b>stability</b> using classical and modern techniques.</li> <li>Equip students with the skills to <b>design and tune feedback controllers</b> (such as PID controllers) to meet given performance specifications.</li> <li>Introduce students to <b>frequency-domain analysis tools</b>, including Bode plots, Nyquist plots, and root locus methods.</li> <li>Introduce PID controller design techniques.</li> <li>Enable students to <b>design and tune feedback controllers</b> to meet specified engineering requirements.</li> </ol> |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                   | <p><b>Analyze</b> system stability using classical stability criteria.</p> <p><b>Evaluate</b> system performance in time and frequency domains using standard control techniques.</p> <p><b>Design and tune</b> basic controllers (e.g., PID) to satisfy given performance specifications.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                                                                  | <p><b>Week1-Week2: Stability of Linear Control Systems</b></p> <ul style="list-style-type: none"> <li>Concepts and types of stability in linear control systems</li> <li>Relationship between pole locations and system stability</li> <li>Methods for determining stability</li> <li>Formulation of the Routh array</li> <li>Stability conditions using the Routh–Hurwitz criterion</li> <li>Special cases and interpretation of results</li> </ul> <p><b>Week 3: State Feedback Design</b></p> <ul style="list-style-type: none"> <li>State-space representation of dynamic systems</li> <li>Concept of state feedback control</li> </ul>                                                                                                                                                                                                                                                                                                |

- Pole placement technique
- Examples of MIMO systems

#### **Week 4-Week 6: Root Locus Analysis**

- Introduction to root locus technique
- Basic properties and construction rules
- Effect of system gain on pole locations
- Performance improvement using root locus
- Selection of appropriate gain values
- Time-domain performance specifications
- Worked examples of root locus analysis

#### **Week 7: Midterm Examination**

#### **Week 8 - Week 12: Frequency-Domain Analysis**

- Introduction to frequency-domain methods
- Nyquist stability concept
- Relationship between frequency response and stability
- Construction of Nyquist plots
- Application of the Nyquist stability criterion
- Analytical and design examples
- Magnitude and phase plots
- Frequency response characteristics
- Gain and phase margins
- Manual construction of Bode plots
- Logarithmic approximation techniques
- Interpretation of results

#### **Week 13 – Week 15: Control System Design**

- Systematic design procedure
- Integration of time-domain and frequency-domain methods
- Controller selection
- Structure of PID controllers
- Effect of proportional, integral, and derivative actions
- Practical design considerations
- Principles of Ziegler–Nichols tuning
- Open-loop and closed-loop tuning methods

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| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p><b>1. Lectures</b></p> <ul style="list-style-type: none"> <li>Structured lectures introduce fundamental concepts, theories, and analytical techniques in control systems.</li> <li>Emphasis is placed on conceptual understanding, mathematical formulation, and physical interpretation.</li> </ul> <p><b>2. Problem-Solving Sessions</b></p> <ul style="list-style-type: none"> <li>Guided tutorials focus on solving numerical and analytical problems.</li> <li>Students practice stability analysis, controller design, and performance evaluation.</li> <li>Active student participation is encouraged through in-class discussions.</li> </ul> <p><b>3. Project-Based Learning</b></p> <ul style="list-style-type: none"> <li>Individual or group mini-projects involve modeling, analysis, and controller design for selected systems.</li> </ul> <p><b>4. Self-Directed Learning</b></p> <ul style="list-style-type: none"> <li>Students are encouraged to engage in independent study through textbooks, research papers, and online resources.</li> <li>Homework assignments and reading tasks support deeper understanding.</li> </ul> <p><b>5. Continuous Feedback</b></p> <ul style="list-style-type: none"> <li>Regular formative feedback is provided through assignments, quizzes, and reports.</li> <li>Feedback helps students identify strengths and areas for improvement.</li> </ul> |

| <b>Module Evaluation</b><br><b>تقييم المادة الدراسية</b> |                     |                 |                |           |                           |
|----------------------------------------------------------|---------------------|-----------------|----------------|-----------|---------------------------|
| As                                                       |                     | Time/<br>Number | Weight (Marks) | Week Due  | Relevant Learning Outcome |
| <b>Formative assessment</b>                              | <b>Quizzes</b>      | 1/3             | 10             | CONTINUES | 1-3                       |
|                                                          | <b>Assignments</b>  | 1/3             | 5              | CONTINUES | 1-2                       |
|                                                          | <b>CLASSWORK</b>    | 1/1             | 5              | CONTINUES | 1-3                       |
|                                                          | <b>Report</b>       | 1/1             | 10             | CONTINUES | 1-3                       |
| <b>Summative assessment</b>                              | <b>Midterm Exam</b> | 1.5/1           | 10             | CONTINUES | 1-3                       |
|                                                          | <b>Final Exam</b>   | 3/1             | 60             | CONTINUES | 1-3                       |
| <b>Total assessment</b>                                  |                     |                 | 100            |           |                           |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المناهج الاسبوعي النظري |                                                                       |
|-------------------------------------------------------------------|-----------------------------------------------------------------------|
| Week                                                              | Material Covered                                                      |
| Week 1                                                            | Stability of Linear Control Systems, Methods of Determining Stability |
| Week 2                                                            | Routh-Hurwitz Criterion                                               |
| Week 3                                                            | Design of State feedback                                              |
| Week 4                                                            | Root Locus Analysis, Basic Properties of the Root Loci (RL)           |
| Week 5                                                            | Design Aspects of the Root Loci                                       |
| Week 6                                                            | Root Locus Analysis and Examples                                      |
| Week 7                                                            | <b>Exam</b>                                                           |
| Week 8                                                            | Frequency-Domain Analysis, Nyquist Stability concept                  |
| Week 9                                                            | Nyquist Stability – examples                                          |
| Week 10                                                           | Bode Plot Analysis                                                    |
| Week 11                                                           | Stability Analysis with the Magnitude-Phase Plots                     |
| Week 12                                                           | Bode Plot Analysis<br>With Logarithmic Graph Paper                    |
| Week 13                                                           | Design of Control System                                              |
| Week 14                                                           | Design of PID Controller                                              |
| Week 15                                                           | ziegler-nichols Method for Controller                                 |
| Week 16                                                           | Preparatory week before the final Exam                                |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                                                                                            |                           |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                                 | Text                                                                                                                                       | Available in the Library? |
| Required Texts                                                  | 4. Automatic Control Systems, (9th Edition),<br>By: Golnaraghi and B. C. Kuo.                                                              |                           |
| Recommended Texts                                               | 5. Modern Control Engineering, (5th Edition), By: Katsuhiko Ogata.<br><br>6. Control Systems Engineering, (6th Edition) By: Norman S. Nise |                           |

|          |  |
|----------|--|
| Websites |  |
|----------|--|

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                  |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
|                                                                                                                                                                                                                                                                                                                                                                                      | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |

## نموذج وصف المادة الدراسية

| Module Information                                       |                          |                                                                                                                                                                                                                                          |
|----------------------------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية                                  |                          |                                                                                                                                                                                                                                          |
| Module Title                                             | Power System Analysis II | Module Delivery                                                                                                                                                                                                                          |
| Module Type                                              | Core                     | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                                              | EEP411                   |                                                                                                                                                                                                                                          |
| Number of Credit Hours (Total) / Number of Units (Total) | 3/3                      |                                                                                                                                                                                                                                          |

|                                           |                                    |                                      |                               |
|-------------------------------------------|------------------------------------|--------------------------------------|-------------------------------|
|                                           |                                    |                                      |                               |
| <b>Module Level</b>                       | 4                                  | <b>Semester of Delivery</b>          | 8                             |
| <b>Administering Department</b>           | 2 - (Electrical Engineering)       | <b>College</b>                       | UoM2 - (Engineering)          |
| <b>Module Leader</b>                      | Dr. Omar Sh. AL-Yozbaky            | <b>e-mail</b>                        | o.yehya@uomosul.edu.iq        |
| <b>Module Leader's Acad. Title</b>        | Assistant Prof.                    | <b>Module Leader's Qualification</b> | PhD                           |
| <b>Module Tutor</b>                       | Dr. Saad Enad Mohammed             | <b>e-mail</b>                        | saadmohamed@uomosul.edu.iq    |
| <b>Peer Reviewer Name</b>                 | Prof. Dr. Ahmed Nasser B. Alsammak | <b>e-mail</b>                        | ahmed_alsammak@uomosul.edu.iq |
| <b>Scientific Committee Approval Date</b> | 01/12/2025                         | <b>Version Number</b>                | 1.0                           |

