| Al-Furat Al-Awsat Technology University<br>جامعة الفرات الأوسط التقنية | |
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# *First Cycle – bachelor's degree (B.Tech.) – Mechanical Engineering Techniques of Power*

## هندسة تقنيات ميكانيك قوى-بكالوريوس

**The Department of Mechanical Engineering Techniques of Power in Najaf is part of the Najaf Technical College of Engineering, one of the colleges affiliated with Al-Furat Al-Awsat Technical University. The department was established in 2017 with the aim of qualifying technical engineers capable of meeting the needs of the power mechanics labor market. The college is located in Najaf Governorate and aims to provide distinguished education in power mechanics sciences and technology, including mechanical systems, turbine systems, and thermal engine systems.**

The educational program used in the Department of Mechanical Engineering Techniques of Power Technology is based on a track called the Bologna process.

It is a multi-purpose process that aims to establish a framework that makes higher education qualifications comparable in their certificates and the information they contain, facilitates the comparison of university degrees across European Union countries, enables the adoption of similar quality standards, and helps higher education in student employment and global competitiveness

## Table of Contents | جدول المحتويات



# 1. Mission & Vision Statement

***Vision Statement***

The vision of the Mechanical Engineering Techniques of Power Department at the Engineering Technology College in Najaf to become the department**:**

- A pioneer in technical engineering education in the domain of power mechanics.
- Acknowledged for its vigorous research and substantial contributions to industry and scientific progress.
- A reliable collaborator for the industrial sector, addressing labor market demands and fostering sustainable development.

***Mission Statement***

The Mechanical Engineering Techniques of Power academic staff pursues a multifaceted charge at Al-Furat Al-Awsat Technology University. The program aims to instill in students a profound sense of professionalism, ethical conduct, and regard for diversity, as well as to educate and empower them with the essential skills of problem-solving, leadership, and teamwork. It offers our students a comprehensive and high-quality education in thermal and power engineering.

In addition to fostering industry partnerships and contributing to innovative technological solutions for the benefit of both local and global societies, the department actively promotes cutting-edge research in the field of power engineering. Additionally, the department collaborates with a variety of public and private sector entities to align our academic programs with industry needs. The following are included: facilitating the integration of our graduates into the workforce, promoting their talents, and providing expert consultations.

# 2. Program Specification

| | | | |
|---|---|---|---|
| **Program code:** | BTch-ATU12 | **ECTS** | 240 |
| **Duration:** | 4 levels, 8 Semesters | **Method of Attendance:** | Full Time |

B. Mechanical Engineering Techniques of Power

The B. Mechanical Engineering Techniques of Power is a comprehensive academic program that focuses on applying fundamental engineering principles to the fields of power generation and thermal systems. While the specific syllabus may differ between universities, core subjects such as thermodynamics, fluid mechanics, internal combustion engines, and power system design remain consistent.

Program Components

The curriculum is designed to provide a well-rounded educational experience through a variety of practical and theoretical activities, including:

Group Projects: Students collaborate on applied projects to enhance their teamwork and problem-solving skills.

Practical Training and Workshops: The program offers hands-on experience through dedicated labs and workshops, ensuring students gain practical proficiency.

Internships and Industrial Visits: Students gain a deeper understanding of real-world applications by participating in internships and visiting power plants and other industrial facilities.

Capstone Projects: In their final year, students form teams to complete a capstone project that offers innovative solutions to complex engineering challenges within the field of mechanical power.

