

# UNIVERSITY OF MOSUL



*Bachelor's degree (B.Sc.) – Department of Sustainable Energy  
Engineering*



## Table of Contents | جدول المحتويات

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1. Mission & Vision Statement
2. Program Specification
3. Program Goals
4. Program Student learning outcomes
5. Academic Staff
6. Credits, Grading and GPA
7. Modules
8. Contact

### 1. **Mission & Vision Statement**

#### *Vision Statement*

Department of Sustainable Energy Engineering, we aim to become pioneers at both the local and regional levels in research and education related to sustainable energy, with a focus on solutions that align with local conditions and resources. Our objective is to achieve excellence in the development and application of modern technologies for the clean and efficient generation and utilization of energy.

We believe that sustainable energy is the key to addressing future challenges related to sustainable development and environmental protection. Therefore, we are committed to graduating engineers and researchers who are specialized in sustainable energy engineering, possessing the knowledge and skills to develop and implement innovative solutions that contribute to sustainable development both locally and globally.

We also aim to become a leading center for research and innovation in the field of sustainable energy, where we focus on developing new technologies and Spreading the results to have a positive impact on the energy and environmental industries.

Our vision is for the Department of Sustainable Energy Engineering to serve as a reference in sustainable energy research and education, and to contribute effectively to achieving sustainable development and global environmental preservation goals.

### ***Mission Statement***

The Department of Sustainable Energy Engineering is committed to addressing the needs of Iraqi society and the region by offering high-quality educational programs in sustainable energy engineering, with a focus on teaching, research, and community service through the following objectives:

**Preparing graduates(engineers) works in design opportunities, development, and project management:** The program is designed to equip students with the knowledge and skills necessary to actively engage in the fields of design, development, and project management.

**Promoting creativity and ethical values:** The program focuses on nurturing innovative and ethical standards within the engineering profession, motivating students to adopt creative approaches and make decisions that uphold ethical sustainability.

**Contributing to the development of a continuous learning environment:** The program aims to foster an environment of lifelong learning by offering up-to-date educational resources and practical applications that are aligned with the evolving needs of the market.

**Addressing the engineering needs of the local market:** The program aims to provide graduates with the expertise and skills needed to meet the demands of the local market, with a focus on specific technical and economic considerations.

## **2. Program Specification**

|                        |                       |                              |           |
|------------------------|-----------------------|------------------------------|-----------|
| <b>Programme code:</b> | BSc-MEC               | <b>ECTS</b>                  | 240       |
| <b>Duration:</b>       | 4 levels, 8 Semesters | <b>Method of Attendance:</b> | Full Time |

The Sustainable Energy Engineering program addresses pivotal issues related to energy generation, distribution, and sustainability in today's world, which faces significant environmental challenges. The program focuses on integrating engineering principles with environmental science and modern technology to develop renewable and sustainable energy solutions. Graduates of this program possess comprehensive skills in the engineering design, analysis, and management of modern energy systems, enabling them to play key roles in developing future energy systems.

In the first level, students are introduced to fundamental concepts in engineering and mathematics, as well as the principles of sustainability. They gain a foundation in subjects such as mathematics, engineering mechanics, and physics, paving the way for further advanced studies in sustainable energy. Students are also introduced to the concepts of sustainability engineering and environmental

pollution, which form the basis for understanding the impact of engineering systems on the environment.

In the second level, students focus on applying the theoretical knowledge gained in the first year to practical engineering problems. They are introduced to areas such as fluid mechanics, heat transfer, and thermodynamics. These subjects form the cornerstone for understanding how energy is managed in engineering systems. Students also learn how to use modern engineering tools to analyze and design sustainable energy systems. In the third year, students are introduced to advanced sustainable energy systems such as solar thermal, solar power, and wind power. They are taught advanced geometric and numerical analysis, as well as applications of bioenergy and photovoltaic systems. Emphasis is placed on the integrated design of sustainable energy systems and the study of combustion principles and turbine engines.

In the final year, the focus shifts to advanced topics including smart grid systems, geothermal energy, and fuel cells. Students also receive training in the design of large-scale systems such as power plants and energy storage facilities. A graduation project is undertaken throughout the year, in which students apply the knowledge acquired in previous years to solve real-world sustainable energy problems.