| <b>Relation with other Modules</b><br>العلاقة مع المواد الدراسية الأخرى |      |                 |  |
|-------------------------------------------------------------------------|------|-----------------|--|
| <b>Prerequisite module</b>                                              | None | <b>Semester</b> |  |
| <b>Co-requisites module</b>                                             | None | <b>Semester</b> |  |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                                                                               | The objective of Power system analysis is for designing entire power systems consisting of generators, transformers, capacitor banks, shunt elements, transmission lines and so on. Power system analysis makes sure the equipment works together so that the required power is delivered to the load centers at the prescribed voltage and frequency, and no component in the network is overloaded and no-fault condition jeopardizes the system.                            |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                          | 9. Acquiring knowledge of modern techniques that support the development of electrical power stations.<br>10. Understanding the basic concepts of troubleshooting in electrical power stations and transmission lines.<br>11. Understanding the fundamentals of electrical power transmission and distribution.<br>12. Understanding the basics of dealing with electrical power systems.<br>13. Building the scientific foundation for students in the field of designing and |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | <p>constructing power systems and transmission lines.</p> <p>14. Training students on modern techniques in electrical fault diagnosis and repair.</p> <p>15. Studying the fundamental concepts of building high-quality power systems.</p> <p>16. Equipping students with scientific and practical skills to diagnose and repair faults in electrical power systems.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Indicative Contents</b><br>المحتويات الإرشادية | <p>Indicative content includes the following.</p> <p><b>Part A -</b><br/> Introduction; Syllabus; basic components of a power system, single line diagram, per unit analysis, generator, transformer, transmission line and load representation for different power system, Construction of Y-bus and Z-bus, Power-flow problem and equations [12 hrs.]<br/> Revision problem and tutorial classes [3 hrs.]<br/> Quizzes [1 hr.]</p> <p><b>Part B-</b><br/> Gauss-Seidel method for solving power-flow equations, Newton-Raphson method for solving power-flow equations, balanced three-phase fault, short-circuit capacity, Bus impedance matrix, Fault analysis using bus impedance matrix, Symmetrical components and unbalanced faults (Review), Economical Operation of Power System neglecting generator limits and line losses [15 hrs.]<br/> Revision problem and tutorial classes [4 hrs.]<br/> Quizzes [1 hr.]</p> <p><b>Part C-</b><br/> Economical Operation of Power System with generator limits and line losses. Introduction, Classification of Power System Stability. Dynamic Equation of Synchronous Machine, Stability Analysis Swing equation, Multi machine system, Machines swinging in unison or coherently Power flow under steady state, Steady-state Stability, Transient Stability-Equal area criterion Transient Stability Applications of sudden change in power input, Critical clearing angle and critical clearing time, Application of equal area criterion 1- Sudden loss of one parallel line 2- sudden short circuit on one of parallel lines a) Short circuit at one end of line b) Short circuit at the middle of a line. [15 hrs.]<br/> Revision problem and tutorial classes [4 hrs.]<br/> Quizzes [1 hr.]</p> |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                      | <p>1- Electronic illustration tools, such as presentations, slides, images, videos, and others, can be used to clarify concepts and scientific information to students. These tools can be used to illustrate examples and practical applications, present graphs and charts to clarify relationships and processes, and demonstrate results and statistical data.</p> <p>2- Surprise daily tests can be conducted without prior notice to students to motivate them to regularly review the materials and prepare well for any test. These daily tests can be sudden and short-term, aiming to test students' immediate understanding of the study materials and concepts.</p> <p>As for weekly tests, they can be announced in advance to students, giving them sufficient time to prepare. The purpose of weekly tests is to assess the overall progress of students and their understanding of the study materials over a longer period.</p> <p>3- Students can be given the opportunity to participate in open discussion sessions on the study topics. These sessions can be organized to allow students to discuss scientific materials,</p> |

|  |                                                                                                                                                                                                                                                                                                |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | exchange ideas and opinions, ask questions, and clarify any doubts. These discussion sessions can be organized as part of the lessons or as independent activities. Additionally, students can be assigned research tasks to explore the latest applications of the scientific subject matter. |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Module Evaluation

### تقييم المادة الدراسية

|                         | As              | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning<br>Outcome |
|-------------------------|-----------------|-----------------|------------------|------------|------------------------------|
| Formative<br>assessment | Quizzes         | 3               | 10               | 4,8,12     | All                          |
|                         | Assignments     | 5               | 10               | 2 to 12    | All                          |
|                         | Projects / Lab. | 0               | 0                | ----       | ----                         |
|                         | Report          | 1               | 10               | Continuous | All                          |
| Summative<br>assessment | Midterm Exam    | 1.5hr           | 10               | 8          | All                          |
|                         | Final Exam      | 3hr             | 60               | 16         | All                          |
| Total assessment        |                 |                 | 100% (100 Marks) |            |                              |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

| Week    | Material Covered                                                                                                                                                  |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1  | Introduction of Fault Analysis                                                                                                                                    |
| Week 2  | Balanced Faults: Importance of short circuit analysis                                                                                                             |
| Week 3  | Assumptions in fault analysis fault analysis using Thevenin's theorem.                                                                                            |
| Week 4  | Z-bus building algorithm analysis using Z-bus.                                                                                                                    |
| Week 5  | Computations of short circuit capacity, Post fault voltage and currents.                                                                                          |
| Week 6  | MATLAB Applications in balance faults.                                                                                                                            |
| Week 7  | Fault Analysis- Unbalanced Faults: Introduction to symmetrical components.                                                                                        |
| Week 8  | Mid-EXAM                                                                                                                                                          |
| Week 9  | Sequence impedances- sequence circuits of synchronous machine transformer and transmission lines.                                                                 |
| Week 10 | Sequence networks analysis of single line to ground, line to line and double line to ground faults using Thevenin's theorem and Z-bus sequence matrix.            |
| Week 11 | MATLAB Applications in unbalance faults.                                                                                                                          |
| Week 12 | Stability Analysis: Importance of stability analysis in power system planning and operation - classification of power system stability.                           |
| Week 13 | Angle and voltage stability- Single Machine Infinite Bus (SMIB) system: Development of swing equation.                                                            |
| Week 14 | Equal area criterion, determination of critical clearing angle and time - solution of swing equation by modified Euler method and Runge-Kuta fourth order method. |
| Week 15 | MATLAB Applications in stability analysis.                                                                                                                        |
| Week 16 | Final Exam                                                                                                                                                        |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|                | Text                                                                                                                                                                                                                                                                                                       | Available in the<br>Library? |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Required Texts | Power system analysis<br>by Hadi Saadat<br><a href="http://powerunit-ju.com/wp-content/uploads/2016/11/Power-System-Analysis-by-Hadi-Saadat-Electrical-Engineering-libre.pdf">http://powerunit-ju.com/wp-content/uploads/2016/11/Power-System-Analysis-by-Hadi-Saadat-Electrical-Engineering-libre.pdf</a> | NO                           |

|                          |                                                                                |    |
|--------------------------|--------------------------------------------------------------------------------|----|
| <b>Recommended Texts</b> | Power System Analysis<br>By Emeritus John J. Grainger and William D. Stevenson | NO |
| <b>Websites</b>          |                                                                                |    |

| <b>Grading Scheme</b><br>مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound works with notable errors       |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

نموذج وصف المادة الدراسية

**Module Information**

معلومات المادة الدراسية

| Module Information                                       |                                                  |                                    |                                                                                                                                                                                                                                            |                               |     |
|----------------------------------------------------------|--------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----|
| معلومات المادة الدراسية                                  |                                                  |                                    |                                                                                                                                                                                                                                            |                               |     |
| Module Title                                             | Power System Protection II<br>IIنظم حماية القدرة |                                    | Module Delivery                                                                                                                                                                                                                            |                               |     |
| Module Type                                              | Core                                             |                                    | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab 7<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                               |     |
| Module Code                                              | EEP412                                           |                                    |                                                                                                                                                                                                                                            |                               |     |
| Number of Credit Hours (Total) / Number of Units (Total) | 3/2                                              |                                    |                                                                                                                                                                                                                                            |                               |     |
|                                                          |                                                  |                                    |                                                                                                                                                                                                                                            |                               |     |
| Module Level                                             |                                                  | UGx11 4                            | Semester of Delivery                                                                                                                                                                                                                       |                               | 8   |
| Administering Department                                 |                                                  | 2 - (Electrical Engineering)       | College                                                                                                                                                                                                                                    | UoM2 - (Engineering)          |     |
| Module Leader                                            | Dr. Omar Sh. AL-Yozbaky                          |                                    | e-mail                                                                                                                                                                                                                                     | o.yehya@uomosul.edu.iq        |     |
| Module Leader’s Acad. Title                              |                                                  | Assistant Prof                     | Module Leader’s Qualification                                                                                                                                                                                                              |                               | PhD |
| Module Tutor                                             | Dr. Shaker Mahmood Khudher                       |                                    | e-mail                                                                                                                                                                                                                                     | shakeralhyane@uomosul.edu.iq  |     |
| Peer Reviewer Name                                       |                                                  | Prof. Dr. Ahmed Nasser B. Alsammak | e-mail                                                                                                                                                                                                                                     | ahmed_alsammak@uomosul.edu.iq |     |
| Scientific Committee Approval Date                       |                                                  | 01/06/2023                         | Version Number                                                                                                                                                                                                                             |                               | 1.0 |

