UNIVERSITY OF MOSUL

جامعة الموصل

First Cycle – Bachelor's degree (B.Sc.) – Mechanical Engineering

بكالوريوس علوم - الهندسة الميكانيكية

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1. Mission & Vision Statement

Vision Statement

Our vision is to establish the Department of Mechanical Engineering as a distinguished leader in the field, both within Iraq and the wider region. We strive to produce exceptional mechanical engineers who excel in their specialization, equipped with the latest scientific knowledge and skills derived from cutting-edge curricula. Through the utilization of state-of-the-art laboratories and innovative teaching methods, we aim to cultivate a dynamic learning environment that fosters creativity, critical thinking, and problem-solving. By continuously adapting to the evolving needs of industry and society, we aspire to be at the forefront of technological advancements, making significant contributions to the development and progress of mechanical engineering as a whole.

Mission Statement

Our mission is to provide a comprehensive and transformative education in mechanical engineering, empowering our students to become skilled professionals, leaders, and innovators in the field. Through rigorous academic programs, hands-on experiences, and industry collaborations, we aim to develop technical proficiency, critical thinking abilities, and a strong ethical foundation in our graduates. We are dedicated to promoting a culture of continuous learning, research, and innovation, where faculty, students, and industry partners collaborate to address the challenges of the present and future. By fostering a multidisciplinary approach and embracing emerging technologies, we strive to contribute to the socioeconomic development of Iraq and the region, while also addressing global engineering

challenges. Our commitment to excellence, inclusivity, and sustainability drives us to make a positive impact on society and shape the future of mechanical engineering.

2. Program Specification

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

Studying mechanical engineering at the University of Mosul is a great choice if you are interested in pursuing a career in the field. The emphasis of the programme is the analysis of forces on rigid and moving body, dynamic systems, the interaction between heat and work in various systems which are projected on many real life applications

Level 1 exposes students to the fundamentals of force analysis, engineering drawing, and fundamental mathematical and programming tools. Students are also exposed to fundamental of manufacturing processes. Programme-specific core topics are covered at Level 2 preparing for research-led subject specialist modules at Levels 3 and 4. A Leeds Biology graduate is therefore trained to appreciate how research informs teaching, according to the University and School Mission statements.

At Levels 2, 3 and 4 students are free to choose more than half of their module credits with the proviso a range of modules are selected that reflect the complexity of life forms from molecules, through dynamics, thermodynamic, strength of materials expected of a graduate with a mechanical engineering degree.

The research ethos is developed and fostered from the start via practicals, which are either embedded in lecture modules or taught in dedicated practical modules, research seminars and tutorials. There is a compulsory field course in Level 1, which students must pass in order to progress into Level 2, and optional field courses in Levels 2, 3 and 4. At Level 4 all students carry out an independent research project, which may be a credit library or data analysis project, or a credit field or laboratory based project.

Academic tutorials are held at Levels 1 and 2 with the same tutor, who is also the personal tutor, providing continuity and progressive guidance. Level 1 and 2 tutorials include a number of workshops to teach skills, e.g. library use and presentation skills, followed by assessed exercises, e.g. essays and talks, as opportunities to practice these skills in a subject-specific context.

International years and Industrial placements are also offered and individual needs are discussed with the appropriate tutor and accommodated wherever possible.

3. Program Goals

1. Academic Excellence: Strive for academic excellence by offering a rigorous and up-to-date curriculum that aligns with international standards and prepares students for successful careers in mechanical engineering.
2. Graduation of Competent Engineers: Graduates of the program should possess a strong foundation in fundamental principles, theories, and practices of mechanical engineering. They should demonstrate proficiency in critical thinking, problem-solving, and effective communication skills.
3. Practical Skills Development: Equip students with practical skills through hands-on experiences, laboratory work, and industry collaborations. Foster their ability to apply theoretical knowledge to real-world engineering challenges.
4. Ethical and Professional Standards: Instill a strong sense of ethical and professional responsibility in students, emphasizing the importance of integrity, accountability, and respect for societal and environmental concerns.
5. Research and Innovation: Foster a culture of research and innovation among faculty and students. Encourage and support research initiatives that contribute to advancements in mechanical engineering and address relevant societal needs.
6. Collaboration and Industry Engagement: Promote collaboration and engagement with industry partners, encouraging internships, cooperative education programs, and research projects. Provide opportunities for students to interact with professionals and gain practical industry experience.
7. Continuous Improvement: Continuously review and enhance the curriculum, teaching methodologies, and resources to ensure the program remains current, responsive to emerging trends, and aligned with industry demands.
8. Inclusivity and Diversity: Foster an inclusive and diverse learning environment that promotes equal opportunities, encourages diverse perspectives, and prepares students to work effectively in a globalized and multicultural society.
9. Community Outreach: Engage with the local community and industry stakeholders through outreach programs, workshops, and initiatives that promote the understanding and application of mechanical engineering principles to address societal challenges.
10. Lifelong Learning: Cultivate a mindset of lifelong learning among students, encouraging them to pursue professional development, continuing education, and advanced degrees to enhance their knowledge and skills throughout their careers.