# 3. Program Objectives

The program objectives of the educational Engineering Technology program mean the achievements of the graduates in the short term, i.e. the skills acquired by the graduates of the department throughout their academic studies in the Engineering Technology College-Najaf (16) skills.

| | | | |
|---|---|---|---|
| PO-1 | Knowledge and understanding | PO-1-1 | An ability to apply knowledge of mathematics, science, and engineering. |
| | | PO-1-2 | Understand the professional and ethical responsibilities of the field of specialization. |
| | | PO-1-3 | The ability to evaluate course outcomes with faculty, industry and professional practitioners, as well as employers and graduate students for improvement. |
| | | PO-1-4 | Teaching leadership skills and the value of quality commitment, ethical behavior and respect for others. |
| PO-2 | Subject-specific skills | PO-2-1 | Ability to work and integrate into multidisciplinary teams |
| | | PO-2-2 | The ability to design and conduct experiments as well as analyze and interpret data. |
| | | PO-2-3 | The ability to use modern technologies, engineering skills and tools to practice engineering |
| | | PO-2-4 | The ability to identify and formulate engineering problems in the field of specialization |
| Po-3 | Thinking skills | Po-3-1 | The ability to communicate effectively with those involved in the field of specialization in the civil and military aspects. |
| | | Po-3-2 | Recognition of the need and ability to engage in lifelong learning. |
| | | Po-3-3 | Knowledge of contemporary issues in the field of specialization. |
| | | Po-3-4 | Broad learning necessary to understand the global impact of engineering solutions and economic, environmental and social problems. |
| Po-4 | General and transferable skills (other skills related to employability and personal development) | Po-4-1 | Equipment Management and Operation<br>Graduates are proficient in managing and operating equipment related to power systems, such as power generation plants, HVAC systems, and pumps. |
| | | Po-4-2 | Mechanical Design and Manufacturing<br>Graduates are skilled in utilizing the latest 3D design and simulation software, enabling them to design and manufacture mechanical components efficiently while considering environmental, economic, and social constraints. |
| | | Po-4-3 | Diagnostic Capabilities<br>Graduates possess a strong ability to use modern diagnostic tools to troubleshoot and analyze mechanical, electrical, and electronic systems within the power sector. |

| | | | |
|---|---|---|---|
| | | Po-4-4 | Interdisciplinary Adaptability<br>Graduates possess the capacity to effectively work in related engineering fields, including refrigeration and air conditioning, general mechanical engineering, and renewable energy. |

# 4. Student Learning Outcomes

The easiest statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire during their study period through the educational program and depend on the standards of the Iraqi National Council for Program Accreditation of Technology Engineering Colleges. The outputs of the educational program of the Mechanical Power Engineering Department are based on international standards and are adequate to the requirements of the specialized programs. This is a major task and requires a process of research and analysis by experts and specialists in those programs. Many international standards have been studied (Accreditation Board of Engineering and Technology ABET, Japan Accreditation Board of Engineering Education, United Kingdom Accreditation Board, Canada Accreditation Board of Engineering Education, International Engineering Alliance IEA) by specialists in the Ministry of Higher Education and Scientific Research from The Scientific Supervision and Evaluation Authority and the Iraqi National Council for Program Accreditation of Technology Engineering Colleges, after which ABET and IEA standards will be accredited in the specialization of a Bachelor of Technology program (Engineering Technology Degree program.)

The educational program outputs must achieve the objectives of the program through two continuous assessment and evaluation processes. After completing the requirements of the prepared program, the student will be able to:

**Outcome 1**

*Selects and applies modern knowledge, techniques, skills and devices in activities engineering on a large scale.*

**Outcome** 2

Selects and applies knowledge in mathematics, engineering, technology, and science to solve other engineering problems that require the application of principles or procedures applied methodologies.

**Outcome 3**

Conducts the required tests, experiments and measurements, and analyzes and interprets their results.

**Outcome 4**

It applies experimental results to improve engineering processes.

**Outcome 5**

Designs systems, components, or processes for large-scale engineering problems which are consistent with the objectives of the educational program.

**Outcome 6**

Work effectively as a member or leader of a specialized engineering team.

**Outcome 7**
Identifies, analyzes and solves engineering problems on a large scale.

**Outcome 8**
-Identifies and uses appropriate Technology literature as well as applies written editors Oral and graphic communication in both Technology and non-Technology environments Both.

**Outcome 9**
Participates in self-directed continuing professional development

**Outcome 10**
Works to understand and adhere to professional and ethical responsibilities.

**Outcome 11**
Works to understand the impact of solutions to engineering problems locally and globally and applies them in the field his specialty.