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

**Module Aims, Learning Outcomes and Indicative Contents**

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Module Aims</b><br/>أهداف المادة الدراسية</p>                      | <p>The aim of this course is to:</p> <ul style="list-style-type: none"> <li>• Provide students with a comprehensive understanding of <b>power system protection principles</b> for major components including generators, motors, and transmission lines.</li> <li>• Develop the ability to <b>analyze and evaluate protection schemes</b> for electrical machines under normal and fault conditions.</li> <li>• Introduce the fundamental concepts of <b>distance (impedance) protection</b>, including relay characteristics, comparators, and performance under practical conditions.</li> <li>• Enhance students' knowledge of <b>modern protection techniques</b>, particularly digital (numerical) protective relays and their advantages over conventional systems.</li> <li>• Familiarize students with <b>communication-based protection systems</b>, specifically Power Line Carrier Communication (PLCC), and their applications in transmission networks.</li> <li>• Enable students to <b>integrate and select appropriate protection strategies</b> to ensure reliability, selectivity, and stability in power system operation.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Module Learning Outcomes</b><br/>مخرجات التعلم للمادة الدراسية</p> | <p><i>At the end of this course, students will be able to:</i></p> <ol style="list-style-type: none"> <li>11. <b>Analyze generator protection systems</b> by identifying fault types and evaluating appropriate protection schemes such as differential and restricted earth fault protection.</li> <li>12. <b>Design and assess protection schemes for industrial motors</b>, considering electrical, thermal, and mechanical fault conditions.</li> <li>13. <b>Explain the principles of distance (impedance) protection</b> for high-voltage transmission lines, including impedance measurement and relay operation.</li> <li>14. <b>Derive and apply phase and magnitude comparator equations</b>, and interpret the duality concept in determining relay characteristics and operating regions.</li> <li>15. <b>Differentiate between distance relay types</b> (Impedance, Reactance, and Mho) using Argand (R–X) diagrams and evaluate their performance in practical applications.</li> <li>16. <b>Evaluate distance protection performance</b> under abnormal conditions such as under-reach and over-reach, and recommend suitable mitigation techniques.</li> <li>17. <b>Explain and apply digital (numerical) protective relay concepts</b>, including basic signal processing techniques and advantages over conventional relays.</li> <li>18. <b>Describe and evaluate Power Line Carrier Communication (PLCC)</b> and its role in modern transmission line protection schemes.</li> <li>19. <b>Integrate and select appropriate protection strategies</b> to ensure reliability, selectivity, and stability in power system operation.</li> </ol> <p>CLO Reference</p> <ul style="list-style-type: none"> <li>• <b>LO1:</b> Analyze generator protection systems by identifying fault types and evaluating appropriate protection schemes.</li> <li>• <b>LO2:</b> Design and assess protection schemes for industrial motors under various operating and fault conditions.</li> <li>• <b>LO3:</b> Explain the principles of distance (impedance) protection for high-voltage transmission lines.</li> <li>• <b>LO4:</b> Derive and apply phase and magnitude comparator equations and interpret relay characteristics and operating regions.</li> <li>• <b>LO5:</b> Differentiate between distance relay types (Impedance,</li> </ul> |

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           | <p>Reactance, and Mho) using R–X diagrams and evaluate their performance.</p> <ul style="list-style-type: none"> <li>• <b>LO6:</b> Evaluate distance protection performance under practical conditions such as under-reach and over-reach.</li> <li>• <b>LO7:</b> Explain and apply digital (numerical) protective relay concepts and basic signal processing techniques.</li> <li>• <b>LO8:</b> Describe and evaluate Power Line Carrier Communication (PLCC) in protective relaying systems.</li> <li>• <b>LO9:</b> Integrate and select appropriate <b>protection strategies</b> to ensure reliability, selectivity, and stability in power system operation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p><b>Indicative Contents</b><br/>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p style="text-align: center;"><b>Part A – Protection of Generators and Motors</b></p> <p>Protection of generators: types of faults (stator and rotor), abnormal operating conditions (loss of excitation, over/under voltage and frequency), generator protection schemes including differential protection and restricted earth fault (REF).</p> <p>Protection of industrial motors: types of faults, thermal protection, overcurrent protection, differential protection, and coordination of motor protection systems.<br/><b>[10 hrs.]</b></p> <p style="text-align: right;">Revision problems and tutorial classes <b>[2 hrs.]</b><br/>Quizzes <b>[1 hr.]</b></p> <p style="text-align: center;"><b>Part B – Distance Protection of Transmission Lines</b></p> <p>High voltage transmission line protection using distance (impedance) relays.<br/>General equations of phase and magnitude comparators and duality of comparators.<br/>Determination of impedance relay characteristics and operating regions.<br/>Distance relay types based on Argand (R–X) diagram: impedance, reactance, and Mho relays.<br/>Distance protection performance under practical conditions: under-reach and over-reach.<br/><b>[11 hrs.]</b></p> <p style="text-align: right;">Revision problems and tutorial classes <b>[2 hrs.]</b><br/>Quizzes <b>[1 hr.]</b></p> <p style="text-align: center;"><b>Part C – Digital Relays and Communication in Protection</b></p> <p>Digital (numerical) protective relays: principles, advantages, and basic concepts of signal processing (sampling, filtering).<br/>Power Line Carrier Communication (PLCC) in protective relaying: principles, components, and applications in transmission line protection.<br/>Integration and coordination of protection systems in modern power networks.<br/><b>[6 hrs.]</b></p> <p style="text-align: right;">Revision problems and tutorial classes <b>[1 hr.]</b><br/>Quizzes <b>[1 hr.]</b></p> |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

#### Strategies

The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through

1. Formal face-to-face lectures, which provide you with a focus on the core analytical material in the course, together with qualitative, alternative explanations to aid your understanding.
2. Tutorials, which allow for exercises in problem solving and allow time for you to resolve problems in understanding of lecture material.

## Module Evaluation

### تقييم المادة الدراسية

|                         | As              | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning<br>Outcome |
|-------------------------|-----------------|-----------------|------------------|------------|------------------------------|
| Formative<br>assessment | Quizzes         | 3               | 10               | 4,8,12     | LO #1–2, 3–5, 6–8            |
|                         | Assignments     | 4               | 10               | 2 to 12    | LO #1–2, 3–5                 |
|                         | Projects / Lab. | 0               | 0                |            |                              |
|                         | Report          | 1               | 10               | Continuous | All                          |
| Summative<br>assessment | Midterm Exam    | 1.5 hr          | 10               | 8          | LO #1–5                      |
|                         | Final Exam      | 3hr             | 60               | 16         | All                          |
| Total assessment        |                 |                 | 100% (100 Marks) |            |                              |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

| Week    | Material Covered                  |
|---------|-----------------------------------|
| Week 1  | Introduction                      |
| Week 2  | Generator Protection              |
| Week 3  | Generator Protection (Cont.)      |
| Week 4  | Generator Protection Schemes      |
| Week 5  | Motor Protection                  |
| Week 6  | Motor Protection Schemes          |
| Week 7  | Distance Protection Basics        |
| Week 8  | Midterm Exam                      |
| Week 9  | Distance Protection – Comparators |
| Week 10 | Distance Relay Characteristics    |
| Week 11 | Relay Performance                 |
| Week 12 | Digital Protective Relays         |
| Week 13 | Digital Relay Algorithms          |
| Week 14 | PLCC in Protection                |
| Week 15 | Review & Integration              |

## Learning and Teaching Resources

### مصادر التعلم والتدريس

|  | Text | Available in the |
|--|------|------------------|
|--|------|------------------|

|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                          |                     |                  |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------|---------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                          | <b>Library?</b>     |                  |                                       |
| <b>Required Texts</b>                                                                                                                                                                                                                                                                                                                                                                | حماية نظم القدرة / د عبدالغني عبدالرزاق                                                                                                                                  | Yes                 |                  |                                       |
| <b>Recommended Texts</b>                                                                                                                                                                                                                                                                                                                                                             | 3- FUNDAMENTALS OF POWER SYSTEM PROTECTION by Y.G. Paithankar and S.R. Bhide,2003.<br>4- TRANSMISSION NETWORK PROTECTION: THEORY AND PRACTICE by Yeshwant G. Paithankar. | No                  |                  |                                       |
| <b>Grading Scheme</b>                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                          |                     |                  |                                       |
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                          |                     |                  |                                       |
| <b>Group</b>                                                                                                                                                                                                                                                                                                                                                                         | <b>Grade</b>                                                                                                                                                             | التقدير             | <b>Marks (%)</b> | <b>Definition</b>                     |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent                                                                                                                                                     | امتياز              | 90 - 100         | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good                                                                                                                                                     | جيد جدا             | 80 - 89          | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good                                                                                                                                                          | جيد                 | 70 - 79          | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory                                                                                                                                                  | متوسط               | 60 - 69          | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient                                                                                                                                                    | مقبول               | 50 - 59          | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail                                                                                                                                                         | راسب (قيد المعالجة) | (45-49)          | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail                                                                                                                                                          | راسب                | (0-44)           | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                          |                     |                  |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                                                                                                                                                                          |                     |                  |                                       |

### نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية |                                                      |                                                                                                                                     |
|------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Title</b>                                  | High Voltage Engineering II<br>هندسة الضغط العالي II | <b>Module Delivery</b>                                                                                                              |
| <b>Module Type</b>                                   | Core                                                 | <input checked="" type="checkbox"/> <b>Theory</b><br><input type="checkbox"/> <b>Lecture</b><br><input type="checkbox"/> <b>Lab</b> |
| <b>Module Code</b>                                   | EEP414                                               |                                                                                                                                     |

|                                                          |                                    |                               |                                                                                                                        |  |
|----------------------------------------------------------|------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------|--|
| Number of Credit Hours (Total) / Number of Units (Total) | 2/2                                |                               | <input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |  |
| Module Level                                             | UGx11 4                            | Semester of Delivery          | 8                                                                                                                      |  |
| Administering Department                                 | 2 - (Electrical Engineering)       | College                       | Engineering                                                                                                            |  |
| Module Leader                                            | Dr. Omar Sh. AL-Yozbak             | e-mail                        | o.yehya@uomosul.edu.iq                                                                                                 |  |
| Module Leader's Acad. Title                              | Assistant Prof.                    | Module Leader's Qualification | Ph.D.                                                                                                                  |  |
| Module Tutor                                             | Dr. Dawood Najem Saleh             | e-mail                        | dnsaij@uomosul.edu.iq                                                                                                  |  |
| Peer Reviewer Name                                       | Prof. Dr. Ahmed Nasser B. Alsammak | e-mail                        | ahmed_alsammak@uomosul.edu.iq                                                                                          |  |
| Scientific Committee Approval Date                       | 01/12/2025                         | Version Number                | 1.0                                                                                                                    |  |

### Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                      |      |          |  |
|----------------------|------|----------|--|
| Prerequisite module  | None | Semester |  |
| Co-requisites module | None | Semester |  |

### Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية             | <p><b>The module aims (derived from the course description) are:</b></p> <ol style="list-style-type: none"> <li>To develop advanced knowledge of <b>high voltage systems, measurements, and testing techniques.</b></li> <li>To analyze <b>over-voltage phenomena</b> (temporary, slow-front, fast-front) and their impact on power systems.</li> <li>To study <b>protection methods</b> such as earthing, shielding, and surge protection.</li> <li>To understand <b>insulation behavior and coordination</b> in high voltage equipment.</li> <li>To prepare students for <b>safe, reliable, and efficient operation</b> of high voltage systems in industry and research.</li> </ol> |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة | <p><b>By the end of the course, students will be able to:</b></p> <p><b>20. Understand High Voltage Fundamentals</b></p> <ol style="list-style-type: none"> <li>Explain principles of high voltage generation and measurement.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                              |

|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| الدراسية                                          | <p>b. Analyze electric field distribution and breakdown mechanisms.</p> <p><b>21. Study Insulation Materials &amp; Techniques</b></p> <p>a. Evaluate insulation materials and their behavior.</p> <p>b. Apply insulation coordination in system design.</p> <p><b>22. Learn High Voltage Testing &amp; Safety</b></p> <p>a. Apply standard testing methods for HV equipment.</p> <p>b. Follow safety procedures in HV laboratories.</p> <p><b>23. Explore High Voltage Equipment &amp; Applications</b></p> <p>a. Describe operation of transformers, circuit breakers, and surge arresters.</p> <p>b. Identify industrial and power system applications.</p> <p><b>24. Analyze Overvoltages &amp; Protection Techniques</b></p> <p>a. Explain lightning and switching overvoltages.</p> <p>b. Apply protection methods such as grounding and shielding.</p> <p><b>25. Prepare for Industry &amp; Research</b></p> <p>a. Solve practical high voltage engineering problems.</p> <p>b. Understand modern trends like HVDC and smart grids.</p> |
| <b>Indicative Contents</b><br>المحتويات الإرشادية | <p><b>The indicative contents are based on the course topics:</b></p> <ul style="list-style-type: none"> <li>• High voltage measurements</li> <li>• High voltage testing</li> <li>• Temporary over-voltages</li> <li>• Slow-front over-voltages</li> <li>• Fast-front over-voltages</li> <li>• Over-voltage protection methods</li> <li>• Earthing systems</li> <li>• Insulation coordination</li> <li>• Tutorial and revision</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Strategies                                                             | <p>11. Lectures: Traditional lectures can be used to deliver theoretical concepts, principles, and foundational knowledge of high voltage engineering. Instructors can present information using visual aids, multimedia presentations, and demonstrations to enhance understanding.</p> <p>12. Laboratory Work: Practical laboratory sessions allow students to apply theoretical knowledge to real-world scenarios. Hands-on experiments involving high voltage equipment, measurement techniques, and diagnostic tools can help students gain practical skills and reinforce theoretical concepts.</p> <p>13. Case Studies: Engaging students in case studies and real-world examples can provide a deeper understanding of high voltage engineering principles. Analyzing and solving problems encountered in actual high voltage systems can develop critical thinking and problem-solving skills.</p> <p>14. Group Discussions and Brainstorming: Encouraging students to participate in group</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>discussions and brainstorming sessions fosters active learning. It promotes collaboration, idea sharing, and the exploration of different perspectives on high voltage engineering topics.</p> <p>15. Simulations and Virtual Laboratories: Utilizing computer-based simulations and virtual laboratories can provide a safe and interactive learning environment. Students can simulate high voltage systems, perform experiments, and observe the outcomes, allowing for experimentation and exploration of different scenarios.</p> <p>16. Guest Lectures and Industry Experts: Inviting guest lecturers from industry or research institutions can provide valuable insights into practical applications, current trends, and emerging technologies in high voltage engineering. It offers students exposure to real-world experiences and industry perspectives.</p> <p>17. Problem-Solving Exercises: Assigning problem sets and exercises related to high voltage engineering challenges students to apply their knowledge and skills to solve specific problems. These exercises can range from calculations and design tasks to analyzing system failures and proposing solutions.</p> <p>18. Field Trips and Site Visits: Organizing field trips or site visits to high voltage substations, power plants, or testing facilities allows students to observe high voltage equipment in operation and gain a practical understanding of the engineering practices in real-world settings.</p> <p>19. Multimedia Resources and Online Platforms: Utilizing multimedia resources, such as video lectures, online tutorials, and interactive learning platforms, can supplement classroom teaching and provide students with additional resources for self-study and revision.</p> <p>20. Assessment and Feedback: Regular assessments, including quizzes, exams, and projects, help gauge students' understanding and progress. Providing constructive feedback on their performance enables them to identify areas for improvement and reinforce their learning.</p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Module Evaluation

#### تقييم المادة الدراسية

|                         | As              | Time/<br>Number | Weight (Marks)   | Week Due   | Relevant Learning<br>Outcome |
|-------------------------|-----------------|-----------------|------------------|------------|------------------------------|
| Formative<br>assessment | Quizzes         | 3               | 10               | 3, 6, 10   | LO #1, 2,3, and 4            |
|                         | Assignments     | 4               | 10               | 4, 7, 12   | LO #2, 3, 5, 6, 7            |
|                         | Projects / Lab. | 0               | 0                |            |                              |
|                         | Report          | 1               | 10               | Continuous | All                          |
| Summative<br>assessment | Midterm Exam    | 1.5             | 10               | 8          | LO # 1-8                     |
|                         | Final Exam      | 3               | 60               | 16         | All                          |
| Total assessment        |                 |                 | 100% (100 Marks) |            |                              |

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

| Week   | Material Covered          |
|--------|---------------------------|
| Week 1 | High voltage measurements |
| Week 2 | High voltage testing      |
| Week 3 | High voltage testing      |

|         |                                   |
|---------|-----------------------------------|
| Week 4  | Temporary over-voltages           |
| Week 5  | Slow-front over-voltages          |
| Week 6  | Fast-front over-voltages          |
| Week 7  | Midterm Exam                      |
| Week 8  | Over-voltage protection           |
| Week 9  | Over-voltage protection           |
| Week 10 | Earthing                          |
| Week 11 | Earthing                          |
| Week 12 | Insulation coordination           |
| Week 13 | Insulation coordination           |
| Week 14 | Tutorial / Revision               |
| Week 15 | Additional revision / preparation |
| Week 16 | <b>Final Exam</b>                 |

### Learning and Teaching Resources

مصادر التعلم والتدريس

|                          | Text                                                                                                                                                                | Available in the Library? |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Required Texts</b>    | 3. Andreas Küchler, High voltage Engineering, Springer-Verlag GmbH Germany, 2018.<br>4. C.L. Wadhwa, High Voltage Engineering, 2nd ed., New Age International, 2007 | Yes                       |
| <b>Recommended Texts</b> | E. Kuffel, W.S. Zaengl, and J. Kuffel, High Voltage Engineering: Fundamentals, 2nd edition, Butterworth Heinemann, 2000.                                            | No                        |
| <b>Websites</b>          |                                                                                                                                                                     |                           |

### Grading Scheme

مخطط الدرجات

| Group                               | Grade                   | التقدير             | Marks (%) | Definition                            |
|-------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                     | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                     | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                     | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                     | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>      | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                     | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                     |                         |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