### **3. Program Goals**

1. To provide students with a solid scientific and practical foundation in mathematics and engineering sciences, and to develop their skills in addressing technical and practical problems in the fields of sustainable and renewable energy.
2. To enable students to conduct experiments, design, develop, operate, and maintain modern equipment and technologies, while considering environmental requirements and ensuring sustainability in engineering applications.
3. To prepare students for personal and professional development, with an emphasis on leadership, responsibility, and teamwork within multidisciplinary groups, and to develop communication and decision-making skills according to the highest ethical standards.
4. To encourage graduates to pursue postgraduate studies and diverse engineering careers, and to enhance opportunities for continuous career development in the local and international job markets.
5. To foster creativity and initiative through participation in innovative entrepreneurial projects that contribute to the sustainable development of society and promote collaboration with relevant industries and sectors.
6. To provide an advanced learning environment that includes laboratories equipped with state-of-the-art tools and technologies, including computer-aided design (CAD) tools, to enhance engineering skills.

7. To offer a flexible academic structure that meets the needs of students and the industrial community, and responds to rapid technological advancements and market demands.

## **4. Student Learning Outcomes**

Upon successful completion of this program, graduates will be able to demonstrate knowledge and understanding in the following areas:

1. Apply fundamental concepts in mathematics and engineering science to solve a wide range of technical and practical problems in the field of sustainable energy engineering.
2. Gain knowledge of modern and historical principles and methodologies related to the development of sustainable energy technologies, including their role in addressing environmental and economic challenges.
3. Acquire practical, computational, and technical skills related to the design and operation of renewable and sustainable energy engineering systems, while adhering to current industry practices.
4. Design efficient and sustainable energy systems and power plants, considering environmental, economic, social, and political constraints.
5. Analyze the impact of changes in energy system components on overall system performance, and utilize modern tools such as simulators and laboratories to analyze relevant problems.
6. Be able to undertake independent development projects in the field of sustainable energy, in accordance with the highest ethical and professional standards.
7. Conduct scientific experiments, analyze data, and interpret results, contributing to the improvement of sustainable systems.
8. Work effectively within multidisciplinary teams and communicate professionally with experts and the wider community.
9. Develop business plans for pioneering renewable energy projects that contribute to achieving sustainable development.
10. Pursue postgraduate studies and engage in specialized engineering professions, with a focus on continuous professional development and participation in innovative projects that serve local communities.

## **5. Academic Staff**

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## 6. Credits, Grading and GPA

### Credits

The Department of Mechanical Engineering at the University of Mosul 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                                                                                                                                                                                                                                                                                                                                                           |                  |                     |           |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|-----------|---------------------------------------|
| 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:                                                                                                                                                                                                                                                                                                                                                                    |                  |                     |           |                                       |
| 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:

$$\text{CGPA} = [ (1^{\text{st}} \text{ module score} \times \text{ECTS}) + (2^{\text{nd}} \text{ module score} \times \text{ECTS}) + \dots ] / 240$$

## 7. Curriculum/Modules

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

| Code    | Module                                  | SSWL | USSWL | ECTS | Type | Pre-request |
|---------|-----------------------------------------|------|-------|------|------|-------------|
| SEE101  | Engineering Mechanics-Statics           | 63   | 62    | 5.00 | C    |             |
| SEE102  | Mathematics I                           | 78   | 72    | 6.00 | B    |             |
| SEE103  | Electric Circuits                       | 78   | 47    | 5.00 | C    |             |
| SEE104  | Physics                                 | 63   | 37    | 4.00 | B    |             |
| SEE105  | Introduction to Sustainable Engineering | 63   | 62    | 5.00 | B    |             |
| UOM1031 | Computer 1                              | 63   | 12    | 3.00 | B    |             |
| UOM1011 | Arabic Language 1                       | 33   | 17    | 2.00 | B    |             |

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

| Code    | Module                         | SSWL | USSWL | ECTS | Type | Pre-request |
|---------|--------------------------------|------|-------|------|------|-------------|
| SEE151  | Engineering Mechanics-Dynamics | 78   | 72    | 6.00 | C    |             |
| SEE152  | Mathematics II                 | 78   | 72    | 6.00 | B    |             |
| SEE153  | Engineering Drawing            | 78   | 47    | 5.00 | C    |             |
| SEE154  | Environmental Pollution        | 78   | 47    | 5.00 | B    |             |
| SEE155  | Chemistry                      | 63   | 37    | 4.00 | B    |             |
| UOM1021 | English 1                      | 33   | 17    | 2.00 | B    |             |
| UOM1040 | Democracy and Human Rights     | 33   | 17    | 2.00 | B    |             |