**Outcome 12**
Adheres to the concepts of quality and strives for continuous improvement.

# 5. Academic Staff

**Hassanein Ghani Hamid Al-Hussaini |** Ph.D. in Mechanical Engineering | Prof.
Email: **hassanain.hameed@atu.edu.iq**
Mobile no.: +964**7801315063**

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**Adel A. Edan** | Ph.D. in Mechanical Engineering | Prof.
Email: **inj.adel@atu.edu.iq**
Mobile no.: +964 **7702687817**

---

**Asaad Awad Abbas Al-Sahlani** Ph.D. in Mechanical Engineering | Prof
Email: **assaad.alsahlani.cnj@atu.edu.iq**
Mobile no: :+9647800035901

---

**Dhafer Manea Hachim**| Ph.D. in Mechanical Engineering | Prof.
Email: **Coj.dfr@atu.edu.iq**
Mobile no.: +964 **7809787897**

---

**Basil Nouri Abd**| Ph.D. in Mechanical Engineering | Assistant Prof.
Email: **coj.bas@atu.edu.iq**
Mobile no.: +964 **7809496181**

---

**Mohammed Salim AbdAlameer**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **mohammed.salim@atu.edu.iq**
Mobile no.: +964 **7818928162**

---

**Ahmed Diaa Ajwad Rabie**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **coj.ahm1@atu.edu.iq**
Mobile no.: +964 **7827962407**

---

**Fatima Obaid Salman Abas**| Ph.D. in Mechanical Engineering | Lecturer.
Email: **fatima.obaid@atu.edu.iq**
Mobile no.: +964 **7810108510**

---

**Fatima Mohammed Kazim**| Ph.D. in Mechanical Engineering | Lecturer.
Email: **coj.fmk@atu.edu.iq**
Mobile no.: +964 **7801673041**

---

**Ahmed Hamoudi Ali**| Ph.D. in Mechanical Engineering | Assistant Prof.
Email: **ahmed.hamoodi.chm@atu.edu.iq**
Mobile no.: +964 **7831851682**

---

**Muhammad Ali Diwan**| Ph.D. in Mechanical Engineering | Lecturer.
Email: **Coj.muh2@atu.edu.iq**
Mobile no.: +964 **7726250380**

**Hashem Sahar Mohsen**| Ph.D. in Mechanical Engineering | Assistant Prof.
Email: **h.s.mohaisen@atu.edu.iq**
Mobile no.: +964 **713146007**

**Ahmed Salem Nasser**| Ph.D. in Mechanical Engineering| Assistant Prof.
Email: **ahmed.al-murshedi@atu.edu.iq**
Mobile no.: +964 **7813203286**

**Hawraa Fadhel Abd Hassan**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **hawraa.hassan@atu.edu.iq**
Mobile no.: +964 **7808428616**

**Muayyad Baqir Muhammad**| Ph.D. in Mechanical Engineering | Assistant Prof.
Email: **mua@atu.edu.iq**
Mobile no.: +964 **7810888060**

**Mona Ali Talib**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **muna.talib.cnj@atu.edu.iq**
Mobile no.: +964 **7826202323**

**Basma Abdul Amir Aziz**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **basimh.abdulamir@atu.edu.iq**
Mobile no.: +964 **7827816485**

**Balasem Abdulameer Jabbar**| Ph.D. in Mechanical Engineering | Assistant Prof.
Email: **balasemalquraishi@atu.edu.iq**
Mobile no.: +964 **7800562088**

**Huda Balasim Ahmed**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **huda.abid@atu.edu.iq**
Mobile no.: +964 **7702084576**

**Muhannad Ahmed Hameed**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **muhannad.hameed@atu.edu.iq**
Mobile no.: +964 **7736538342**

**Monatadhar Almoussawi**| Ph.D. in Mechanical Engineering | Prof.
Email: **inj.mun@atu.edu.iq**
Mobile no.: +964 **7840024598**