## نموذج وصف المادة الدراسية

| <b>Module Information</b><br>معلومات المادة الدراسية            |                                                               |                                    |                                                                                                                                                                                                                                          |                                                                  |     |
|-----------------------------------------------------------------|---------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----|
| <b>Module Title</b>                                             | Special Electrical Machines II<br>مكائن كهربائية خاصة II      |                                    | <b>Module Delivery</b>                                                                                                                                                                                                                   |                                                                  |     |
| <b>Module Type</b>                                              | Core                                                          |                                    | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |                                                                  |     |
| <b>Module Code</b>                                              | EEP 413                                                       |                                    |                                                                                                                                                                                                                                          |                                                                  |     |
| <b>Number of Credit Hours (Total) / Number of Units (Total)</b> | 3/3                                                           |                                    |                                                                                                                                                                                                                                          |                                                                  |     |
|                                                                 |                                                               |                                    |                                                                                                                                                                                                                                          |                                                                  |     |
| <b>Module Level</b>                                             |                                                               | UGx11 4                            | <b>Semester of Delivery</b>                                                                                                                                                                                                              |                                                                  | 8   |
| <b>Administering Department</b>                                 |                                                               | 2 - (Electrical Engineering)       | <b>College</b>                                                                                                                                                                                                                           | UoM2 - (Engineering)                                             |     |
| <b>Module Leader</b>                                            | Dr. Omar Sh. AL-Yozbak                                        |                                    | <b>e-mail</b>                                                                                                                                                                                                                            | o.yehya@uomosul.edu.iq                                           |     |
| <b>Module Leader's Acad. Title</b>                              |                                                               | Ass. Prof.                         | <b>Module Leader's Qualification</b>                                                                                                                                                                                                     |                                                                  | PhD |
| <b>Module Tutor</b>                                             | Prof. Dr. Ahmed Nasser B. Alsammak<br>Mr. Omar Turath Tawfeeq |                                    | <b>e-mail</b>                                                                                                                                                                                                                            | ahmed_alsammak@uomosul.edu.iq<br>omartawfeeq_1981@uomosul.edu.iq |     |
| <b>Peer Reviewer Name</b>                                       |                                                               | Prof. Dr. Ahmed Nasser B. Alsammak | <b>e-mail</b>                                                                                                                                                                                                                            | ahmed_alsammak@uomosul.edu.iq                                    |     |
| <b>Scientific Committee</b>                                     |                                                               | 01/12/2025                         | <b>Version Number</b>                                                                                                                                                                                                                    |                                                                  | 1.0 |

|               |  |  |  |
|---------------|--|--|--|
| Approval Date |  |  |  |
|---------------|--|--|--|

| Relation with other Modules<br>العلاقة مع المواد الدراسية الأخرى |      |          |  |
|------------------------------------------------------------------|------|----------|--|
| Prerequisite module                                              | None | Semester |  |
| Co-requisites module                                             | None | Semester |  |

| Module Aims, Learning Outcomes and Indicative Contents<br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                                                                        | 8. To develop skills and understanding of principles of operation of the different types of Special Electrical Machines.<br>9. To develop skills and knowledge of the construction of Special Electrical Machines.<br>10. To perform equivalent circuit analysis of the Special Electrical Machines.<br>11. To portray the torque-speed characteristics of the Special Electrical Machines.<br>12. To understand the applications of the Special Electrical Machines.<br>13. This course deals with all operating conditions of the Special Electrical Machines.<br>14. To explain the advantages and disadvantages of the Special Electrical Machines.                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية                                                   | <p style="text-align: right;"><b>At the end of this course, students can:</b></p> 26. Categorize various types of the Special Electrical Machines, and its applications.<br>27. Explain the construction, operation and analysis of the Reluctance motor.<br>28. Explain the construction, operation and analysis of the Hysteresis motor.<br>29. Explain the construction, operation and analysis of the Universal motor.<br>30. Explain the construction, operation and analysis of the Repulsion motor.<br>31. Explain the construction, operation and analysis of the Stepper motor.<br>32. Explain the construction, operation and analysis of the Linear induction motor.<br>33. Explain the construction, operation and analysis of the Schrage motor.<br>34. Explain the Permanent Magnet Synchronous Motor's (PMSM) construction, operation and analysis.<br>35. Explain the Pilot exciter synchronous generator with Generator excitation and voltage control systems' types, construction, operation and analysis. |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                                                                  | <p style="text-align: right;">Indicative content includes the following:</p> <p><b><u>Part A – Starting Problems and distributed field</u></b><br/> Introduction about Special Electrical Machines, Single-phase synchronous motors: Variable Reluctance type motors, Switched Reluctance motors, Hysteresis motor.<br/> [16 hrs.]<br/> Revision problem and tutorial classes [8 hrs.]<br/> Quizzes [1 hr.]</p> <p><b><u>Part B- Equivalent Circuit and Modeling Cases</u></b><br/> Single-phase AC series commutator motor. The Universal motor. The Repulsion motor. Stepper</p>                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>motors: Types, construction, characteristics, equivalent circuit, applications, advantages and disadvantages. Linear induction motors: Types, features and applications. [16 hrs.]</p> <p>Revision problem and tutorial classes [8 hrs.]</p> <p>Quizzes [1 hr.]</p> <p><b>Part C- Special cases and starting Torque</b></p> <p>Three-phase ac commutator machines. Schrage motor. Permanent Magnet Synchronous Motor (PMSM). Pilot excitor synchronous generator, Generator excitation and voltage control systems. [16 hrs.]</p> <p>Revision problem and tutorial classes [8 hrs.]</p> <p>Quizzes [1 hr.]</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Learning and Teaching Strategies</b><br><b>استراتيجيات التعلم والتعليم</b> |                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                                                             | <p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |

| <b>Module Evaluation</b><br><b>تقييم المادة الدراسية</b>                 |                                                                                                                                      |                 |                  |           |                              |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|-----------|------------------------------|
| As                                                                       |                                                                                                                                      | Time/<br>Number | Weight (Marks)   | Week Due  | Relevant Learning<br>Outcome |
| Formative<br>assessment                                                  | Quizzes                                                                                                                              | 3               | 10               | 3, 10, 12 | LO #3,5, and 8               |
|                                                                          | Assignments                                                                                                                          | 3               | 10               | 2 to 12   | LO #1, 2, 6, 7 and 8         |
|                                                                          | Projects / Lab.                                                                                                                      | 0               | 0                | ----      | ----                         |
|                                                                          | Report                                                                                                                               | 1               | 10               | ----      | ----                         |
| Summative<br>assessment                                                  | Midterm Exam                                                                                                                         | 2 hr            | 10               | 8         | LO # 1-8                     |
|                                                                          | Final Exam                                                                                                                           | 3hr             | 60               | 16        | All                          |
| Total assessment                                                         |                                                                                                                                      |                 | 100% (100 Marks) |           |                              |
| <b>Delivery Plan (Weekly Syllabus)</b><br><b>المنهاج الاسبوعي النظري</b> |                                                                                                                                      |                 |                  |           |                              |
| Week                                                                     | Material Covered                                                                                                                     |                 |                  |           |                              |
| Week 1                                                                   | Introduction to Special Electrical Machines                                                                                          |                 |                  |           |                              |
| Week 2                                                                   | Single-phase synchronous motors: Variable reluctance type motors                                                                     |                 |                  |           |                              |
| Week 3                                                                   | Switched reluctance motors_1, Types, construction, characteristics, equivalent circuit, applications, advantages, and disadvantages. |                 |                  |           |                              |
| Week 4                                                                   | Switched reluctance motors_2, Types, construction, characteristics, equivalent circuit, applications, advantages, and disadvantages. |                 |                  |           |                              |
| Week 5                                                                   | Hysteresis motor                                                                                                                     |                 |                  |           |                              |
| Week 6                                                                   | Single-phase AC series commutator motor                                                                                              |                 |                  |           |                              |
| Week 7                                                                   | The Universal motor-1, Types, construction, characteristics, equivalent circuit, applications, advantages, and disadvantages.        |                 |                  |           |                              |
| Week 8                                                                   | The Universal motor-2, Types, construction, characteristics, equivalent circuit, applications, advantages, and disadvantages.        |                 |                  |           |                              |

|                |                                                                                                                       |
|----------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Week 9</b>  | The Repulsion motor.                                                                                                  |
| <b>Week 10</b> | Stepper motors: Types, construction, characteristics, equivalent circuit, applications, advantages and disadvantages. |
| <b>Week 11</b> | Linear induction motors-1: Types, characteristics, and applications.                                                  |
| <b>Week 12</b> | Linear induction motors-2: Types, characteristics, and applications.                                                  |
| <b>Week 13</b> | Three-phase ac commutator machines: Schrage motor.                                                                    |
| <b>Week 14</b> | Pilot excitor synchronous generator                                                                                   |
| <b>Week 15</b> | Generator excitation and voltage control systems                                                                      |
| <b>Week 16</b> | <b>Preparatory week before the final Exam</b>                                                                         |

| Learning and Teaching Resources |                                                                                                                                                                                                                                      |                           |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                                                                                                      |                           |
|                                 | Text                                                                                                                                                                                                                                 | Available in the Library? |
| <b>Required Texts</b>           | 1- Rotating electrical machine, S.K. Sen, 1975<br>2- Alternating current machines, M.G. Say, 1984<br>3- Electric Machinery and their Application, J.Hindmarsh 3rd, 1979<br>مكائن التيار المتردد ، د. باسل محمد و د. ضياء علي، 4-1989 | Yes                       |
| <b>Recommended Texts</b>        | 1- Electrical Machinery, A. E. Fitzgerald, Charles Kingsley, Jr., Stephen D. Umans, 2003.<br>2- Electric Machinery Fundamentals, Stephen J. Chapman, 2005<br>3- Electric Motors and Drives, Austin Hughes, 3rd, 2006                 | No                        |
| <b>Websites</b>                 | 1- Electromechanical Motion Devices, Second Edition, Paul Krause, Oleg Wasynczuk, Steven Pekarek, Wiley-IEEE Press, Year: 2012                                                                                                       | No                        |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                         |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                         |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade                   | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>                                                                                                                                                                                                                                                                                                                                                  | <b>A</b> - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>B</b> - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>C</b> - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>D</b> - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>E</b> - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>                                                                                                                                                                                                                                                                                                                                                       | <b>FX</b> – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | <b>F</b> – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                         |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                         |                     |           |                                       |

