

نموذج وصف البرنامج الاكاديمي

اسم الجامعة : تكريت

اسم البرنامج الاكاديمي او المهني: بكالوريوس هندسة ميكانيكية

اسم الشهادة النهائية: بكالوريوس علوم في الهندسة الميكانيكية

النظام الدراسي: فصول دراسية

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التوقيع

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التاريخ: 2025-10-15



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التاريخ: 2025-10-15



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التاريخ: 2025-10-15



**Ministry of Higher Education and Scientific Research  
Scientific Supervision and Scientific Evaluation Apparatus  
Directorate of Quality Assurance and Academic Accreditation  
Accreditation Department**

# **Academic Program and Course Description Guide**

٢٠٢٦-٢٠٢٥

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## **Introduction:**

The educational program is a well—planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staP together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quaJerly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

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## **Concepts and terminology:**

Academic Program Description: The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

**Learning Outcomes:** A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra—curricular activities to achieve the learning outcomes of the program.

## Academic Program Description Form

**University Name: Tikrit**

**Faculty/Institute: Engineering**

**Scientific Department: Mechanical Engineering Department**

**Academic or Professional Program Name: .....**

**Final Certificate Name: .....**

**Academic System: .....**

**Description Preparation Date:**

**File Completion Date:**

**Signature:**

**Head of Department Name:**

**Raaid Rashad Jassem**

**Date:**

**Signature:**

**Scientific Associate Name: Saad**

**Mahmood Raaof**

**Date:**

**The file is checked by:**

**Department of Quality Assurance and University Performance**

**Director of the Quality Assurance and University Performance Department:**

**Date:**

**Signature:**

**Approval of the Dean**



<b>1. Program Vision</b>
The department strives to achieve excellence in the field of mechanical engineering both locally and regionally.
<b>2. Program Mission</b>
<ol style="list-style-type: none"> <li>1. Foster a spirit of lifelong learning.</li> <li>2. Graduate competent mechanical engineers with the skills, knowledge, and professional ethics required in their field.</li> <li>3. Enhance the research and innovation capabilities of both graduates and faculty members.</li> </ol>
<b>3. Program Objectives</b>
General statements describing what the program or institution intends to achieve.
<ol style="list-style-type: none"> <li>1. Equip graduates with knowledge and experience in solving complex engineering problems using principles of mathematics and engineering sciences, as well as designing mechanical components and systems that meet technical, developmental, and environmental requirements.</li> <li>2. Develop graduates' ability to conduct measurements and analyze results effectively and professionally communicate technical information to diverse audiences.</li> <li>3. Instill teamwork skills, ethical responsibilities, and professional integrity in decision-making, along with an understanding of the societal and environmental impacts of engineering solutions.</li> <li>4. Enable graduates to embrace continuous learning and to be qualified to engage graduate studies and conduct scientific researches to keep up with technological advancements and apply effective management principles in planning and executing engineering projects efficiently.</li> </ol>
<b>4. Program Accreditation</b>
No
<b>5. Other external influences</b>
Is there a sponsor for the program?

6 Program Structure				
Program Structure	Number of Courses	Credit hours	Percentage	Reviews•
Institution Requirements	۱۰	۳۳	%۱۴	
College Requirements	۷	۲۶	%۱۱	
Department Requirements	۳۶	۲۴۰	%۷۵	
Summer Training	-	-	-	
Other	-	-	-	

This can include notes whether the course is basic or optional.

7. Program Description				
Year/Level	Course Code	Course Name	Credit Hours	
			theoretical	practical
1/2025	MATH-101	Calculus I	5	
1/2025	ENG-106	Engineering Workshop	4	
1/2025	ENG-104	Computer Science	3	
1/2025	ENG-101	Engineering Drawing	5	
1/2025	ENG-105	Physics I	5	
1/2025	ENG-108	Human Rights and Democracy	2	
1/2025	MECH-104	Basics of Electricity	4	
1/2025	ENG-113	Arabic Language 1	2	
1/2025	MATH-102	Calculus II	5	
1/2025	UOT002	English Language 1	2	
1/2025	MECH-102	Mechanical Drawing	5	
1/2025	MECH-103	Manufacturing Processes 1	4	
1/2025	MECH-101	Thermodynamics	4	
1/2025	MECH-105	Physics II	5	
1/2025	ENG-102	Engineering Mechanics - Statics	5	
2/2025	MATH-201	Engineering Analysis	5	
2/2025	MECH-204	Metallurgical Engineering	5	
2/2025	MECH-201	Fluid Mechanics 1	5	
2/2025	UOT031	Computer II	3	
2/2025	MECH-203	Strength of Materials 1	5	
2/2025	MECH-205	Engineering Mechanics-Particle dynamics	5	
2/2025	UOT005	The Crimes of Baath Regime in Iraq	2	
2/2025	UOT021	English Language 2	2	
2/2025	MECH-206	Engineering Mechanics - rigid dynamics	6	
2/2025	MECH-207	Strength of Materials 2	5	

٢/٢.٢٥	MECH-208	Fluid Mechanics 2	6	
٢/٢.٢٥	MECH-209	Applied Thermodynamics	5	
٢/٢.٢٥	MECH-210	Computer Aided Drawing	4	
٢/٢.٢٥	UOT011	Arabic Language II	2	
٣/٢.٢٥	MATH-301	Numerical Analysis	٤	
٣/٢.٢٥	MECH-311	Energy Conversion	٤	
٣/٢.٢٥	MECH-302	Theory of Machines	٦	
٣/٢.٢٥	MECH-303	Heat Transfer conduction	٦	
٣/٢.٢٥	MECH-304	Gas Dynamic	٥	
٣/٢.٢٥	MECH-305	Manufacturing Processes 2	٥	
٣/٢.٢٥	MATH-302	Statistics and probability	3	
٣/٢.٢٥	MECH-306	Machine Design 1	6	
٣/٢.٢٥	MECH-307	Heat Transfer (convection & radiation)	6	
٣/٢.٢٥	MECH-308	Internal Combustion Engines	6	
٣/٢.٢٥	MECH-309	Engineering Materials	5	
٣/٢.٢٥	MECH-311	Engineering Ethics and Management	4	
٤/٢.٢٥	MECH-401	Engineering Graduation Project I	٤	
٤/٢.٢٥	MECH-402	Mechanical Design 2	٦	
٤/٢.٢٥	MECH-403	Vibration 1	٥	
٤/٢.٢٥	MECH-404	Fundamentals of Control	٥	
٤/٢.٢٥	MECH-405	Principles of Air Conditioning	٥	
٤/٢.٢٥	MECH-406	Power Plant Engineering	٥	
٤/٢.٢٥	MECH-407	Engineering Graduation Project II	٤	
٤/٢.٢٥	MECH-408	Control System Analysis	٥	
٤/٢.٢٥	MECH-409	Heating, Ventilation and Air Conditioning (HVAC)	٦	
٤/٢.٢٥	MECH-410	Vibration 2	٥	
٤/٢.٢٥	MECH-412	Industrial Engineering	٥	
٤/٢.٢٥	MECH-411 & 413	Elective Course 1 or 2 Electrical Machines Engineering Materials for Particular Applications	٥	

ξ/γ.γδ	MECH-411	Electrical Machines( Elective Course)		
ξ/γ.γδ	MECH-413	Engineering Materials for Particular Applications( Elective Course)		

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## 8. Expected learning outcomes of the program

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### Knowledge

- ❖ Comprehensive understanding of the fundamental principles of mathematics, sciences, and mechanical engineering, and the ability to apply them in analyzing and solving engineering problems.
- ❖ Understanding the principles of designing mechanical systems and equipment, as well as their operation and development.
- ❖ Awareness of environmental, economic, health, and occupational safety aspects related to mechanical systems and processes.