These goals reflect the Department of Mechanical Engineering's commitment to academic excellence, practical skills development, ethical responsibility, research and innovation, industry engagement, inclusivity, and continuous improvement.

11. Student Learning Outcomes

At the Department of Mechanical Engineering, we are dedicated to providing our students with a comprehensive and transformative learning experience that prepares them to excel in the field of mechanical engineering. Our curriculum is designed to cultivate a broad range of knowledge, skills, and competencies necessary for success in this dynamic and evolving discipline. We have identified a set of Student Learning Outcomes (SLOs) that serve as a guide to assess and measure our students' achievements and ensure they acquire the necessary capabilities to become competent engineers.

Our SLOs are carefully aligned with the program's educational goals and reflect the core competencies expected of a mechanical engineering graduate. Through a combination of theoretical instruction, practical experiences, and hands-on projects, we aim to develop our students' technical proficiency, critical thinking abilities, communication skills, and ethical responsibility.

The attainment of these SLOs empowers our graduates to address complex engineering problems, adapt to technological advancements, collaborate effectively in multidisciplinary teams, and contribute to the socio-economic development of Iraq and the region. We continuously evaluate and improve our curriculum, instructional methodologies, and assessment practices to ensure that our students are well-prepared to meet the demands of the profession and make valuable contributions to the field of mechanical engineering.

By focusing on these SLOs, we provide our students with a solid foundation for lifelong learning and professional growth. Our commitment to excellence in education and the development of well-rounded engineers is evident in our rigorous academic programs, dedicated faculty, state-of-the-art facilities, and strong ties with industry partners.

Through the attainment of our SLOs, our students embark on a transformative educational journey that equips them with the skills and knowledge to succeed in the competitive field of mechanical engineering, making a positive impact on society and shaping a better future..

Outcome 1

Identification of Complex Relationships

Graduates will be able to illustrate the structure and function of cellular components and explain how they interact in a living cell.

Outcome 2

Proficiency in Engineering and Mechanical Drawing

Engineering and mechanical drawing play a crucial role in the communication and visualization of mechanical systems and designs. This outcome focuses on developing students' proficiency in creating and interpreting engineering drawings, including mechanical drawings, schematics, and diagrams.

Students should acquire knowledge of engineering drawing standards, conventions, and symbols. They should understand the principles of projection, dimensioning, tolerancing, and annotation in technical drawings. This includes the ability to create and interpret orthographic projections, isometric drawings, section views, and assembly drawings.

Moreover, students should be proficient in using computer-aided design (CAD) software to create precise and accurate engineering drawings. They should develop skills in drafting and modeling techniques, including 2D and 3D modeling, parametric design, and assembly modeling. Students should also be able to analyze and evaluate engineering drawings for manufacturability, functionality, and compliance with design specifications and standards.

By achieving this outcome, students will be equipped with the skills to effectively communicate design intent, create accurate engineering drawings, and collaborate with multidisciplinary teams in the development and documentation of mechanical systems.

Outcome 3

Understanding and Selection of Engineering Materials

Engineering materials form the foundation of mechanical engineering, and this outcome focuses on developing students' understanding of different types of materials and their properties. It includes both metallic and non-metallic materials such as metals, alloys, polymers, ceramics, composites, and semiconductors. Students should gain knowledge of the structure, properties, and behaviors of these materials, including mechanical properties (such as strength, stiffness, toughness), thermal properties, electrical properties, and corrosion resistance.

Moreover, students should learn how to select appropriate materials for specific engineering applications based on their properties and characteristics. This involves considering factors such as load requirements, environmental conditions, manufacturing processes, and cost considerations. Students should also be familiar with material testing techniques and standards to evaluate and characterize material properties.

By achieving this outcome, students will be able to make informed decisions regarding material selection, ensuring the optimal performance and durability of mechanical systems and components.