### نموذج وصف المادة الدراسية

| Module Information                                       |                                                          |                               |                                                                                                                                                                                                                               |  |
|----------------------------------------------------------|----------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| معلومات المادة الدراسية                                  |                                                          |                               |                                                                                                                                                                                                                               |  |
| Module Title                                             | Power and Machines Lab. IV<br>مختبرات القدرة والمكائن IV |                               | Module Delivery                                                                                                                                                                                                               |  |
| Module Type                                              | Core                                                     |                               | <input type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |  |
| Module Code                                              | EEP418                                                   |                               |                                                                                                                                                                                                                               |  |
| Number of Credit Hours (Total) / Number of Units (Total) | 4/2                                                      |                               |                                                                                                                                                                                                                               |  |
|                                                          |                                                          |                               |                                                                                                                                                                                                                               |  |
| Module Level                                             | UGx11 4                                                  | Semester of Delivery          | 8                                                                                                                                                                                                                             |  |
| Administering Department                                 | 2 - (Electrical Engineering)                             | College                       | UoM2 - (Engineering)                                                                                                                                                                                                          |  |
| Module Leader                                            | Dr.Omar Sh. Alyozbak                                     | e-mail                        | o.yehya@uomosul.edu.iq                                                                                                                                                                                                        |  |
| Module Leader's Acad. Title                              | Prof. ( Head of Dept)                                    | Module Leader's Qualification | PhD                                                                                                                                                                                                                           |  |
| Module Tutor                                             | Prof. Ahmed Nasser B. Alsammak                           | e-mail                        | <a href="mailto:ahmed_alsammak@uomosul.edu.iq">ahmed_alsammak@uomosul.edu.iq</a>                                                                                                                                              |  |
| Peer Reviewer Name                                       | Prof. Ahmed Nasser B. Alsammak                           | e-mail                        | <a href="mailto:ahmed_alsammak@uomosul.edu.iq">ahmed_alsammak@uomosul.edu.iq</a>                                                                                                                                              |  |
| Scientific Committee Approval Date                       |                                                          | Version Number                |                                                                                                                                                                                                                               |  |

| Relation with other Modules       |      |          |  |
|-----------------------------------|------|----------|--|
| العلاقة مع المواد الدراسية الأخرى |      |          |  |
| Prerequisite module               | None | Semester |  |
| Co-requisites module              | None | Semester |  |

| <b>Module Aims, Learning Outcomes and Indicative Contents</b><br><b>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br><b>أهداف المادة الدراسية</b>                                                                               | <p>Power and Machines lab consists of a sum of laboratories that can be listed below:-</p> <p><b>1- Machines Laboratory.</b><br/>In this lab. A student can perform a series of experiments on different specialized machines (II). Also in this lab, an AC Motor Drive is used to study methods for controlling a three-phase induction motor, as well as modern methods for motor starting and dynamic braking. This lab is given by (Dr. Wael Hashem, Dr. Saad Enad).</p> <p><b>2- Control Laboratory.</b><br/>Demonstrate his/her understanding of the basics of control system laboratory including: Basics of transfer function of any control system and represented in MATLAB software, realization and implementation of control system in time domain and frequency domain response such step response, bode plot response, Nichols. PID controller. State space model represents for transfer function of control system. Implement some controller such state variable feedback design and root locus design for speed control of dc servo motor. Principle of Arduino microcontroller with many applications. This lab. is given by (Dr. Ibrahim Ismael, Dr. Hasan Adnan).</p> <p><b>3- Transmission Line Laboratory.</b><br/>To study the behavior of transmission lines under the principles of compensation and voltage regulation, along with load flow analysis and fault study. This lab. is given by (Dr. Shakir Mahmood).</p> <p><b>4- Renewable Energy Laboratory.</b><br/>Recently, renewable energy has been more popular in household and rural locations due to the reduction of conventional energy sources. This laboratory helps the student to understand and design different types of renewable energy, such as photovoltaic energy systems, wind energy systems, etc. This lab. is given by (Dr. Omer Sharaf-aldeen, Raghad Adeeb).</p> <p><b>5- High Voltage Laboratory.</b> This lab provides principal knowledge associated with high voltage engineering methods, techniques, and equipment. It is divided into two sections. The first section uses methods to measure the insulation resistance, and the second section measures soil resistance (Dr. Dawood Najem Saleh and Dr. Riyadh Zaki).</p> |
| <b>Module Learning Outcomes</b><br><b>مخرجات التعلم للمادة الدراسية</b>                                                          | <p>At completing this course, the student should be able to:</p> <p>36. Understand the operation of the transmission line.</p> <p>37. Simulate and analyze all the input and output ratings of the transmission line.</p> <p>38. Investigate the effect of the faults that occur in the transmission line and the protection</p> <p>39. device performance.</p> <p>40. Learn about spatial types of machines used in real life and understand their applications.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Indicative Contents</b><br><b>المحتويات الإرشادية</b>                                                                         | <p>Dividing and organizing the students into sum of groups and teams.</p> <p>Examine the construction of the universal motor, then determine the brushes' neutral point and find its no-load and full load characteristics while operating on AC and DC.</p> <p>Compare the starting torque for the Universal motor on both AC and DC supply. Dependence of the universal motor speed on the voltage while operating on an AC supply, then observe the effect of removing the compensating winding on both the AC and DC supply. Observe the effect of the universal motor inductive compensation on both AC and DC.</p> <p>Modern methods to control the starting and braking of a three-phase induction motor.</p> <p>State variable feedback design.</p> <p>Root locus design in MATLAB.</p> <p>High Voltage safety</p> <p>Breakdown voltage for the DC field.</p> <p>Soil resistivity test.</p> <p>polarity effects on breakdown voltage.</p> <p>Operation of Boost converters in PV System.</p> <p>Effect of irradiation and temperature on the PV Panel Output Power Generation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

|  |                                                                                                     |
|--|-----------------------------------------------------------------------------------------------------|
|  | The power station and transmission system model short circuit and no-load test on a logic line Exam |
|--|-----------------------------------------------------------------------------------------------------|

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

#### Strategies

Focus on hands-on experiments that reinforce theoretical concepts. Use a combination of demonstrations, simulations, and real-world case studies to illustrate the functioning of machines and power systems. Encourage problem-solving and data analysis during experiments to foster critical thinking. Incorporate safety protocols and real-time troubleshooting to prepare students for industrial applications. Finally, assess learning through practical reports, quizzes, and project-based assignments.

## Module Evaluation

### تقييم المادة الدراسية

|                         | As               | Time/<br>Number | Weight (Marks)   | Week Due | Relevant Learning<br>Outcome |
|-------------------------|------------------|-----------------|------------------|----------|------------------------------|
| Formative<br>assessment | Quizzes          | 1               | 10               | 8        | All                          |
|                         | Report           | 10              | 20               | 1 to 15  | All                          |
|                         | Practical Exam   | 1               | 20               | 8,15     | All                          |
| Summative<br>assessment | Theoretical Exam | 1               | 10               | 7        | All                          |
|                         | Final Exam       | 3hr             | 40               | 16       | All                          |
| Total assessment        |                  |                 | 100% (100 Marks) |          |                              |

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

| Week   | Material Covered                                                                                                                                                                                                                                                                                                                             |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 1 | Dividing and organizing the students into sum of groups and teams.                                                                                                                                                                                                                                                                           |
| Week 2 | Examine the construction of the universal motor then determine the brushes neutral point and find its no-load and full load characteristics while operating on AC and DC.                                                                                                                                                                    |
| Week 3 | Compare the starting torque for the Universal motor on both AC and DC supply. Dependency of the universal motor speed on the voltage while operating on AC supply then observe the effect of removing the compensating winding on both AC and DC supply. Observe the effect of the universal motor inductive compensation on both AC and DC. |
| Week 4 | Root locus design in Matlab.                                                                                                                                                                                                                                                                                                                 |
| Week 5 | State variable feedback design.                                                                                                                                                                                                                                                                                                              |
| Week 6 | Modern methods to control the starting and braking of a three phase induction motor.                                                                                                                                                                                                                                                         |

|                |                                                                                                |
|----------------|------------------------------------------------------------------------------------------------|
| <b>Week 7</b>  | Operation of Boost converters in PV System.                                                    |
| <b>Week 8</b>  | Effect of irradiation and temperature on the PV Panel Output Power Generation.                 |
| <b>Week 9</b>  | Review                                                                                         |
| <b>Week 10</b> | Exam                                                                                           |
| <b>Week 11</b> | Breakdown voltage for DC field.                                                                |
| <b>Week 12</b> | Soil resistivity test.                                                                         |
| <b>Week 13</b> | polarity effects on breakdown voltage.                                                         |
| <b>Week 14</b> | The power station and transmission system model short circuit and no-load test on a logic line |
| <b>Week 15</b> | Exam                                                                                           |

| Learning and Teaching Resources |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                           |
|                                 | Text                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Available in the Library? |
| <b>Required Texts</b>           | 1- Induction Machines Handbook Transients, Control Principles, Design and Testing, ION BOLDEA.<br>2- SYNCHRONOUS GENERATORS, ION BOLDEA.<br>3- Feedback Group Company. www.feedback.group.com.<br>4- Roland S. Burns, " Advanced Control Engineering", University of Plymouth. UK., 2001.<br>5- B.M. Weedy, Electric Power System, 5th edition, John Wiley and Sons, 2012.<br>6- William D. Stevenson, Jr, Elements of Power System Analysis, 4th Edition, McGraw Hill, 1982.<br>7- John Twidell and Tony Weir "Renewable Energy Resources " second edition<br>8- Wim Turkenburg "Renewable Energy".<br>9- JP Holtzhausen , WL Vosloo "High Voltage Engineering Practice and Theory" 2018 | Yes                       |
| <b>Recommended Texts</b>        | Electric Circuits Tenth Edition (James W. Nilsson) 2015                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | No                        |
| <b>Websites</b>                 | Fundamentals of Electric Circuits (Charles K. Alexander) 2009                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |
|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                  |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
|                                                                                                                                                                                                                                                                                                                                                                                      | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |

## نموذج وصف المادة الدراسية

| Module Information      |                             |                 |
|-------------------------|-----------------------------|-----------------|
| معلومات المادة الدراسية |                             |                 |
| Module Title            | Physics III<br>الفيزياء III | Module Delivery |
| Module Type             | Core                        | ☑ Theory        |

|                                                          |                               |                    |                               |                                                                                                                                                                                                                                       |        |
|----------------------------------------------------------|-------------------------------|--------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Module Code                                              | EEC 420                       |                    |                               | <div><input type="checkbox"/> Lecture</div> <div><input type="checkbox"/> Lab</div> <div><input checked="" type="checkbox"/> Tutorial</div> <div><input type="checkbox"/> Practical</div> <div><input type="checkbox"/> Seminar</div> |        |
| Number of Credit Hours (Total) / Number of Units (Total) | 3/3                           |                    |                               |                                                                                                                                                                                                                                       |        |
|                                                          |                               |                    |                               |                                                                                                                                                                                                                                       |        |
| Module Level                                             |                               | 4                  | Semester of Delivery          |                                                                                                                                                                                                                                       | 8      |
| Administering Department                                 |                               | Electrical Dept.   | College                       | Engineering                                                                                                                                                                                                                           |        |
| Module Leader                                            | Dr. Omar Sharaf Al-Deen Yehya |                    | e-mail                        | o.yehya@uomosul.edu.iq                                                                                                                                                                                                                |        |
| Module Leader’s Acad. Title                              |                               | Asst. Prof         | Module Leader’s Qualification |                                                                                                                                                                                                                                       | Doctor |
| Module Tutor                                             | Mr. Ahmad Abduljabbar Ismael  |                    | e-mail                        | a.a.ismail@uomosul.edu.iq                                                                                                                                                                                                             |        |
| Peer Reviewer Name                                       |                               | Dr. Mohammed Obaid | e-mail                        | mohammed.obaid@uomosul.edu.iq                                                                                                                                                                                                         |        |
| Scientific Committee Approval Date                       |                               |                    | Version Number                |                                                                                                                                                                                                                                       | 1      |

### Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                             |      |                 |  |
|-----------------------------|------|-----------------|--|
| <b>Prerequisite module</b>  | None | <b>Semester</b> |  |
| <b>Co-requisites module</b> | None | <b>Semester</b> |  |

### Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <ul style="list-style-type: none"> <li>To develop applied skills in employing advanced electromagnetic laws to analyze electromechanical energy conversion systems (motors, generators, and relays).</li> <li>To apply physical principles in modeling and optimizing renewable energy systems, specifically solar photovoltaics and wind turbines.</li> <li>To deepen the understanding of solid-state physics as a foundation for designing and manufacturing power electronic components like Thyristor and Triac.</li> </ul> |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ul style="list-style-type: none"> <li>Ability to calculate electromagnetic and electrostatic forces in micro-electromechanical systems (MEMS).</li> <li>Understanding photon physics and charge carrier dynamics to analyze the efficiency of solar cells.</li> </ul>                                                                                                                                                                                                                                                           |

|                                                   |                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | <ul style="list-style-type: none"> <li>Analyzing the physical and thermal behavior of Thyristors and Triacs in high-power circuits.</li> </ul>                                                                                                                                                                                           |
| <b>Indicative Contents</b><br>المحتويات الإرشادية | <p>Part I: Physics of electromechanical forces, magnetic circuits, and electrostatic relays.</p> <p>Part II: Photon physics, energy bandgaps, solar conversion systems, and wind dynamics.</p> <p>Part III: Advanced semiconductor physics, carrier transport, and fabrication technology for power electronics and thermal sensors.</p> |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | <p><b>1. Lectures</b></p> <ul style="list-style-type: none"> <li>Structured lectures introduce fundamental concepts, theories, and analytical techniques in control systems.</li> <li>Emphasis is placed on conceptual understanding, mathematical formulation, and physical interpretation.</li> </ul> <p><b>2. Problem-Solving Sessions</b></p> <ul style="list-style-type: none"> <li>Guided tutorials focus on solving numerical and analytical problems.</li> <li>Students practice stability analysis, controller design, and performance evaluation.</li> <li>Active student participation is encouraged through in-class discussions.</li> </ul> <p><b>3. Project-Based Learning</b></p> <ul style="list-style-type: none"> <li>Individual or group mini-projects involve modeling, analysis, and controller design for selected systems.</li> </ul> <p><b>4. Self-Directed Learning</b></p> <ul style="list-style-type: none"> <li>Students are encouraged to engage in independent study through textbooks, research papers, and online resources.</li> <li>Homework assignments and reading tasks support deeper understanding.</li> </ul> <p><b>5. Continuous Feedback</b></p> <ul style="list-style-type: none"> <li>Regular formative feedback is provided through assignments, quizzes, and reports.</li> </ul> <p>Feedback helps students identify strengths and areas for improvement.</p> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Module Evaluation

### تقييم المادة الدراسية

|                                 | As                     | Time/<br>Number | Weight (Marks) | Week Due | Relevant Learning<br>Outcome |
|---------------------------------|------------------------|-----------------|----------------|----------|------------------------------|
| <b>Formative<br/>assessment</b> | <b>Quizzes</b>         | 4               | 5% (5)         | 2, 8, 12 | LO# 2, 5 and 7               |
|                                 | <b>Assignments</b>     | 3               | 5% (5)         | 2 to 15  | LO # 1, 3, and 6             |
|                                 | <b>Projects / Lab.</b> | 0               | 0 (0)          | -----    | ----                         |
|                                 | <b>Report</b>          |                 |                |          |                              |

|                      |              |   |                  |    |     |
|----------------------|--------------|---|------------------|----|-----|
| Summative assessment | Midterm Exam | 1 | 30%(30)          | 11 | 3   |
|                      | Final Exam   | 1 | 60% (60)         | 9  | 1-4 |
| Total assessment     |              |   | 100% (100 Marks) |    |     |

| <b>Delivery Plan (Weekly Syllabus)</b><br>المناهج الاسبوعي النظري |                                                                                                                                                         |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week                                                              | Material Covered                                                                                                                                        |
| Week 1                                                            | Force Physics: Review of Maxwell's equations and Faraday's law applications in generators.                                                              |
| Week 2                                                            | <b>Magnetic Circuits:</b> Permeability, Hysteresis, and energy loss in electric motors. Physics of forces between charged plates and MEMS applications. |
| Week 3                                                            | <b>Electrostatic Relays:</b> Physics of forces between charged plates and MEMS applications                                                             |
| Week 4                                                            | <b>Renewable Energy:</b> Physics of light and photon absorption in semiconductors.                                                                      |
| Week 5                                                            | <b>Solar Cells:</b> P-N junction physics under illumination; Short-circuit current and Open-circuit voltage.                                            |
| Week 6                                                            | <b>Energy Efficiency:</b> Physical and environmental factors affecting solar cells (Heat and Shading).                                                  |
| Week 7                                                            | <b>Wind Energy:</b> Fluid dynamics, Betz's Law, and converting kinetic motion into electrical energy.                                                   |
| Week 8                                                            | Midterm Exam                                                                                                                                            |
| Week 9                                                            | <b>Solid State Physics:</b> Fermi statistics, energy gaps, and doping levels in semiconductors.                                                         |
| Week 10                                                           | <b>Transistor Physics:</b> Transport mechanisms (Drift and Diffusion) and Field-Effect in power transistors.                                            |
| Week 11                                                           | <b>Thyristors:</b> Physical structure (PNPN), triggering mechanisms, and controlled breakdown.                                                          |
| Week 12                                                           | <b>Triacs:</b> Physics of bidirectional operation and AC power control                                                                                  |
| Week 13                                                           | <b>Thermal Components:</b> Physics of NTC and PTC conductors and thermal protection applications                                                        |
| Week 14                                                           | <b>Applied Case Studies:</b> Physical modeling of an integrated system (Solar + Power Electronics).                                                     |
| Week 15                                                           | <b>Fabrication Physics:</b> Lithography, deposition, and ion implantation in semiconductor manufacturing.                                               |
| Week 16                                                           | Preparatory week before the final Exam                                                                                                                  |