### Skills

- ❖ Ability to apply fundamental principles of mathematics, sciences, and mechanical engineering in analyzing and solving complex engineering problems.
- ❖ Proficiency in designing, operating, and developing mechanical systems and equipment to achieve high efficiency and economic feasibility.
- ❖ Utilization of modeling and computational simulation tools in studying and analyzing thermal and mechanical systems.
- ❖ Development of critical thinking and problem-solving skills through applied projects and scientific research connected to industrial practice.

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## 9. Teaching and Learning Strategies

The department relies on an integrated mix of interactive theoretical lectures to explain fundamental concepts and practical laboratory experiments to strengthen applied skills. In addition, problem-based and project-based learning is employed to develop analytical and creative thinking through graduation projects and engineering designs. The program also provides summer field training in industrial institutions to connect academic knowledge with practical application, while promoting collaborative learning and teamwork through joint activities and case studies related to industrial practice. The teaching process incorporates engineering software and computational tools for analysis, design, and simulation, alongside seminars, presentations, and scientific discussions to enhance communication and persuasion skills. Students are encouraged to pursue self-learning and continuous development through research and engagement with modern resources, supported by academic supervision and professional guidance to strengthen their educational and career journey.

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## 10. Evaluation methods

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The department employs several methods to measure the achievement of the intended learning outcomes, including:

Written examinations (midterm and final).

- ❖ Quizzes to assess continuous understanding of the course material.
  - ❖ Laboratory reports and evaluation of practical performance in laboratories.
  - ❖ Homework assignments and individual/group tasks.
  - ❖ Engineering projects and graduation projects, with evaluation of reports and presentations.
  - ❖ Seminars and presentations, along with scientific discussions.
  - ❖ Evaluation of summer field training through training reports and monitoring student performance.
  - ❖ Case studies and solving engineering problems.
  - ❖ Assessment of teamwork, leadership, and communication skills within joint activities and projects.
  - ❖ Direct observation of practical performance during laboratory and applied activities.
  - ❖ Surveys of graduates, employers, and feedback from the Industrial Advisory Board (IAB) to measure the long-term achievement of program outcomes and educational objectives.
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## Professional Development

### Mentoring new faculty members

To achieve continuous improvement in the department and guide new faculty members, numerous seminars, workshops, and training courses are organized, which include:

- ❖ Introduction to academic and administrative systems and policies at the university and college.
- ❖ Development of modern teaching skills through training in interactive teaching methods, classroom management, and student assessment.
- ❖ Enhancement of research capabilities via workshops on scientific writing, publishing in reputable journals, and using global databases.
- ❖ Training on the use of engineering technologies and software in teaching and research.
- ❖ Instilling values of academic integrity and professional ethics to ensure quality performance and social responsibility.

### Professional development of faculty members

Aimed at enhancing the efficiency of faculty members and strengthening their academic, research, and professional capabilities in line with modern developments in education and engineering, the program focuses on:

- ❖ Developing teaching and assessment skills through modern instructional methods and interactive techniques.
- ❖ Enhancing research capabilities and scientific publishing by providing training and encouraging publication in reputable international journals.
- ❖ Expanding training in the use of advanced engineering software and tools for analysis, design, and simulation to support teaching and research.
- ❖ Encouraging continuous learning and self-development to keep pace with scientific and technological advancements in mechanical engineering, through participation in local and international conferences and supervision of postgraduate research.

## 12. Acceptance Criterion

Students are admitted to the Bachelor of Mechanical Engineering program in accordance with the regulations of the central admission system issued by the Iraqi Ministry of Higher Education and Scientific Research, and in line with the admission requirements approved by Tikrit University and the College of Engineering. The admission requirements include:

- ❖ The applicant must hold a preparatory school certificate / scientific branch, or an officially recognized equivalent.
- ❖ Achieving the minimum grade required for admission to the College of Engineering according to the annual central admission plan.
- ❖ Fulfilling the conditions and regulations set by the Ministry of Higher Education and Scientific Research and Tikrit University.
- ❖ Passing the registration procedures, medical examination, and approved administrative requirements.
- ❖ Students are distributed among the engineering departments, including the Department of Mechanical Engineering, according to the mechanisms approved by the college and the university.

## 13. The most important sources of information about the program

The information related to the Bachelor of Mechanical Engineering program is based on a set of official and academic sources, including:

- ❖ Program Specification and program description documents.
- ❖ The approved study plan for the Mechanical Engineering program.
- ❖ Course Specifications for all program courses.
- ❖ The Self-Assessment Report (SAR) of the program.
- ❖ The Student Handbook and academic regulations of the college and university.
- ❖ The official website of the Mechanical Engineering Department at the College of Engineering – Tikrit University.
- ❖ The official website of the College of Engineering – Tikrit University.
- ❖ The official website of Tikrit University, including academic regulations and instructions.
- ❖ Instructions of the Iraqi Ministry of Higher Education and Scientific Research related to curricula, admission, quality assurance, and academic accreditation.
- ❖ Minutes of meetings of the Industrial Advisory Board (IAB) and reports on quality and continuous improvement.
- ❖ Surveys of students, graduates, and employers used in program evaluation and development.
- ❖ Scientific references, textbooks, and specialized journals in the field of mechanical engineering.

#### 14. Program Development Plan

Based on the department's strategic plan and the self-assessment report, the program focuses on the continuous development of curricula and modernization of laboratories to meet labor market requirements and national and international accreditation standards. It also strengthens the application of Outcome-Based Education (OBE) by linking courses to learning outcomes, and introduces new courses in areas such as sustainability, artificial intelligence, and digital technologies.

The program emphasizes expanding applied learning opportunities through summer training, practical projects, and scientific research, in addition to enhancing partnerships with the industrial sector to support training, employment, and joint projects. It encourages scientific research and innovation, develops students' skills in communication, teamwork, and leadership, and increases reliance on digital learning and engineering software.

Special attention is given to occupational safety and quality programs, as well as maintaining strong connections with alumni, employers, and the Industrial Advisory Board (IAB) to ensure continuous improvement, fulfill accreditation requirements, and keep pace with modern developments in mechanical engineering.

## Program Skills Outline

### Required program Learning outcomes

Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
الأول/2026-2025 الأول/2026-2025	MATH-101		اساسي		X			X						X	
	ENG-106		اساسي	X				X						X	
الأول/2026-2025 الأول/2026-2025	ENG-104		اساسي	X	X			X						X	
	ENG-101		اساسي	X				X						X	
الأول/2026-2025 الأول/2026-2025	ENG-105		اساسي				X		X			X	X		
	ENG-108		اساسي	X				X						X	
الأول/2026-2025 الأول/2026-2025	ENG-113		اساسي	X			X						X		
	MATH-102		اساسي	X				X						X	
الأول/2026-2025	UOT002		اساسي	X	X			X						X	
الأول/2026-2025	MECH-102		اساسي	X				X						X	
الأول/2026-2025	MECH-103		اساسي		X					X				X	
الأول/2026-2025	MECH-101		اساسي		X					X					X
الأول/2026-2025	MECH-104		اساسي	X				X						X	
الأول/2026-2025	ENG-102		اساسي	X			X						X		X