**Hamam Abdel Moneim Saleh**| Ph.D. in Mechanical Engineering | Lecturer.
Email: **humam.salih@atu.edu.iq**
Mobile no.: +964 **7800562088**

**Header Ali A**| Ph.D. in Mechanical Engineering | Lecturer.
Email: **Header.ali.a@atu.edu.iq**
Mobile no.: +964 **7821645165**

**Wisam Ahmed Abdulwahid**| Ph.D. in Mechanical Engineering | Prof.
Email: **coj.wsm@atu.edu.iq**
Mobile no.: +964 **784054149**

**Enas Khudhair Abdel Razzaq**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **enas.abdul.cnj@atu.edu.iq**
Mobile no.: +964 **7830075872**

**Zainab Muhammad Mahdi**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **Zainab.mahdi@atu.edu.iq**
Mobile no.: +964 **7810599735**

**Ammar Maytham Faisal**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **Ammar.faisil.me.etcn@student.atu.edu.iq**
Mobile no.: +964 **7806732672**

**Merwa Abdul sada Hussein**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **marwa.hussein.cnj@atu.edu.iq**
Mobile no.: +964 **7601880556**

**Bassam Abdel Sahib Mohammed Hussein**| Ph.D. in Mechanical Engineering | Lecturer.
Email: **bassamhilali@atu.edu.iq**
Mobile no.: +964 **7802835723**

**Yasser Fayez Youssef**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **coj.yaserfa@atu.edu.iq**
Mobile no.: +964 **7801228900**

**Saif mohammad jawad haider**| Ph.D. in Mechanical Engineering | Lecturer.
Email: **saif.haider.cnj1@atu.edu.iq**
Mobile no.: +964 **7702726633**

**Fatima Abd al latif**| Ph.D. in Mechanical Engineering | Ass.lect.
Email: **fatema.tali.cnj@atu.edu.iq**
Mobile no.: +964 **7815676741**

# 6. Credits, Grading and GPA

***Credits***

Al-Furat Al-Awsat Technology 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***

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 module score x ECTS) + (2nd module score x ECTS) + ……] / 240

