# University of Mosul
# جامعة الموصل

## College of Science
## كلية العلوم

*First Cycle – Bachelor's degree (B.Sc.) – New and Renewable Energies*

**بكالوريوس علوم - الطاقات الجديدة والمتجددة**

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## 1. Mission & Vision Statement

***Vision Statement*** **الرؤية**

We aspire to be a leading academic department in the field of new and renewable energy by fostering an innovative educational environment based on cutting-edge scientific and technical curricula. Our vision is to equip students with the skills and knowledge necessary to explore sustainable solutions to environmental and energy challenges. Through research, innovation, and collaboration, we aim to drive sustainable development, train highly qualified professionals, and lead the transition to clean and renewable energy sources. Our commitment lies in offering high-quality education that meets labor market demands, enabling our graduates to pioneer sustainable energy projects globally.

نطمح إلى أن نكون قسم الطاقات الجديدة والمتجددة قسما أكاديميًا رائدًا في مجال الطاقات الجديدة والمتجددة من خلال تعزيز بيئة تعليمية مبتكرة تستند إلى مناهج علمية وتقنية متقدمة. رؤيتنا تتمثل في تزويد الطلبة بالمهارات والمعرفة اللازمة لاستكشاف حلول مستدامة للتحديات البيئية ومشكلات الطاقة. ومن خلال البحث العلمي والابتكار والتعاون، نسعى إلى دفع عجلة التنمية المستدامة، وتدريب كوادر مؤهلة تأهيلاً عالياً، وقيادة التحول نحو مصادر الطاقة النظيفة والمتجددة. ونحن ملتزمون بتقديم تعليم عالي الجودة يواكب متطلبات سوق العمل، ويُمكّن خريجينا من ريادة المشاريع المستدامة في مجال الطاقة على مستوى العالم.

***Mission Statement*** **الرسالة**

Our mission is to accelerate the adoption and integration of new and renewable energy sources to meet the growing demand for sustainable and clean energy. We aim to drive innovation and collaboration across the energy sector to create a more resilient, reliable, and affordable energy system. We are committed to ensuring that our efforts are guided by a strong sense of environmental responsibility, social equity, and economic viability.

نسعى لأن يكون قسم الطاقات الجديدة والمتجددة في طليعة الأقسام الأكاديمية المتخصصة في مجال الطاقات المستدامة، عبر تطوير بيئة تعليمية مبتكرة ترتكز على مناهج علمية وتقنية حديثة تواكب أحدث التطورات في هذا المجال. نهدف إلى تمكين الطلاب من اكتساب المهارات والمعرفة التي تؤهلهم لاستكشاف حلول مستدامة وفعّالة للتحديات البيئية والطاقة في العالم المعاصر. كما نؤمن بأن القسم سيسهم بشكل مباشر في تحقيق التنمية المستدامة من خلال البحث العلمي والابتكار، وتوفير الكوادر المؤهلة التي تساهم في قيادة التحول نحو مصادر الطاقة النظيفة والمتجددة.

# 2. Program Specification

| | | | |
|---|---|---|---|
| **Programme code:** | *BSc-NRE* | **ECTS** | *240* |
| **Duration:** | *4 levels, 8 Semesters* | **Method of Attendance:** | *Full Time* |

A new and renewable energies department refer to teaching and researching renewable energy technologies and sustainability. Such a department offer courses and programs related to renewable energy, sustainable engineering, energy policy, and environmental science.
The department may also conduct research on renewable energy technologies, such as solar cells, wind turbines, and energy storage systems. This research could focus on areas such as improving efficiency, reducing costs, and developing new technologies.
In addition, a new and renewable energies department may collaborate with industry partners, government agencies, and non-profit organizations to promote renewable energy solutions and support the transition to a more sustainable energy system. They may also provide outreach and education to the broader community on the importance of renewable energy and sustainability.

يُعنى قسم الطاقات الجديدة والمتجددة بتعليم وبحث تقنيات الطاقة المتجددة والاستدامة. حيث يقدم هذا القسم برامج ومقررات دراسية متخصصة في مجالات الطاقة المتجددة، والهندسة المستدامة، وسياسات الطاقة، والعلوم البيئية.

كما يضطلع القسم بإجراء أبحاث علمية حول تقنيات الطاقة المتجددة، مثل الخلايا الشمسية، والتوربينات الهوائية، وأنظمة تخزين الطاقة. وتركز هذه الأبحاث على تحسين الكفاءة، وتقليل التكاليف، وتطوير تقنيات جديدة مبتكرة.