الثالث/2026-2025	MECH-305	اساسي		X	X		X	X					X	
الثالث/2026-2025	MATH-302	اساسي	X				X			X		X		
الثالث/2026-2025	MECH-306	اساسي		X	X		X	X					X	
الثالث/2026-2025	MECH-307	اساسي			X		X	X	X		X			X
الثالث/2026-2025	MECH-308	اساسي			X		X	X	X		X			X
الثالث/2026-2025	MECH-309	اساسي			X		X	X	X		X			X
الثالث/2026-2025	MECH-310	اساسي			X		X	X	X		X			X
الرابع/2026-2025	MECH-401	اساسي			X		X	X	X		X			X
الرابع/2026-2025	MECH-402	اساسي			X		X	X	X		X			X
الرابع/2026-2025	MECH-403	اساسي		X									X	
الرابع/2026-2025	MECH-404	اساسي				X		X	X	X		X		
الرابع/2026-2025	MECH-405	اساسي				X		X	X	X		X		
الرابع/2026-2025	MECH-406	اساسي				X		X	X	X		X		
الرابع/2026-2025	MECH-407	اساسي				X		X	X	X		X		
الرابع/2026-2025	MECH-408	اساسي				X		X	X	X		X		
الرابع/2026-2025	MECH-409	اساسي			X		X	X	X		X			X
الرابع/2026-2025	MECH-410	اساسي		X	X			X	X				X	
الرابع/2026-2025	MECH-412	اساسي				X		X	X	X		X		
الرابع/2026-2025	MECH-411 & 413	اختياري				X		X	X	X		X		

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

## Course Description Calculus1

1. Course Name:Calculus 1					
2. Course Code:					
3. Semester / Year:					
4. Description Preparation Date:					
5. Available Attendance Forms:					
6. Number of Credit Hours (Total) / Number of Units (Total)					
93/6					
7. Course administrator's name (mention all, if more than one name)					
Name: Thamir K. Ibrahim , Hamza R. Yaseen Email: <a href="mailto:thamirmathcad@tu.edu.iq">thamirmathcad@tu.edu.iq</a> , e-mail hamza.r.yaseen94@tu.edu.iq					
8. Course Objectives					
<b>Course Objectives</b>			Developing of student ability in the general mathematics principle and applications.		
9. Teaching and Learning Strategies					
<b>Strategy</b>	The learning and teaching strategy is designed to: We designed teaching strategies to support students' development of mathematical knowledge and problem solving as well as communication and team working skills. We used an action research perspective as various methods within this stance can ensure flexibility in responding to the dynamics of interaction between the teachers and the students.				
10. Course Structure					
<b>Week</b>	<b>Hours</b>	<b>Required Learning</b>	<b>Unit or subject name</b>	<b>Learning method</b>	<b>Evaluation</b>

		Outcomes			method
Week 1			Review of differentiation and integration		
Week 2			Transcendental Functions: Inverse – Trigonometric Functions and The Derivatives of the Inverse – Trigonometric Functions		
Week 3			The Natural Logarithm and its Derivative, and its properties		
Week 4			The Natural Logarithm and its Derivative, and its properties		
Week 5			The Exponential Function		
Week 6			Methods of Integration: By parts		
Week 7			Products of Powers of Trigonometric functions		
Week 8			Even powers of Sine and Cosine		
Week 9			Trigonometric substitutions that replace $a^2 - u^2$ , $a^2 + u^2$ and $u^2 - a^2$		
Week 10			Hyperbolic Function: Definition of Hyperbolic Function		
Week 11			Derivatives and Integrals of Hyperbolic Function		
Week 12			Inverse of Hyperbolic Function		
Week 13			Power Series: Taylor Polynomials		
Week 14			Taylor's Series for Sine, Cosine and $e^x$		
Week 15			Binomial Theorem		

<b>Week 16</b>			<b>Final Exam</b>		
<b>11. Course Evaluation</b>					
The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.					
<b>Learning and Teaching Resources</b>					
<b>Text Book</b>	"Calculus" by George B. Thomas, Jr. publishing company, 2010 "Engineering Mathematics" by K. A. Stroud, Dexter J. Booth, 5th edition, Industrial press Inc., New York, 2001.				
<b>Main Reference source</b>	"Calculus" by George B. Thomas, Jr. publishing company, 2010 "Engineering Mathematics" by K. A. Stroud, Dexter J. Booth, 5th edition, Industrial press Inc., New York, 2001.				
<b>Recommended Books</b>	Advanced_Engineering_Mathematics_By_Erwin_Kreyszig_tenth_Edition, 2011 Higher Engineering Mathematics by JOHN, 2010				
<b>Electronics References Websites</b>					

## Course Description Control II

1. Course Name: <b>Control II</b>	
2. Course Code: <b>Mech 442</b>	
3. Semester / Year: <b>Second semester</b>	
4. Description Preparation Date: <b>16-6-2026</b>	
5. Available Attendance Forms: <b>Weekly Attendance</b>	
6. Number of Credit Hours (Total) / Number of Units (Total) 45	
7. Course administrator's name (mention all, if more than one name)	
Name: Adel M.Bash Email: <a href="mailto:adelbash@tu.edu.iq">adelbash@tu.edu.iq</a>	
8. Course Objectives	
<b>Course Objectives</b>	<p>The main objectives of the course are:</p> <ul style="list-style-type: none"> <li>• Study and analyze the different methods of stability analysis.</li> <li>• To understand the principles and techniques of frequency response analysis in control systems:</li> <li>• To develop proficiency in state space analysis of continuous systems.</li> <li>• Analyze system stability and performance using state transition matrices.</li> <li>• Design controllers that optimize specific objectives, such as minimizing error or maximizing stability.</li> <li>• Implement and evaluate the performance of modern control designs in practical scenarios.</li> </ul>
9. Teaching and Learning Strategies	
<b>Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques in lectures and demonstrate concepts with appropriate (and, where possible, practical) examples. Allow students adequate time to practice the techniques using many carefully selected tutorial problems. Continuous systems.
10. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1	3	Upon completing this topic, students will be able to analyze the stability of continuous-time control systems in the S-domain by examining pole locations	Stability Analysis in S-Domain	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework Quizzes
Week 2	3	students will be able to explain the concept of system stability and apply the Routh–Hurwitz stability criterion to determine the stability of linear continuous-time systems by analyzing the characteristic equation without explicitly calculating its roots.	The concept of stability – Routh Hurwitz's stability criterion	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
Week 3	3	tudents will be able to explain the concept of system stability, distinguish between absolute, qualitative, and conditional stability	Qualitative stability and conditional stability	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework Quizzes
Week 4	3	students will be able to apply the Root Locus technique to analyze and predict the movement of closed-loop poles as system gain varies	Root Locus Technique	Theoretical	Monthly exams / Periodic exams In-class questions / Real-time questions Out-of-class assignments / Homework Quizzes
Week 5	3	evaluate the effects of pole locations on system stability and dynamic performance.	Concept of root locus - Construction of root locus,	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
Week 6	3	valuate how these modifications influence the stability and dynamic performance of closed-loop control systems.	Effects of adding poles and zeros to $G(s)$ $H(s)$ on the root loci.	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
Week 7	3	students will be able to design and analyze feedback control systems using the	Design control system using root locus	Theoretical	In-class questions / Real-time questions Out-of-class assignments /