Outcome 4

Proficiency in Machine Design and Analysis

Machine design is a critical aspect of mechanical engineering, involving the creation and development of mechanical systems and components. This outcome focuses on developing students' proficiency in machine design principles and practices. Students should acquire knowledge of engineering materials, structural analysis, kinematics, dynamics, and manufacturing processes. They should be able to apply engineering standards and considerations to design and analyze mechanical systems, such as mechanisms, gears, bearings, linkages, and power transmission systems. Students should also demonstrate proficiency in using computer-aided design (CAD) software, conducting design calculations, performing stress and deformation analysis, and optimizing designs for efficiency, reliability, and safety.

Outcome 5

Proficiency in Heat Transfer Analysis and Design

Heat transfer is a fundamental area of study in mechanical engineering, encompassing the principles and mechanisms of heat transfer, including conduction, convection, and radiation. This outcome focuses on developing students' proficiency in analyzing and designing heat transfer systems and processes. Students should be able to apply mathematical and computational methods to calculate heat transfer rates, temperature distributions, and thermal gradients in various engineering applications. They should also be skilled in selecting appropriate heat transfer mechanisms and designing heat exchangers, thermal insulation systems, and other heat transfer equipment to meet desired performance objectives and specifications.

Outcome 6

Understanding and Designing Air Conditioning and Refrigeration Systems

Air conditioning and refrigeration systems play a significant role in various sectors, including residential, commercial, and industrial settings. This outcome focuses on developing students' understanding of the principles, components, and processes involved in air conditioning and refrigeration systems. Students should gain knowledge of thermodynamics, heat transfer, fluid mechanics, and psychrometrics, among other related areas. They should be able to analyze and design HVAC (Heating, Ventilation, and Air Conditioning) systems, including selecting appropriate refrigerants, sizing equipment, and designing ductwork or piping layouts. Additionally, students should understand the energy efficiency and environmental impact considerations associated with air conditioning and refrigeration systems, aiming to design sustainable and environmentally friendly solutions.

Outcome 7

Proficiency in Mathematics, Engineering Analysis, and Numerical Analysis

Mathematics forms the foundation of engineering analysis and numerical methods. This outcome focuses on developing students' proficiency in mathematical concepts, engineering analysis techniques, and numerical analysis methods used in solving engineering problems.

Students should acquire a strong foundation in mathematics, including calculus, differential equations, linear algebra, and probability and statistics. They should be able to apply mathematical principles and techniques to model and analyze mechanical engineering problems. This includes formulating mathematical equations, solving differential equations, performing matrix operations, and applying statistical methods for data analysis.

Moreover, students should develop skills in engineering analysis, which involves the application of mathematical and scientific principles to solve engineering problems. They should learn methods such as statics, dynamics, mechanics of materials, and fluid mechanics to analyze and evaluate the behavior and performance of mechanical systems and structures.

Additionally, students should gain knowledge of numerical analysis methods and techniques used to solve complex engineering problems computationally. They should be proficient in using numerical methods such as finite difference, finite element, and numerical optimization methods to approximate solutions for engineering equations and simulations. Students should also be able to critically evaluate

the accuracy and limitations of numerical solutions and make appropriate decisions based on the results.

By achieving this outcome, students will be equipped with the mathematical and analytical skills necessary to model, analyze, and solve engineering problems encountered in mechanical engineering practice.

Outcome 8

Analysis and Control of Vibrating Systems

Vibration analysis and control are important aspects of mechanical engineering, particularly in the design and operation of various mechanical systems. This outcome focuses on developing students' skills in analyzing and controlling vibrations in mechanical systems.

Students should acquire knowledge of vibration theory, including concepts such as natural frequencies, mode shapes, damping, and resonance. They should be able to apply mathematical techniques and computational methods to analyze and predict the behavior of vibrating systems. This includes understanding the effects of external forces, structural dynamics, and system parameters on vibration response.

Additionally, students should learn about control systems and their applications in mitigating or suppressing vibrations. This involves understanding feedback control, controller design, and implementing strategies such as active control, passive control, and adaptive control. Students should be able to design and implement control systems to minimize vibrations and ensure the stability and performance of mechanical systems.

By achieving this outcome, students will be equipped with the knowledge and skills to analyze, model, and control vibrations in various mechanical systems, contributing to improved system performance, safety, and comfort.