بالإضافة إلى ذلك، يتعاون قسم الطاقات الجديدة والمتجددة مع شركاء من القطاع الصناعي، والجهات الحكومية، والمنظمات غير الربحية بهدف تعزيز حلول الطاقة المتجددة ودعم التحول نحو نظام طاقة أكثر استدامة. كما يضطلع القسم بدور توعوي من خلال تقديم برامج تعليمية للمجتمع تسلط الضوء على أهمية الطاقة المتجددة ومبادئ الاستدامة.

Level 1 exposes students to the fundamentals of new and renewable energies, suitable for progression to all programmers within the department programme group. Programme-specific core topics are covered at Level 2 preparing for research-led subject specialist modules at Levels 3 and 4. The new and renewable energies graduate is therefore trained to appreciate how research informs teaching and field-working, according to our vision.

Level 1: - Awareness of the importance of renewable energy and sustainability
- Understanding of the course objectives and content
- Perception of the quality of the course delivery and materials
- Motivation to learn more about renewable energy and sustainability

Level 2: - Knowledge of renewable energy technologies and their applications
- Understanding of the principles of sustainability and their relevance to energy systems
- Ability to analyze and evaluate different renewable energy options
- Familiarity with relevant policies, regulations, and standards

Level 3: - Ability to apply the knowledge and skills learned in the course to real-world situations
- Incorporation of sustainable practices in personal and professional life
- Confidence in making informed decisions related to renewable energy and sustainability
- Collaboration and communication skills to work effectively with others on REs projects

Level 4: - Increased adoption of renewable energy technologies and sustainable practices
- Reduced carbon emissions and other environmental impacts
- Improved energy efficiency and cost savings
- Increased awareness and understanding of renewable energy and sustainability issues

## 3. Program Objectives اهداف البرنامج

### 1. Enhancing Innovation in Renewable Energy Technologies

- Developing students' skills in innovative thinking and problem-solving in the renewable energy sector.
- Encouraging research and development to create sustainable and efficient energy solutions.

## 2. Bridging Theory with Practical Application

- Strengthening partnerships with industrial and research institutions.
- Providing hands-on training opportunities to prepare students for real-world applications.

## 3. Advancing Scientific Research in Renewable Energy

- Supporting student research projects and establishing specialized research centers.
- Enhancing academic standing through advanced graduate programs.

## 4. Promoting Environmental Sustainability

- Integrating sustainability concepts into curricula and research.
- Encouraging responsible use of natural resources and minimizing environmental impacts.

## 5. Developing Technical and Ethical Competencies

- Providing hands-on training in renewable energy technologies.
- Instilling ethical values to ensure responsible and sustainable practices.

## 6. Strengthening International Cooperation

- Collaborating with global universities and research institutions.
- Facilitating knowledge exchange through joint projects and research.

## 7. Integrating Artificial Intelligence & Nanotechnology

- Introducing AI and nanotechnology into renewable energy curricula.
- Offering elective courses that explore their applications in improving energy efficiency.

- تطوير مهارات الخريجين وتعزيز جاهزيتهم لسوق العمل

يسعى القسم إلى تزويد الطلبة بالمعارف والمهارات اللازمة ليكونوا مؤهلين للمنافسة عالميًا، من خلال تحسين قدراتهم العلمية والتطبيقية في جميع المجالات المتعلقة بمصادر الطاقة الجديدة والمتجددة.

- إجراء أبحاث علمية متقدمة في مجال الطاقة والطاقة المتجددة

يهدف القسم إلى إنتاج أبحاث عالية الجودة تركز على استغلال الموارد المحلية في تطوير تقنيات الطاقة المتجددة، مما يسهم في تحقيق الاستدامة البيئية والاقتصادية.

- دعم المجتمع والمؤسسات الحكومية في مواجهة تحديات الطاقة

يعمل القسم على تقديم الاستشارات والحلول الفعالة لمختلف الجهات، بهدف تعزيز كفاءة استخدام الطاقة وتحسين أداء الأنظمة الطاقية في المؤسسات المختلفة.

- تعزيز مبادئ التنمية المستدامة

من خلال توظيف الموارد الجديدة والمتجددة لتوليد الطاقة، يسعى القسم إلى تقليل الاعتماد على الوقود الأحفوري، مما يساهم في حماية البيئة ودعم الاقتصاد الأخضر.

- تنمية المهارات التقنية والأخلاقية لدى الطلبة

يحرص القسم على إعداد خريجين يتمتعون بمهارات تقنية متقدمة في مجال الطاقة المتجددة، مع التزامهم بالمعايير الأخلاقية والمهنية التي تعزز من دورهم في المجتمع.