		Root Locus technique by selecting appropriate controller parameters to achieve desired stability and performance specifications			Homework
<b>Week 8</b>	3	students will be able to analyze the frequency response of control systems, interpret frequency-domain specifications, and evaluate system performance and stability characteristics using frequency response techniques.	Frequency Response Analysis: Introduction, Frequency domain specifications	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 9</b>	3	students will be able to construct and interpret Bode plot diagrams, determine gain margin and phase margin, and assess the stability and performance of control systems using frequency-response analysis techniques.	Bode plot diagrams- Determination of Phase margin and Gain margin	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 10</b>	3	Upon completing this topic, students will be able to design and compensate control systems using Bode plot techniques by modifying system frequency-response characteristics to satisfy specified stability and performance requirements, including gain margin, phase margin, bandwidth, and steady-state accuracy.	Design control system using Bod plot	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 11</b>	3	Upon completing this topic, students will be able to design control systems using Bode plot techniques and analyze system frequency-response characteristics through Polar plots to evaluate stability	Polar plots.	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework

<b>Week 12</b>	3	students will be able to apply the Nyquist stability criterion to determine the stability of closed-loop control systems by analyzing Nyquist plots and assessing the relationship between open-loop frequency response and system stability.	The Nyquist stability criterion	Theoretical	In-class questions / Real-time questions / Out-of-class assignments / Homework
<b>Week 13</b>	3	students will be able to apply the Nyquist stability criterion to analyze and design feedback control systems	Applications of the Nyquist stability criterion	Theoretical	In-class questions / Real-time questions / Out-of-class assignments / Homework
<b>Week 14</b>	3	students will be able to explain the basic concepts of measurement devices, including accuracy, precision, sensitivity, resolution, linearity, repeatability, and calibration, and evaluate their roles in measurement and instrumentation systems.	Basic concepts of measurement devices	Theoretical	In-class questions / Real-time questions / Out-of-class assignments / Homework
<b>Week 15</b>	3	students will be able to identify and classify various types of sensors, explain their operating principles, and select appropriate sensors for measuring physical variables such as temperature, pressure, displacement, flow, force, and light in engineering applications.	various types of sensors	Theoretical	In-class questions / Real-time questions / Out-of-class assignments / Homework
<b>Week 16</b>	3		Final Exam		In-class questions

### 12. Course Evaluation

The evaluation strategy for the Control Systems course relies on a balanced framework of continuous and final assessments to ensure the successful achievement of the intended learning outcomes. Formative assessments, which make up 40% of the overall grade, consist of quizzes, homework assignments, classroom activities, seminars, and project work. These are designed to continuously monitor student progress and reinforce learning throughout the semester. Additionally, a midterm

exam (10%) evaluates the students' grasp of the fundamental concepts taught during the first half of the course. Lastly, the final examination (50%) serves as a comprehensive assessment of the students' overall mastery of the course materials and objectives at the end of the semester.

**Learning and Teaching Resources**

<b>Text Book</b>	1-Modern Control Engineering" by Katsuhiko Ogata. 2-Raivan "Engineering control "
<b>Main Reference source</b>	1- Control Systems Theory and Applications - S. K. Bhattacharya, Pearson. 2. Control Systems Engineering - S. Palani, TMH. 3. Control Systems - N. K. Sinha, New Age International (P) Limited Publishers.
<b>Recommended Books</b>	Control Systems by S.Hasan Saeed, KATSON BOOKS.
<b>Electronics References Websites</b>	<a href="https://www.mathworks.com/help/control/ug/control-system-modeling-with-model-objects.html">https://www.mathworks.com/help/control/ug/control-system-modeling-with-model-objects.html</a>

## Course Description Control I

1. Course Name: <b>Control I</b>					
2. Course Code: <b>Mech 442</b>					
3. Semester / Year: <b>First semester</b>					
4. Description Preparation Date: <b>16-6-2026</b>					
5. Available Attendance Forms: <b>Weekly Attendance</b>					
6. Number of Credit Hours (Total) / Number of Units (Total) 45					
7. Course administrator's name (mention all, if more than one name) Name: Adel M.Bash Email: <a href="mailto:adelbash@tu.edu.iq">adelbash@tu.edu.iq</a>					
8. Course Objectives					
<b>Course Objectives</b>		The main objectives of the course are: <ul style="list-style-type: none"> <li>• Introduce the principles and applications of linear control systems and Laplace transform.</li> <li>• The basic concepts of block diagram reduction transfer function representation.</li> <li>• Time response and time domain analysis, solutions to linear time-invariant systems.</li> </ul>			
9. Teaching and Learning Strategies					
<b>Strategy</b>		The learning and instruction strategy aims to introduce students to the fundamental concepts and mathematical models used in control systems in a course on classical control systems. They learn about the various control system components, such as sensors, actuators, controllers, and plant models.			
10. Course Structure					
Week	Hours	Required Learning	Unit or subject name	Learning method	Evaluation

					method
<b>Week 1</b>	3	Identify the types of control systems and their performance methods: their advantages, limitations and uses	Introduction: Concept of control system, Classification of control systems - Open loop and closed loop control systems, Differences, Examples of control systems- Effects of feedback, Feedback Characteristics.	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework Quizzes
<b>Week 2</b>	3	Teaching students about the impact of feedback on the performance of control systems	Transfer Function Representation	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 3</b>	3	Teaching students how to represent systems	Block diagram algebra	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework Quizzes
<b>Week 4</b>	3	Identify methods of reducing block diagrams and their importance in finding transfer functions for systems	Determining the Transfer function from Block Diagrams	Theoretical	Monthly exams / Periodic exams In-class questions / Real-time questions Out-of-class assignments / Homework Quizzes
<b>Week 5</b>	3	Understanding the components of electrical systems and their uses	The mathematical representation of control systems	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 6</b>	3	Identifying the components of vibratory and torsional	Mechanical and Electrical system	Theoretical	In-class questions / Real-time

		systems			questions Out-of-class assignments / Homework
<b>Week 7</b>	3	Identifying the components of a Hydraulic and pneumatic system and its calculations	Hydraulic and pneumatic systems	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 8</b>	3	Accurately identify and comprehend SFG terminology and graphical elements, including nodes, branches, forward paths, and loops.	Signal flow graphs (SFG)	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 9</b>	3	Acquire the skill to convert complex algebraic/differential equations and block diagrams into clear and simplified signal flow graphs.	Reduction using Mason's gain formula	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 10</b>	3	Utilize Mason's rule to directly determine the overall transfer function of a control system, bypassing lengthy and complex algebraic reduction procedures.	The transfer function of SFG's.	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 11</b>	3	Defining and mathematically represent the four standard test signals (Step, Ramp, Parabolic, and Impulse) in both the time domain and the Laplace domain (s-domain).	Time Response Analysis: Standard test signals	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 12</b>	3	Calculate and evaluate the steady-state error and static error constants of a control system based on the	Time response of first-order systems, Characteristic Equation of Feedback control systems	Theoretical	In-class questions / Real-time questions Out-of-class

		applied test signal and the specified system type.			assignments / Homework
<b>Week 13</b>	3	Define and graphically identify the standard time-domain specifications on a step response curve, including Delay Time ( $t_d$ ), Rise Time ( $t_r$ ), Peak Time ( $t_p$ ), Maximum Overshoot ( $M_p$ ), and Settling Time ( $t_s$ ).	Transient response of second order systems - Time domain specifications	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 14</b>	3	calculate and evaluate the steady-state error and static error constants of a control system based on the applied test signal and the specified system type.	Steady-state response, Steady state errors, and error constants	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 15</b>	3	Evaluate the overall transient performance of a control system against specific engineering design requirements and understand how adjusting system parameters affects the speed of response and system stability.	Examples of steady-state response, steady-state errors, and error constant	Theoretical	In-class questions / Real-time questions Out-of-class assignments / Homework
<b>Week 16</b>	3		<b>Final Exam</b>		In-class questions

### 9. Course Evaluation

The evaluation strategy for the Control Systems course relies on a balanced framework of continuous and final assessments to ensure the successful achievement of the intended learning outcomes. Formative assessments, which make up 40% of the overall grade, consist of quizzes, homework assignments, classroom activities, seminars, and project work. These are designed to continuously monitor student progress and reinforce learning throughout the semester. Additionally, a midterm exam (10%) evaluates the students' grasp of the fundamental concepts taught during the first half of the course. Lastly, the final examination (50%) serves as a comprehensive assessment of the students' overall mastery of the course materials and objectives at the end of the semester.