| <b>Learning and Teaching Resources</b><br>مصادر التعلم والتدريس |                                                                    |                           |
|-----------------------------------------------------------------|--------------------------------------------------------------------|---------------------------|
|                                                                 | Text                                                               | Available in the Library? |
| Required Texts                                                  | <i>Principles of Electronic Materials and Devices – S.O. Kasap</i> |                           |
|                                                                 | <i>Electric Machinery Fundamentals – Stephen J. Chapman.</i>       |                           |
| Recommended Texts                                               | Physics of Solar Cells – Peter Würfel.                             |                           |
| Websites                                                        |                                                                    |                           |

| <b>Grading Scheme</b><br>مخطط الدرجات |               |         |           |                                |
|---------------------------------------|---------------|---------|-----------|--------------------------------|
| Group                                 | Grade         | التقدير | Marks (%) | Definition                     |
| Success Group<br>(50 - 100)           | A - Excellent | امتياز  | 90 - 100  | Outstanding Performance        |
|                                       | B - Very Good | جيد جدا | 80 - 89   | Above average with some errors |
|                                       | C - Good      | جيد     | 70 - 79   | Sound work with notable errors |

|                                                                                                                                                                                                                                                                                                                                                                                             |                         |                     |         |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------|---------|---------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>D - Satisfactory</b> | متوسط               | 60 - 69 | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>E - Sufficient</b>   | مقبول               | 50 - 59 | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 – 49)</b>                                                                                                                                                                                                                                                                                                                                                              | <b>FX – Fail</b>        | راسب (قيد المعالجة) | (45-49) | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                             | <b>F – Fail</b>         | راسب                | (0-44)  | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                             |                         |                     |         |                                       |
| <p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p> |                         |                     |         |                                       |

### نموذج وصف المادة الدراسية

| Module Information      |           |                 |
|-------------------------|-----------|-----------------|
| معلومات المادة الدراسية |           |                 |
| Module Title            | Chemistry | Module Delivery |

|                                                          |                            |                               |                                                                                                                                                                                                                                                                                             |                               |     |
|----------------------------------------------------------|----------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----|
|                                                          | الكيمياء                   |                               |                                                                                                                                                                                                                                                                                             |                               |     |
| Module Type                                              | Core                       |                               | <div><input checked="" type="checkbox"/> Theory</div> <div><input type="checkbox"/> Lecture</div> <div><input type="checkbox"/> Lab</div> <div><input checked="" type="checkbox"/> Tutorial</div> <div><input type="checkbox"/> Practical</div> <div><input type="checkbox"/> Seminar</div> |                               |     |
| Module Code                                              | EEC 421                    |                               |                                                                                                                                                                                                                                                                                             |                               |     |
| Number of Credit Hours (Total) / Number of Units (Total) | 3/3                        |                               |                                                                                                                                                                                                                                                                                             |                               |     |
|                                                          |                            |                               |                                                                                                                                                                                                                                                                                             |                               |     |
| Module Level                                             |                            | Fourth-P&M                    | Semester of Delivery                                                                                                                                                                                                                                                                        |                               | six |
| Administering Department                                 |                            | Department of Electrical Eng. | College                                                                                                                                                                                                                                                                                     | Engineering                   |     |
| Module Leader                                            | Dr.Omar Sh. Alyozbak       |                               | e-mail                                                                                                                                                                                                                                                                                      | o.yehya@uomosul.edu.iq        |     |
| Module Leader’s Acad. Title                              |                            | Head of Dept.                 | Module Leader’s Qualification                                                                                                                                                                                                                                                               |                               | PhD |
| Module Tutor                                             | Dr. Mohammed Obaid Mustafa |                               | e-mail                                                                                                                                                                                                                                                                                      | mohammed.obaid@uomosul.edu.iq |     |
| Peer Reviewer Name                                       |                            | Dr. Mohammed Obaid Mustafa    | e-mail                                                                                                                                                                                                                                                                                      | mohammed.obaid@uomosul.edu.iq |     |
| Scientific Committee Approval Date                       |                            |                               | Version Number                                                                                                                                                                                                                                                                              |                               | 1.1 |

### Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

|                      |      |          |  |
|----------------------|------|----------|--|
| Prerequisite module  | None | Semester |  |
| Co-requisites module | None | Semester |  |

### Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module Aims<br>أهداف المادة الدراسية                      | <ul style="list-style-type: none"> <li>Strengthen chemical understanding of materials used in electrical engineering.</li> <li>Explain chemical degradation and aging of insulation systems.</li> <li>Support material selection for high-voltage and power applications.</li> <li>Introduce chemical aspects of energy storage and sustainability.</li> <li>Prepare students for advanced courses in high-voltage engineering, power systems, and renewable energy.</li> </ul>                                                         |
| Module Learning Outcomes<br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>Explain atomic bonding and chemical structure of electrical materials.</li> <li>Analyze chemical aging and degradation mechanisms in insulation systems.</li> <li>Describe dielectric behavior of gases and liquids used in power equipment.</li> <li>Evaluate corrosion and electrochemical effects in grounding systems.</li> <li>Assess chemical principles behind modern energy storage technologies.</li> <li>Apply sustainability concepts to electrical engineering materials.</li> </ol> |
| Indicative Contents<br>المحتويات الإرشادية                | Part A – Chemical Foundations and Electrical Engineering Materials<br>Atomic structure and periodic trends; chemical bonding and relation to electrical conductivity, dielectric strength, and thermal stability; structure-property relationships in conductors, insulators, and semiconductors. Metals and alloys; PVC, XLPE, epoxy, silicone rubber, ceramics, glass, composite                                                                                                                                                      |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | insulation systems, fillers, stabilizers, and additives. [21 hrs.]                                                                                                                                                                                                                                                                                                                                                      |
|  | Part B – Aging, Degradation, and Dielectric Media<br>Oxidation, thermal degradation, hydrolysis, moisture effects, electrical treeing, water treeing, radiation, environmental effects, insulation lifetime, dielectric gases, SF6 chemistry and decomposition, eco-friendly alternatives, mineral and ester transformer oils, contamination, moisture, acidity, dissolved gases, oil aging and regeneration. [21 hrs.] |
|  | Part C – Electrochemistry, Energy Storage, and Sustainability<br>Electrochemical reactions, corrosion mechanisms, grounding systems, coatings, cathodic protection, battery chemistries, degradation, safety, recycling, environmental impact, green insulation materials, SF6 replacement, and regulatory considerations. [21 hrs.]                                                                                    |

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

|                   |                                                                                                                                                                                               |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b> | Lectures, guided problem-solving sessions, practical case studies, self-directed learning using technical references, and continuous feedback through quizzes, assignments, and examinations. |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Module Evaluation

### تقييم المادة الدراسية

|                                 | As                  | Time/<br>Number | Weight (Marks) | Week Due  | Relevant Learning<br>Outcome |
|---------------------------------|---------------------|-----------------|----------------|-----------|------------------------------|
| <b>Formative<br/>assessment</b> | <b>Quizzes</b>      | 1/3             | 10             | CONTINUES | 1-2                          |
|                                 | <b>Assignments</b>  | 1/3             | 5              | CONTINUES | 1-2                          |
|                                 | <b>CLASSWORK</b>    | 1/1             | 5              | CONTINUES | 1-2                          |
|                                 | <b>Report</b>       | 1/1             | 10             | CONTINUES | 1-2                          |
| <b>Summative<br/>assessment</b> | <b>Midterm Exam</b> | 1.5/1           | 10             | CONTINUES | 1-2                          |
|                                 | <b>Final Exam</b>   | 3/1             | 60             | CONTINUES | 1-2                          |
| <b>Total assessment</b>         |                     |                 | 100            |           |                              |

## Delivery Plan (Weekly Syllabus)

### المناهج الأسبوعي النظري

| Week    | Material Covered                            |
|---------|---------------------------------------------|
| Week 1  | Role of chemistry in electrical engineering |
| Week 2  | Atomic structure and bonding                |
| Week 3  | Electrical materials: metals and alloys     |
| Week 4  | Polymers and composites in insulation       |
| Week 5  | Chemical aging mechanisms                   |
| Week 6  | Treeing and insulation lifetime             |
| Week 7  | Midterm Exam                                |
| Week 8  | Dielectric gases and SF6                    |
| Week 9  | Eco-friendly gases such as g3               |
| Week 10 | Liquid dielectrics and transformer oils     |
| Week 11 | Electrochemistry fundamentals               |
| Week 12 | Corrosion and grounding systems             |
| Week 13 | Battery chemistry                           |
| Week 14 | Sustainability and green materials          |
| Week 15 | Review and applied case studies             |
| Week 16 | Preparatory week before final exam          |

| Learning and Teaching Resources |                                                                                                                                                                                                                                                                                         |                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                                                                                                                                                         |                           |
|                                 | Text                                                                                                                                                                                                                                                                                    | Available in the Library? |
| Required Texts                  | <ul style="list-style-type: none"> <li>• A.J. Dekker – Electrical Engineering Materials</li> <li>• Dissado &amp; Fothergill – Electrical Degradation and Breakdown in Polymers</li> <li>• Wadhwa – High Voltage Engineering</li> <li>• Selected IEEE / IEC technical reports</li> </ul> |                           |
| Recommended Texts               |                                                                                                                                                                                                                                                                                         |                           |
| Websites                        |                                                                                                                                                                                                                                                                                         |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                  |                     |           |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks (%) | Definition                            |
|                                                                                                                                                                                                                                                                                                                                                                                      | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          |                  |                     |           |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |           |                                       |