- دمج الذكاء الاصطناعي وتقنيات النانو في قطاع الطاقة

يهدف القسم إلى استغلال التقنيات الحديثة، مثل الذكاء الاصطناعي والنانو تكنولوجي، في تحسين أداء موارد الطاقة المتجددة وزيادة كفاءتها، مما يسهم في تحقيق ثورة علمية في هذا المجال.

## 1. Student Learning Outcomes مخرجات التعلم

The study of new and renewable energies typically focuses on the science, technology, and policy related to renewable energy sources, including solar, wind, geothermal, hydropower, biomass, and ocean energy. It involves understanding the physical and chemical principles underlying renewable energy technologies, as well as the economic, environmental, and social factors that influence their adoption and deployment.

While the organizational and operational aspects of renewable energy systems are important components of the field, they are not the sole focus. Instead, the study of new and renewable energies typically covers a broad range of topics.

Overall, the study of new and renewable energies is an interdisciplinary field that draws on principles and techniques from science, engineering, economics, policy, and social science to address the complex challenges of transitioning to a more sustainable energy system.

**Outcome 1**

*Knowledge of renewable energy technologies*

Graduates will have a comprehensive understanding of different renewable energy technologies, including their principles, applications, advantages, and limitations.

**Outcome 2**

*Understanding of sustainability principles*

Graduates will understand the principles of sustainability and their relevance to energy systems, and be able to analyze the social, environmental, and economic impacts of renewable energy technologies.

**Outcome 3**

*Ethical and professional responsibility*

Graduates will understand the ethical and professional responsibilities associated with renewable energy technologies, and be able to apply them in their personal and professional lives.

**Outcome 4**

*Laboratory and Field Studies*

Graduates will be able to perform laboratory experiments and field studies, by using scientific equipment and computer technology while observing appropriate safety protocols.

**Outcome 5**

*Collaboration and communication skills*

Graduates will be able to work effectively in teams, communicate their ideas clearly, and present their findings to diverse audiences.

**Outcome 6**

*Scientific Knowledge*

Graduates will be able to design and implement renewable energy systems that meet the energy needs of communities, organizations, and individuals, and to evaluate their performance.

**Outcome 7**

*Data Analyses*

Graduates will be able to evaluate the technical and economic feasibility of different renewable energy systems, and to compare them with conventional energy sources.

**Outcome 8**

*Critical Thinking*

Graduates will be able to identify and assess complex problems related to renewable energy and sustainability, and to develop and implement effective solutions.

1- تحديد التحديات المتعلقة بالطاقة المتجددة يتمكن الطلبة من التعرف على القضايا الرئيسية المرتبطة بكفاءة الطاقة، والاستدامة، والأثر البيئي، وتحليلها.

2- توظيف المعرفة العلمية في حلول الطاقة يتم تأهيل الخريجين لتصميم وتنفيذ حلول فعّالة للطاقة النظيفة تلبي الاحتياجات المحلية والعالمية.

3- إجراء التجارب العلمية في مجال الطاقة المتجددة تطوير مهارات عملية في تصميم واختبار وتحليل تقنيات الطاقة المتجددة.

4- التواصل الفعّال في قطاع الطاقة تعزيز مهارات التواصل الشفوي والكتابي للتعاون المهني والأكاديمي.

5- الالتزام بالمعايير الأخلاقية والمهنية فهم المسؤوليات الاجتماعية والبيئية المرتبطة بممارسات الطاقة المتجددة.

6- التميز في المشاريع الجماعية في مجال الطاقة العمل بفعالية ضمن فرق بحثية لتطوير حلول مبتكرة في مجال الطاقة.

7- .مواكبة التطورات التكنولوجية اكتساب المعرفة والخبرة في أحدث تقنيات الطاقة، بما في ذلك الطاقة الشمسية، وطاقة الرياح، والطاقة الحيوية.

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# 3. Credits, Grading and GPA

***Credits***

Mosul University is following the Bologna Process with the European Credit Transfer System (ECTS) credit system. The total degree program number of ECTS is 240, 30 ECTS per semester. 1 ECTS is equivalent to 25 hrs student workload, including structured and unstructured workload.