<b>Learning and Teaching Resources</b>	
<b>Text Book</b>	1-Modern Control Engineering" by Katsuhiko Ogata. 2-Raivan "Engineering control "
<b>Main Reference source</b>	1- Control Systems Theory and Applications - S. K. Bhattacharya, Pearson. 2. Control Systems Engineering - S. Palani, TMH. 3. Control Systems - N. K. Sinha, New Age International (P) Limited Publishers.
<b>Recommended Books</b>	Control Systems by S.Hasan Saeed, KATSON BOOKS.
<b>Electronics References Websites</b>	<a href="https://www.mathworks.com/help/control/ug/control-system-modeling-with-model-objects.html">https://www.mathworks.com/help/control/ug/control-system-modeling-with-model-objects.html</a>

## Course Description Computer Science (II)

1. Course Name:	
Computer Science (II)	
2. Course Code:	
3. Semester / Year:	
First Semester / Second stage / 2025 – 2026.	
4. Description Preparation Date:	
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	
7. Course administrator's name (mention all, if more than one name)	
Asst. Prof. Dr. Saif Sabah Irhayyim E-mail: <a href="mailto:saiof11@tu.edu.iq">saiof11@tu.edu.iq</a>	
8. Course Objectives	
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>1. Understand and utilize the MATLAB interface and environment effectively for programming and data analysis.</li> <li>2. Apply basic programming constructs in MATLAB, including variables, operators, conditional statements, loops, and functions.</li> <li>3. Perform matrix and array manipulations, which are fundamental to MATLAB's capabilities in scientific and engineering applications.</li> <li>4. Create scripts and functions to automate tasks and streamline computations.</li> <li>5. Generate 2D and 3D plots and use data visualization techniques to interpret and present data results.</li> <li>6. Develop and test algorithms for solving mathematical, scientific, and engineering problems.</li> <li>7. Integrate MATLAB with other software and tools for enhanced functionality and application.</li> </ol>
9. Teaching and Learning Strategies	
<b>Strategy</b>	The strategy of this course is to provide students with a strong foundation in MATLAB programming through a balanced combination of theoretical

instruction and hands-on laboratory practice. The course follows a step-by-step approach, beginning with the MATLAB environment, variables, and mathematical operations, and progressing toward matrix manipulation, programming structures, data processing, and graphical visualization. Emphasis is placed on developing computational thinking, analytical skills, and problem-solving abilities through practical engineering and mathematical applications. Students are encouraged to actively participate in laboratory exercises, assignments, and programming tasks that simulate real-world engineering problems. This strategy aims to enhance students' technical competence, independent learning skills, and ability to apply MATLAB effectively in engineering analysis, modeling, and data visualization.

### 10. Course Structure

<b>Week</b>	<b>Hours</b>	<b>Required Learning Outcomes</b>	<b>Unit or subject name</b>	<b>Learning method</b>	<b>Evaluation method</b>
<b>Week 1</b>			General Introduction to Programming in MATLAB (installation and operation of the program)		
<b>Week 2</b>			Desktop MATLAB Program		
<b>Week 3</b>			Symbols MATLAB Program		
<b>Week 4</b>			Constants and Variables MATLAB Program		
<b>Week 5</b>			Arithmetic Expression		
<b>Week 6</b>			Arithmetic and String Statement		
<b>Week 7</b>			Library Functions		
<b>Week 8</b>			Midterm		
<b>Week 9</b>			Matrixes and Operations on Matrixes (create a matrix)		
<b>Week 10</b>			Addressing and Indexing the Matrix		
<b>Week 11</b>			Calculations between Matrixes and between the Matrix and The Single Number		
<b>Week 12</b>			Standard Matrixes and Searching about The Partial Matrix		
<b>Week 13</b>			Input and Output statements		

<b>Week 14</b>			Conditional Statements		
<b>Week 15</b>			Partial Graphs and surface (Plotting).		
<b>Week 16</b>			Final Exam		

### 10. Course Evaluation

This course introduces MATLAB, a high-level programming language and interactive environment widely used in engineering, science, and mathematics for data analysis, modeling, and algorithm development. Students will learn essential programming skills, including variables, functions, control structures, and data visualization. The course covers matrix and array manipulations, plotting and visualization techniques, and custom function creation. Practical applications focus on solving engineering and mathematical problems. By the end of the course, students will have a foundational understanding of MATLAB, enabling them to analyze data, develop algorithms, and model systems effectively.

### Learning and Teaching Resources

<b>Text Book</b>	MATLAB Reference (R2020a) by MathWorks.
<b>Main Reference source</b>	Halpern, David, Howard B. Wilson, and Louis H. Turcotte. Advanced mathematics and mechanics applications using MATLAB. CRC press, 2002.
<b>Recommended Books</b>	
<b>Electronics References Websites</b>	

## Course Description ENGINEERING MATERIALS

1. Course Name:	
Engineering materials	
2. Course Code:	
3. Semester / Year:	
Second Semester / Third stage / 2025 – 2026.	
4. Description Preparation Date:	
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	
7. Course administrator's name (mention all, if more than one name)	
Asst. Prof. Dr. Saif Sabah Irhayyim E-mail: <a href="mailto:saiof11@tu.edu.iq">saiof11@tu.edu.iq</a>	
8. Course Objectives	
<b>Course Objectives</b>	<p>By the end of the course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Analyze and predict the mechanical, thermal, and chemical behavior of engineering materials.</li> <li>2. Select appropriate materials for mechanical and industrial applications based on performance, cost, and sustainability.</li> <li>3. Understand and evaluate failure mechanisms such as fatigue, creep, corrosion, and wear.</li> <li>4. Apply materials characterization techniques for microstructural and property evaluation.</li> <li>5. Explore the role of advanced materials (e.g., nanomaterials, smart materials, biomaterials) in modern engineering applications.</li> </ol> <p>Upon successful completion, students will demonstrate the ability to:</p> <ol style="list-style-type: none"> <li>1. Explain the relationship between structure, processing, and</li> </ol>

	<p>properties of engineering materials.</p> <ol style="list-style-type: none"> <li>2. Solve engineering problems involving the selection and design of materials.</li> <li>3. Evaluate the performance of materials under mechanical, thermal, and chemical loading.</li> <li>4. Interpret experimental results from hardness, tensile, wear, and microstructural analysis tests.</li> <li>5. Discuss recent advances in engineering materials and their industrial applications.</li> </ol>
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### 9. Teaching and Learning Strategies