Outcome 9

Understanding Thermodynamics and Power Plant Engineering, Including Renewable Energy

Thermodynamics and power plant engineering are crucial areas of study in mechanical engineering, focusing on the conversion and utilization of energy. This outcome aims to develop students' understanding of thermodynamic principles, power generation, and renewable energy technologies.

Students should acquire knowledge of thermodynamic laws, cycles (such as the Carnot cycle and Rankine cycle), and energy conversion processes. They should be able to analyze and calculate thermodynamic properties, energy transfers, and efficiencies in various systems. This includes studying combustion processes, refrigeration and air conditioning cycles, and power generation systems.

Moreover, students should learn about conventional power plants, including steam power plants and gas turbine power plants, and their components such as boilers, turbines, and condensers. They should understand the operational principles, efficiency optimization, and environmental considerations associated with these power plants.

Additionally, students should gain knowledge of renewable energy technologies, including solar power, wind power, hydropower, and biomass energy. They should understand the principles and operation of these technologies, including the design and optimization of renewable energy systems. Students

should also be familiar with the integration of renewable energy sources into power grids and the environmental benefits of utilizing renewable energy.
By achieving this outcome, students will be equipped with the knowledge and skills to analyze, design, and optimize thermodynamic systems and power plants, including those based on renewable energy sources, contributing to sustainable and efficient energy solutions.

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13. 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 (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

14. Curriculum/Modules

Semester 1 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
ME101	Engineering Mechanics-Statics	93	107	8.00	C	
ME102	Mathematics I	63	62	5.00	B	
ME103	Manufacturing Processes I	78	72	6.00	C	
ME104	Engineering Drawing	78	97	7.00	B	
ME105	English Language	33	17	2.00	S	
ME106	Human Rights	33	17	2.00	S	

Semester 2 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
ME151	Engineering Mechanics-Dynamic	93	107	8.00	C	
ME152	Mathematics II	63	62	5.00	B	
ME153	Physical Metallurgy	63	62	5.00	C	
ME154	Introduction to Electrical Engineering	63	62	5.00	B	
ME155	Computer Programming I	63	62	5.00	B	
ME156	Democracy	33	17	2.00	S	

Semester 3 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
ME201	Fluid Mechanics I	63	62	5.00	C	
ME202	Thermodynamics I	63	62	5.00	C	
ME203	Mechanics of Materials I	63	62	5.00	C	
ME204	Engineering Mathematics	93	107	8.00	B	ME152
ME205	Computer Programming II	63	62	5.00	C	
ME206	English Language	33	17	2.00	S	

Semester 4 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
ME251	Fluid Mechanics II	63	62	5.00	C	
ME252	Thermodynamics II	63	62	5.00	C	
ME253	Mechanics of Materials II	63	62	5.00	C	
ME254	Mechanical Engineering Laboratory I	48	27	3.00	B	
ME255	Mechanical Drawing	78	97	7.00	C	
ME256	Metallurgy	63	62	5.00	C	

Semester 5 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
ME301	Theory of Machines	93	107	8.00	C	
ME302	Conductive Heat Transfer	48	52	4.00	C	
ME303	Engineering & Numerical Analyses	93	107	8.00	B	
ME304	Combustion and Pollution	48	52	4.00	C	
ME305	Gas Dynamics	48	52	4.00	C	
ME306	English Language	33	17	2.00	S	

Semester 6 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
ME351	Machine Element Design	108	92	8.00	C	
ME352	Convective and Radiative Heat Transfer	48	52	4.00	C	
ME353	Manufacturing Processes II	78	72	6.00	C	
ME354	Industrial Engineering	63	62	5.00	B	
ME355	Mechanical Engineering Laboratory II	48	27	3.00	C	
ME356	Internal Combustion Engines	48	52	4.00	C	ME304

Semester 7 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
ME401	Design of Machines System	108	92	8.00	C	
ME402	Air-conditioning and Refrigeration	108	92	8.00	C	
ME403	Control and measurements	63	87	6.00	C	
ME404	Electric Machines	48	52	4.00	C	
ME405	English Language	33	17	2.00	S	
ME406	Engineering Project I	33	17	2.00	C	

Semester 8 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
ME451	Engineering Materials	63	112	7.00	C	
ME452	Mechanical Vibration	93	82	7.00	C	
ME453	Power Plant and Renewable Energy	78	72	6.00	C	
ME454	Turbomachinery	63	62	5.00	C	
ME455	Mechanical Engineering Laboratory III	48	27	3.00	C	
ME456	Engineering Project II	33	17	2.00	C	ME406

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