# 7. Curriculum/Modules

| | |
|---|---|
| **SWL:** | Student Workload |
| **SSWL:** | Structured SWL |
| **USSWL:** | Unstructured SWL |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| ATUU113 | English for Academic U. | 18 | 32 | 2.00 | S | non |
| ATU1111 | Computer | 48 | 27 | 3.00 | S | non |
| ATU12013 | Single Variables Calculus | 63 | 62 | 5.00 | B | non |
| ATU12014 | Workshop | 63 | 37 | 4.00 | C | non |
| ATU12015 | Engineering physics | 78 | 47 | 5.00 | B | non |
| ATU12016 | CAD Drawing | 120 | 55 | 7.00 | S | non |
| ATUU111 | Human Right and Democracy | 33 | 17 | 2.00 | B | non |
| ATUU112 | Arabic language | 18 | 32 | 2.00 | B | non |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| ATU12021 | Multi-Variables Calculus | 78 | 72 | 6.00 | B | non |
| ATU12022 | Engineering Materials | 63 | 37 | 4.00 | S | non |
| ATU12023 | Fundamentals of Thermodynamics | 78 | 72 | 6.00 | C | non |
| ATU12024 | Engineering Mechanics-Static | 123 | 77 | 8.00 | C | non |
| ATU12025 | Fundamentals of Electricity | 78 | 72 | 6.00 | B | non |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| ATU12031 | Fluid Mechanics -Static | 78 | 47 | 5.00 | C | non |
| ATU12032 | Advanced automotive technology | 63 | 62 | 5.00 | S | non |
| ATU2222 | Computer | 63 | 12 | 3.00 | S | non |
| ATU12034 | Thermodynamic - Ideal Gas | 78 | 47 | 5.00 | C | non |
| ATU12035 | Manufacturing Processes | 63 | 62 | 5.00 | S | non |
| ATU12036 | Fundamentals of Engineering Mechanics-Dynamics | 78 | 47 | 5.00 | C | non |
| ATU24 | The crimes of the Baath regime in Iraq | 33 | 17 | 2.00 | S | non |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| ATU12041 | Fluid Mechanics-Dynamics | 78 | 22 | 4.00 | C | non |
| ATU12042 | Internal Combustion Engine | 78 | 22 | 4.00 | C | non |
| ATU12043 | Engineering Mechanics-Applied of Dynamics | 63 | 62 | 5.00 | S | non |
| ATU12044 | Strength of Materials | 93 | 32 | 5.00 | S | non |
| ATU12045 | Linear algebra | 63 | 37 | 4.00 | B | non |
| ATU12046 | Thermodynamic - Gas cycle | 78 | 22 | 4.00 | C | non |
| ATUU213 | English for Academic U. | 18 | 32 | 2.00 | S | non |
| ATUU212 | Arabic language | 18 | 32 | 2.00 | B | non |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| ATU12051 | Steam Power Plant | 93 | 57 | 6.00 | C | non |
| ATU12052 | Heat Transfer- conduction | 108 | 67 | 7.00 | C | non |
| ATU12053 | Numerical Analyses | 108 | 42 | 6.00 | B | non |
| ATU12054 | Gas Dynamics | 63 | 37 | 4.00 | C | non |
| ATU12055 | Mechanical Vibrations | 63 | 37 | 4.00 | B | non |
| ATU12056 | Professional Ethics | 33 | 42 | 3.00 | S | non |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| ATU12061 | Control Engineering Fundamentals | 48 | 52 | 6.00 | C | non |
| ATU12062 | Vehicle Parts Design | 108 | 42 | 6.00 | S | non |
| ATU12063 | Heat Transfer- convection | 93 | 57 | 6.00 | C | non |
| ATU12064 | Eng. & Numerical Analyses | 63 | 37 | 4.00 | B | non |
| ATU12065 | Hydraulic and Turbomachinery systems | 63 | 37 | 4.00 | C | non |
| ATU12066 | Theory of Machines | 48 | 52 | 4.00 | C | non |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| ATU12071 | Computational Fluid Dynamics | 48 | 27 | 3.00 | C | non |
| ATU12072 | Refrigeration systems | 108 | 92 | 8.00 | C | non |
| ATU12073 | Energy Resources and Conservation | 48 | 52 | 4.00 | C | non |
| ATU12074 | systems design | 48 | 52 | 4.00 | C | non |
| ATU12075 | Advanced Control Systems | 108 | 42 | 6.00 | C | non |
| ATU12076 | CAM (computer Aided manufacturing) | 63 | 62 | 5.00 | S | non |

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

| Code | Module | SSWL | USSWL | ECTS | Type | Pre-request |
|---|---|---|---|---|---|---|
| ATU12081 | Air-Conditioning systems | 108 | 92 | 8.00 | C | non |
| ATU12082 | Conventional and Renewable power plant | 93 | 57 | 6.00 | C | non |
| ATU12083 | Equipment Technology | 78 | 72 | 6.00 | S | non |
| ATU12084 | Industrial Engineering | 48 | 27 | 3.00 | S | non |
| ATU12085 | Computational Modelling | 48 | 52 | 4.00 | S | non |
| ATU12086 | Final Project | 63 | 12 | 3.00 | C | non |
| ATU12081 | Air-Conditioning systems | 108 | 92 | 8.00 | C | non |
| ATU12082 | Conventional and Renewable power plant | 93 | 57 | 6.00 | C | non |

# 8. Contact

Program Manager:
Adel A. Edan | Ph.D. in Mechanical Engineering | Prof.
Email: inj.adel@atu.edu.iq
Mobile no.: +964 7702687817

Program Coordinator:

Enas khudhair Alnajar |MSc. in Mechanical Engineering| Assistant Lecturer.

Email: enas.abdul.cnj@atu.edu.iq

Mobile no.: +9647830075872