<b>Strategy</b>	<p>To achieve the course objectives and learning outcomes, the following instructional and learning strategies will be employed:</p> <ol style="list-style-type: none"> <li><b>1. Lectures and Interactive Discussions</b> <ul style="list-style-type: none"> <li>• Structured lectures supported by multimedia presentations (PowerPoint, animations, and videos) to explain theoretical concepts.</li> <li>• Interactive discussions to promote critical thinking and active participation.</li> <li>• Integration of industrial case studies to link theory with practice.</li> </ul> </li> <li><b>2. Problem-Solving and Tutorials</b> <ul style="list-style-type: none"> <li>• Weekly problem-solving sessions covering phase diagrams, transformation kinetics, and materials selection problems.</li> <li>• Application of numerical methods to analyze fatigue life, creep behavior, and corrosion rates.</li> <li>• Group tutorials to encourage collaborative learning.</li> </ul> </li> <li><b>3. Project-Based Learning (PBL)</b> <ul style="list-style-type: none"> <li>• Group projects focused on <b>materials selection for real engineering applications</b> (aerospace, automotive, energy, biomedical).</li> <li>• Written reports and oral presentations to develop technical communication skills.</li> </ul> </li> <li><b>4. Research-Oriented Learning</b> <ul style="list-style-type: none"> <li>• Encouragement of students to read and present recent journal papers.</li> <li>• Critical review of emerging materials such as nanomaterials, smart materials, and biomaterials.</li> <li>• Linking undergraduate learning with postgraduate research directions.</li> </ul> </li> <li><b>5. Continuous Feedback and Reflection</b> <ul style="list-style-type: none"> <li>• Short quizzes and feedback sessions to monitor student understanding.</li> <li>• Reflection reports to encourage self-assessment of learning progress.</li> <li>• Peer review in project work to develop teamwork and evaluative skills.</li> </ul> </li> </ol>
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### 10. Course Structure

Week	Hours	Required Learning	Unit or subject name	Learning method	Evaluation
		<b>Outcomes</b>			<b>method</b>
Week 1			Fundamentals of Engineering Materials.		

<b>Week 2</b>			Introduction and classification of engineering materials		
<b>Week 3</b>			Atomic structure, bonding, and crystallography in engineering materials.		
<b>Week 4</b>			Defects in solids: point, line, and surface defects; role in mechanical behavior.		
<b>Week 5</b>			Metals and Alloys: Ferrous alloys: steels and cast irons, microstructure, heat treatments.		
<b>Week 6</b>			Metals and Alloys: Non-ferrous alloys: aluminum, copper, magnesium, titanium, nickel-based alloys.		
<b>Week 7</b>			Polymers: classification, structure–property relationships, engineering applications.		
<b>Week 8</b>			Midterm		
<b>Week 9</b>			Ceramics and glasses: structure, properties, advantages, limitations.		
<b>Week 10</b>			Composites: types (MMC, PMC, CMC), processing methods, mechanical behavior, case studies.		
<b>Week 11</b>			Mechanical properties: elasticity, plasticity, hardness, toughness, fatigue, creep.		
<b>Week 12</b>			Nanomaterials: structure, properties, advantages, limitations.		

<b>Week 13</b>			Biomaterials: structure, properties, advantages, limitations.		
<b>Week 14</b>			Smart materials: structure, properties, advantages, limitations.		
<b>Week 15</b>			Semiconductors: structure, properties, advantages, limitations.		
<b>Week 16</b>			Final Exam		
<b>11. Course Evaluation</b>					
<p>This course provides an advanced understanding of engineering materials with emphasis on metals, polymers, ceramics, and composites. It integrates principles of structure–property relationships, phase transformations, materials processing, and performance evaluation under service conditions. The course bridges fundamental materials science with practical applications in mechanical and manufacturing engineering, focusing on modern challenges such as lightweight design, high-temperature applications, corrosion resistance, wear resistance, and advanced composites.</p>					
<b>Learning and Teaching Resources</b>					
<b>Text Book</b>	Callister, W.D., and Rethwisch, D.G. (2020). "Materials Science and Engineering: An Introduction," 10th Edition, Wiley.				
<b>Main Reference source</b>	Callister, W.D., and Rethwisch, D.G. (2020). "Materials Science and Engineering: An Introduction," 10th Edition, Wiley.				
<b>Recommended Books</b>	<ul style="list-style-type: none"> <li>• Ashby, M.F. (2017). "Materials Selection in Mechanical Design," 5th Edition, Butterworth-Heinemann.</li> <li>• Courtney, T.H. (2016). "Mechanical Behavior of Materials," 2nd Edition, Waveland Press.</li> <li>• Hull, D., and Clyne, T.W. (2019). "An Introduction to Composite Materials," 3rd Edition, Cambridge University Press.</li> </ul>				
<b>Electronics References Websites</b>					

## Course Description

# ENGINEERING MATERIALS

1. Course Name:	
Engineering materials	
2. Course Code:	
3. Semester / Year:	
First Semester / Fourth stage / 2025 – 2026.	
4. Description Preparation Date:	
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	
7. Course administrator's name (mention all, if more than one name)	
Asst. Prof. Dr. Saif Sabah Irhayyim E-mail: <a href="mailto:saiof11@tu.edu.iq">saiof11@tu.edu.iq</a>	
8. Course Objectives	
<b>Course Objectives</b>	<p>By the end of the course, students will be able to:</p> <ol style="list-style-type: none"> <li><b>6.</b> Analyze and predict the mechanical, thermal, and chemical behavior of engineering materials.</li> <li><b>7.</b> Select appropriate materials for mechanical and industrial applications based on performance, cost, and sustainability.</li> <li><b>8.</b> Understand and evaluate failure mechanisms such as fatigue, creep, corrosion, and wear.</li> <li><b>9.</b> Apply materials characterization techniques for microstructural and property evaluation.</li> <li><b>10.</b> Explore the role of advanced materials (e.g., nanomaterials, smart materials, biomaterials) in modern engineering applications.</li> </ol> <p>Upon successful completion, students will demonstrate the ability to:</p> <ol style="list-style-type: none"> <li><b>6.</b> Explain the relationship between structure, processing, and properties of engineering materials.</li> <li><b>7.</b> Solve engineering problems involving the selection and design of materials.</li> <li><b>8.</b> Evaluate the performance of materials under mechanical, thermal, and chemical loading.</li> </ol>

	<p><b>9.</b> Interpret experimental results from hardness, tensile, wear, and microstructural analysis tests.</p> <p><b>10.</b> Discuss recent advances in engineering materials and their industrial applications.</p>
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**9. Teaching and Learning Strategies**

<b>Strategy</b>	<p>To achieve the course objectives and learning outcomes, the following instructional and learning strategies will be employed:</p> <p><b>6. Lectures and Interactive Discussions</b></p> <ul style="list-style-type: none"> <li>• Structured lectures supported by multimedia presentations (PowerPoint, animations, and videos) to explain theoretical concepts.</li> <li>• Interactive discussions to promote critical thinking and active participation.</li> <li>• Integration of industrial case studies to link theory with practice.</li> </ul> <p><b>7. Problem-Solving and Tutorials</b></p> <ul style="list-style-type: none"> <li>• Weekly problem-solving sessions covering phase diagrams, transformation kinetics, and materials selection problems.</li> <li>• Application of numerical methods to analyze fatigue life, creep behavior, and corrosion rates.</li> <li>• Group tutorials to encourage collaborative learning.</li> </ul> <p><b>8. Project-Based Learning (PBL)</b></p> <ul style="list-style-type: none"> <li>• Group projects focused on <b>materials selection for real engineering applications</b> (aerospace, automotive, energy, biomedical).</li> <li>• Written reports and oral presentations to develop technical communication skills.</li> </ul> <p><b>9. Research-Oriented Learning</b></p> <ul style="list-style-type: none"> <li>• Encouragement of students to read and present recent journal papers.</li> <li>• Critical review of emerging materials such as nanomaterials, smart materials, and biomaterials.</li> <li>• Linking undergraduate learning with postgraduate research directions.</li> </ul> <p><b>10. Continuous Feedback and Reflection</b></p> <ul style="list-style-type: none"> <li>• Short quizzes and feedback sessions to monitor student understanding.</li> <li>• Reflection reports to encourage self-assessment of learning progress.</li> <li>• Peer review in project work to develop teamwork and evaluative skills.</li> </ul>
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**10. Course Structure**