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

| Code    | Module                | SSWL | USSWL | ECTS | Type | Pre-request |
|---------|-----------------------|------|-------|------|------|-------------|
| SEE201  | Fluid Mechanics       | 93   | 82    | 7.00 | C    |             |
| SEE202  | Thermodynamics        | 93   | 82    | 7.00 | C    |             |
| SEE205  | Applied Electronics   | 63   | 62    | 5.00 | C    |             |
| SEE206  | Applied Mathematics-1 | 78   | 72    | 6.00 | C    |             |
| UOM2032 | Computer 2            | 63   | 12    | 3.00 | B    |             |
| UOM2012 | Arabic Language 2     | 33   | 17    | 2.00 | B    |             |

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

| Code    | Module                      | SSWL | USSWL | ECTS | Type | Pre-request |
|---------|-----------------------------|------|-------|------|------|-------------|
| SEE251  | Engineering Materials       | 78   | 72    | 6.00 | C    |             |
| SEE252  | Power Electronics           | 63   | 37    | 4.00 | C    |             |
| SEE253  | Applied Mathematics-2       | 78   | 72    | 6.00 | C    |             |
| SEE254  | Heat Transfer               | 93   | 82    | 7.00 | C    |             |
| SEE255  | Laboratories I              | 33   | 42    | 3.00 | B    |             |
| UOM2022 | English 2                   | 33   | 17    | 2.00 | B    |             |
| UOM2050 | Crimes of the Ba'ath Regime | 33   | 17    | 2.00 | B    |             |

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

| Code   | Module                       | SSWL | USSWL | ECTS | Type | Pre-request |
|--------|------------------------------|------|-------|------|------|-------------|
| SEE301 | Solar Thermal Energy Systems | 78   | 72    | 6.00 | C    |             |
| SEE302 | Numerical Analysis           | 78   | 72    | 6.00 | C    |             |
| SEE303 | Turbomachinery               | 78   | 47    | 5.00 | C    |             |
| SEE304 | Wind Energy Systems          | 63   | 62    | 5.00 | C    |             |
| SEE305 | Solid Mechanics              | 48   | 52    | 4.00 | C    |             |
| SEE306 | Electric Machines            | 48   | 52    | 4.00 | C    |             |

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

| Code   | Module                                           | SSWL | USSWL | ECTS | Type | Pre-request |
|--------|--------------------------------------------------|------|-------|------|------|-------------|
| SEE351 | Photovoltaic Energy Systems                      | 93   | 57    | 6.00 | C    |             |
| SEE352 | Fundamentals of Combustion and Emissions         | 78   | 47    | 5.00 | C    |             |
| SEE353 | Design of Sustainable Energy Systems             | 63   | 37    | 4.00 | C    |             |
| SEE354 | Principles of Air-Conditioning and Refrigeration | 93   | 57    | 6.00 | C    |             |
| SEE355 | Probability and Statistics                       | 63   | 37    | 4.00 | C    |             |
| SEE356 | Electrical Power Systems                         | 78   | 47    | 5.00 | C    |             |

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

| Code   | Module                                  | SSWL | USSWL | ECTS | Type | Pre-request |
|--------|-----------------------------------------|------|-------|------|------|-------------|
| SEE401 | Geothermal Energy and Bioenergy systems | 63   | 62    | 5.00 | C    |             |
| SEE402 | Fuel Cell Principles and Techniques     | 78   | 72    | 6.00 | C    |             |
| SEE403 | Energy Storage systems                  | 63   | 62    | 5.00 | C    |             |
| SEE404 | Power Plants                            | 78   | 72    | 6.00 | C    |             |
| SEE405 | Automatic Control Systems               | 78   | 72    | 6.00 | C    |             |
| SEE406 | Engineering Design Project I            | 33   | 17    | 2.00 | C    |             |

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

| Code   | Module                            | SSWL | USSWL | ECTS | Type | Pre-request |
|--------|-----------------------------------|------|-------|------|------|-------------|
| SEE451 | Sustainable Building Design       | 63   | 62    | 5.00 | C    |             |
| SEE452 | Mechanical Vibration              | 63   | 62    | 5.00 | C    |             |
| SEE453 | Laboratories II                   | 63   | 62    | 5.00 | C    |             |
| SEE454 | Smart Grid Systems                | 93   | 82    | 7.00 | C    |             |
| SEE455 | Engineering Computer Aided Design | 93   | 57    | 6.00 | C    |             |
| SEE456 | Engineering Design Project I      | 33   | 17    | 2.00 | C    |             |

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