***Grading***

Before the evaluation, the results are divided into two subgroups: pass and fail. Therefore, the results are independent of the students who failed a course. The grading system is defined as follows:

| GRADING SCHEME<br>مخطط الدرجات | | | | |
|---|---|---|---|---|
| **Group** | **Grade** | التقدير | **Marks (%)** | **Definition** |
| **Success Group (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 (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: | | | | |
| Number 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. | | | | |

***Calculation of the Cumulative Grade Point Average (CGPA)***

1. The CGPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

   CGPA of a 4-year B.Sc. degree:

   CGPA = [ (1st $^{m}$odule score x ECTS) + (2nd $^{m}$odule score x ECTS) + ……] / 240

# 4. Curriculum/Modules

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| NRE1101 | General Physics I | 93 | 82 | 7.00 | C | |
| NRE1102 | Principle of Energies and their Sources | 78 | 72 | 6.00 | C | |
| NRE1103 | General Chemistry | 93 | 82 | 7.00 | C | |
| NRE1104 | Environmental Pollution | 78 | 72 | 6.00 | C | |
| UOM101 | Arabic Language | 33 | 17 | 2.00 | B | |
| UOM104 | Human Rights and Democracy | 33 | 17 | 2.00 | B | |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| NRE1205 | Fundamental of Electricity | 108 | 92 | 8.00 | C | |
| NRE1206 | Analytical Chemistry | 93 | 82 | 7.00 | C | |
| NRE1207 | General Physics II (Optics) | 108 | 92 | 8.00 | C | |
| Sci-101 | Mathematics | 33 | 17 | 2.00 | B | |
| UOM102 | English Language | 33 | 17 | 2.00 | B | |
| UOM103 | Fundamental of Computer Science | 48 | 27 | 3.00 | B | |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| NRE2308 | Analog Electronics | 93 | 82 | 7.00 | C | |
| NRE2309 | Circuit Analysis | 93 | 82 | 7.00 | C | |
| NRE23010 | Inorganic Chemistry | 33 | 42 | 3.00 | C | |
| NRE23011 | Geology | 78 | 72 | 6.00 | C | |
| NRE23012 | Thermodynamics | 63 | 62 | 5.00 | C | |
| UOM201 | Crimes of the defunct Baath Party | 33 | 17 | 2.00 | B | |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| NRE24013 | Digital Electronics | 93 | 82 | 7.00 | C | |
| NRE24014 | Materials Science and Fluids | 93 | 82 | 7.00 | C | |
| NRE24015 | Computer Programming | 63 | 62 | 5.00 | C | |
| NRE24016 | Organic Chemistry | 93 | 82 | 7.00 | C | |
| NRE24017 | Occupational Safety | 33 | 17 | 2.00 | C | |
| NRE24018 | Statistics | 33 | 17 | 2.00 | C | |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| NRE35019 | Measurements and Control | 93 | 82 | 7.00 | C | |
| NRE35020 | Heat Transfer | 48 | 27 | 3.00 | C | |
| NRE35021 | Solar Energy | 48 | 27 | 3.00 | C | |
| NRE35022 | Energy Transmission and Storage | 93 | 82 | 7.00 | C | |
| NRE35023 | Modeling of Renewable Energy | 93 | 82 | 7.00 | C | |
| NRE35024 | Hydro Electric Energy | 48 | 27 | 3.00 | C | |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| NRE36025 | Solar Cell PV | 93 | 82 | 7.00 | C | |
| NRE36026 | Economics of Energy | 48 | 27 | 3.00 | C | |
| NRE36027 | Wind Energy | 93 | 82 | 7.00 | C | |
| NRE36028 | Meteorology | 48 | 27 | 3.00 | C | |
| NRE36029 | Petroleum Energy | 93 | 82 | 7.00 | C | |
| NRE36030 | Geothermal Energy | 48 | 27 | 3.00 | C | |

**Semester 7 | 30 ECTS | 1 ECTS = 25 hrs**

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| NRE47031 | Biomass Energy | 93 | 82 | 7.00 | C | |
| NRE47032 | Hydrology | 63 | 62 | 5.00 | C | |
| NRE47033 | Small Solar Energy systems | 93 | 82 | 7.00 | C | |
| NRE47034 | Nuclear Energy | 63 | 87 | 6.00 | C | |
| NRE47035 | Professional Ethics | 33 | 17 | 2.00 | C | |
| NRE47036 | Fuel and Hydrogen Cells | 48 | 27 | 3.00 | C | |

**Semester 8 | 30 ECTS | 1 ECTS = 25 hrs**

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| NRE48037 | Nanotechnology | 93 | 107 | 8.00 | C | |
| NRE48038 | Conductive Polymers | 48 | 52 | 4.00 | C | |
| NRE48039 | Large Solar Energy systems | 93 | 107 | 8.00 | C | |
| NRE48040 | Grid Connected Systems | 63 | 62 | 5.00 | C | |
| NRE48041 | Graduation Project | 33 | 17 | 2.00 | C | |
| NRE48042 | Tidal Energy | 48 | 27 | 3.00 | C | |

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شعبة ضمان الجودة والأداء الجامعي

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التاريخ ٢٠٢٥/٥/٤

التوقيع

التوقيع :

اسم رئيس القسم: أ.م.د. احمد منير سهيل

التاريخ : 2025/5/4