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1			Fundamentals of Engineering Materials.		
Week 2			Introduction and classification of		

			engineering materials		
<b>Week 3</b>			Atomic structure, bonding, and crystallography in engineering materials.		
<b>Week 4</b>			Defects in solids: point, line, and surface defects; role in mechanical behavior.		
<b>Week 5</b>			Metals and Alloys: Ferrous alloys: steels and cast irons, microstructure, heat treatments.		
<b>Week 6</b>			Metals and Alloys: Non-ferrous alloys: aluminum, copper, magnesium, titanium, nickel-based alloys.		
<b>Week 7</b>			Polymers: classification, structure–property relationships, engineering applications.		
<b>Week 8</b>			Midterm		
<b>Week 9</b>			Ceramics and glasses: structure, properties, advantages, limitations.		
<b>Week 10</b>			Composites: types (MMC, PMC, CMC), processing methods, mechanical behavior, case studies.		
<b>Week 11</b>			Mechanical properties: elasticity, plasticity, hardness, toughness, fatigue, creep.		
<b>Week 12</b>			Nanomaterials: structure, properties, advantages, limitations.		

<b>Week 13</b>			Biomaterials: structure, properties, advantages, limitations.		
<b>Week 14</b>			Smart materials: structure, properties, advantages, limitations.		
<b>Week 15</b>			Semiconductors: structure, properties, advantages, limitations.		
<b>Week 16</b>			Final Exam		

## 12. Course Evaluation

This course provides an advanced understanding of engineering materials with emphasis on metals, polymers, ceramics, and composites. It integrates principles of structure–property relationships, phase transformations, materials processing, and performance evaluation under service conditions. The course bridges fundamental materials science with practical applications in mechanical and manufacturing engineering, focusing on modern challenges such as lightweight design, high-temperature applications, corrosion resistance, wear resistance, and advanced composites.

## Learning and Teaching Resources

<b>Text Book</b>	Callister, W.D., and Rethwisch, D.G. (2020). "Materials Science and Engineering: An Introduction," 10th Edition, Wiley.
<b>Main Reference source</b>	Callister, W.D., and Rethwisch, D.G. (2020). "Materials Science and Engineering: An Introduction," 10th Edition, Wiley.
<b>Recommended Books</b>	<ul style="list-style-type: none"> <li>• Ashby, M.F. (2017). "Materials Selection in Mechanical Design," 5th Edition, Butterworth-Heinemann.</li> <li>• Courtney, T.H. (2016). "Mechanical Behavior of Materials," 2nd Edition, Waveland Press.</li> <li>• Hull, D., and Clyne, T.W. (2019). "An Introduction to Composite Materials," 3rd Edition, Cambridge University Press.</li> </ul>
<b>Electronics References Websites</b>	

## Course Description Composite Materials

1. Course Name:	
Composite Materials	
2. Course Code:	
3. Semester / Year:	
Second Semester / Fourth stage / 2025 – 2026.	
4. Description Preparation Date:	
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	
7. Course administrator's name (mention all, if more than one name)	
Asst. Prof. Dr. Saif Sabah Irhayyim E-mail: <a href="mailto:saiof11@tu.edu.iq">saiof11@tu.edu.iq</a>	
8. Course Objectives	
<b>Course Objectives</b>	<p>By the end of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Classify materials into conventional and advanced categories.</li> <li>2. Distinguish between particle-reinforced and fiber-reinforced composites.</li> <li>3. Analyze the influence of fiber length, orientation, and concentration on mechanical properties.</li> <li>4. Understand the properties and applications of Polymer, Metal, and Ceramic matrix composites.</li> <li>5. Explain the processing techniques and the concept of nanocomposites.</li> </ol>
9. Teaching and Learning Strategies	
<b>Strategy</b>	<p>The strategy of this course is to provide students with a comprehensive understanding of composite materials through a progressive learning approach that combines fundamental concepts with advanced engineering applications. The course begins with basic materials science principles and gradually advances to the study of particle-reinforced, fiber-reinforced, polymer-matrix, metal-matrix, ceramic-matrix, and nanocomposite materials. Emphasis is placed on understanding the relationships between material structure, processing methods, and engineering performance. Teaching activities include lectures, case studies, problem-solving exercises, and discussions of real industrial applications. This strategy</p>

aims to develop students' analytical thinking, technical knowledge, and ability to select and evaluate composite materials for engineering design and manufacturing applications.

### 10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1			Historical Perspective of Materials, Conventional Materials (Metals, Ceramics, Polymers, Composites)		
Week 2			Introduction and Definition of Composite Material		
Week 3			Phases of Composites (The Fiber Phase and The Matrix Phase).		
Week 4			Classification of Composites Based on Matrix Phase (PMC, MMC, CMC).		
Week 5			Particle-Reinforced Composites (Particles as Reinforcement)		
Week 6			Fiber-Reinforced Composites (Influence of Fiber Geometry).		
Week 7			Fiber-Reinforced Composites (Influence of Fiber Orientation and Concentration).		
Week 8			Midterm		
Week 9			Metal-Matrix Composites (MMCs)		
Week 10			Polymer-Matrix Composites (PMCs)		
Week 11			Ceramic-Matrix Composites (CMCs)		
Week 12			Specialized Composites (Carbon-Carbon		

			Composites) and (Hybrid Composites).		
<b>Week 13</b>			Structural Composites (Laminar Composites (Laminates) and Sandwich Panels (Honeycomb, Foams).		
<b>Week 14</b>			Processing of Fiber-Reinforced Composites (Pultrusion, Filament Winding, and Prepreg Production Process).		
<b>Week 15</b>			Nanocomposites		
<b>Week 16</b>			Final Exam		

### 13. Course Evaluation

The evaluation of this course is designed to assess students' understanding of the principles of composite materials, their ability to apply engineering concepts, and their analytical problem-solving skills. Assessment methods include quizzes, assignments, classroom participation, midterm examinations, practical problem-solving exercises, and a final examination or project presentation. Students are evaluated on their knowledge of composite material classifications, reinforcement mechanisms, processing techniques, material selection, and engineering applications. Continuous assessment is employed throughout the semester to monitor learning progress and ensure the achievement of the intended learning outcomes.

### Learning and Teaching Resources

<b>Text Book</b>	Callister, W.D., and Rethwisch, D.G. (2020). "Materials Science and Engineering: An Introduction," 10th Edition, Wiley.
<b>Main Reference source</b>	Hull, D., and Clyne, T.W. (2019). "An Introduction to Composite Materials," 3rd Edition, Cambridge University Press.
<b>Recommended Books</b>	Ashby, M.F. (2017). "Materials Selection in Mechanical Design," 5th Edition, Butterworth-Heinemann.
<b>Electronics References Websites</b>	

# CALCULUS I (MATH 1)

## Course Description Calculus1

1. Course Name: Calculus 1					
2. Course Code: ENg101					
3. Semester / Year: 2025-2026- First Semester					
4. Description Preparation Date: 01/06/2023					
5. Available Attendance Forms: in-person attendance.					
6. Number of Credit Hours (Total) / Number of Units (Total)					
150/6					
7. Course administrator's name (mention all, if more than one name)					
Name: Thamir K. Ibrahim, Hamza R. Yaseen Email: <a href="mailto:thamirmathcad@tu.edu.iq">thamirmathcad@tu.edu.iq</a> , e-mail hamza.r.yaseen94@tu.edu.iq					
8. Course Objectives					
<b>Course Objectives</b>			Developing students' ability in the general mathematics principles and applications.		
9. Teaching and Learning Strategies					
<b>Strategy</b>		The learning and teaching <b>strategy</b> is designed to: We designed teaching strategies to support students' development of mathematical knowledge and problem-solving as well as communication and teamwork skills. We used an action research perspective, as various methods within this stance can ensure flexibility in responding to the dynamics of interaction between the teachers and the students.			
10. Course Structure					
<b>Wee</b>	<b>Hour</b>	<b>Required Learning</b>	<b>Unit / Topic Title</b>	<b>Learning</b>	<b>Assessment</b>

<b>k</b>	<b>s</b>	<b>Outcomes</b>		<b>Method</b>	<b>Method</b>
Week 1	٦	The student will be able to understand vectors in space and perform dot and cross product operations.	Vectors in Space, Dot Product, and Cross Product	Theoretical lecture + solved examples	Short quiz / homework
Week 2	٦	The student will be able to determine equations of lines and planes in three-dimensional space.	Equations of Lines and Planes in Space	Lecture + problem-solving activities	Homework
Week 3	٦	The student will be able to identify functions of two or more variables and calculate partial derivatives using suitable rules.	Functions of Two or More Variables, Partial Derivatives, and Chain Rule	Interactive lecture + classroom exercises	Short quiz
Week 4	٦	The student will be able to calculate partial derivatives while correctly identifying constant variables.	Partial Derivatives with Constant Variables	Explanation + solved examples	Homework / class activity
Week 5	٦	The student will be able to apply gradient and directional derivatives to determine the rate of change in a given direction.	Gradient and Directional Derivatives	Lecture + applied problems	Short quiz
Week 6	٦	The student will be able to find tangent planes and normal lines for surfaces.	Tangent Plane and Normal Lines	Theoretical lecture + engineering applications	Homework
Week 7	٦	The student will be able to use partial derivatives to determine maximum points, minimum points, and saddle points.	Applications of Partial Derivatives: Maximum, Minimum, and Saddle Point	Lecture + step-by-step problem solving	Midterm exam / written test
Week 8	٦	The student will be able to understand multiple integrals and evaluate double integrals.	Multiple Integrals: Double Integral	Lecture + solved examples	Homework
Week 9	٦	The student will be able to evaluate double integrals using polar coordinates.	Double Integral in Polar Coordinates	Explanation + sketching regions of integration	Short quiz
Week 10	٦	The student will be able to transform Cartesian integrals into polar integrals and determine the new limits of integration.	Changing Cartesian Integrals into Polar Integrals	Lecture + graphical applications	Homework / class activity
Week 11	٦	The student will be able to evaluate triple integrals in rectangular, cylindrical, and spherical coordinates.	Triple Integral: Rectangular, Cylindrical, and Spherical Coordinates	Theoretical lecture + geometric applications	Short quiz / homework
Week	٦	The student will be able to	Complex Numbers:	Lecture +	Short

12		recognize complex numbers and perform addition and subtraction operations.	Addition and Subtraction	numerical examples	homework
Week 13	٦	The student will be able to perform multiplication and division of complex numbers.	Complex Numbers: Multiplication and Division	Explanation + problem solving	Short quiz
Week 14	٦	The student will be able to represent complex numbers in polar form and convert between algebraic and polar forms.	Polar Representation of Complex Numbers	Lecture + applications	Homework
Week 15	٦	The student will be able to calculate roots of complex numbers using polar representation.	Roots of Complex Numbers	Lecture + applied problems	Class assessment / homework
Week 16	٣	The student's ability to apply the mathematical concepts studied throughout the semester will be evaluated.	Final Examination	General revision + final exam	Final exam

• **Course Evaluation**

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

**Learning and Teaching Resources**

<b>Text Book</b>	"Calculus" by George B. Thomas, Jr. publishing company, 2010 "Engineering Mathematics" by K. A. Stroud, Dexter J. Booth, 5th edition, Industrial press Inc., New York, 2001.
<b>Main Reference source</b>	Calculus" by George B. Thomas, Jr. publishing company, 2010 "Engineering Mathematics" by K. A. Stroud, Dexter J. Booth, 5th edition, Industrial press Inc., New York, 2001.
<b>Recommended Books</b>	Advanced_Engineering_Mathematics_By_Erwin_Kreyszig_tenth_Edition, 2011 Higher Engineering Mathematics by JOHN, 2010
<b>Electronics References Websites</b>	

# ENGINEERING WORKSHOPS

## Course Description Engineering Workshops

Course Name: Engineering Workshops
Course Code: ENG-106
Semester / Year: 2025-2026 - First Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
100/4
7. Course administrator's name (mention all, if more than one name)
Name: Abd Fares Ali Email: abdfaris@tu.edu.iq
Theoretical and practical training in which the student is scientifically and technically established with the most necessary skills in the field of engineering technology.
The learning and teaching <b>strategy</b> is designed to: carefully cover in lectures the necessary fundamental material and analytical techniques, demonstrate concepts with appropriate practical examples, and allow students adequate time to practice techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	The student will be able to understand and apply concepts related to: Industrial safety workshop & Measurement and marking workshop.	Industrial safety workshop & Measurement and marking workshop	Practical workshop training	Homework / class activity
Week 2	4	The student will be able to understand and apply concepts	Filing workshop	Practical workshop training	Homework / class activity

		related to: Filing workshop.			
Week 3	4	The student will be able to understand and apply concepts related to: Filing workshop.	Filing workshop	Practical workshop training	Homework / class activity
Week 4	4	The student will be able to understand and apply concepts related to: Carpentry workshop.	Carpentry workshop	Practical workshop training	Short quiz / homework
Week 5	4	The student will be able to understand and apply concepts related to: Carpentry workshop.	Carpentry workshop	Practical workshop training	Homework / class activity
Week 6	4	The student will be able to understand and apply concepts related to: Welding workshop.	Welding workshop	Practical workshop training	Homework / class activity
Week 7	4	The student will be able to understand and apply concepts related to: Welding workshop.	Welding workshop	Practical workshop training	Homework / class activity
Week 8	4	The student will be able to understand and apply concepts related to: Plumbing workshop.	Plumbing workshop	Practical workshop training	Short quiz / homework
Week 9	4	The student will be able to understand and apply concepts related to: Plumbing workshop.	Plumbing workshop	Practical workshop training	Homework / class activity
Week 10	4	The student will be able to understand and apply concepts related to: Machining workshop.	Machining workshop	Practical workshop training	Homework / class activity
Week 11	4	The student will be able to understand and apply concepts related to: Machining workshop.	Machining workshop	Practical workshop training	Homework / class activity

Week 12	4	The student will be able to understand and apply concepts related to: Casting workshop.	Casting workshop	Practical workshop training	Short quiz / homework
Week 13	4	The student will be able to understand and apply concepts related to: Casting workshop.	Casting workshop	Practical workshop training	Homework / class activity
Week 14	4	The student will be able to understand and apply concepts related to: Electrical workshop.	Electrical workshop	Practical workshop training	Homework / class activity
Week 15	4	The student will be able to understand and apply concepts related to: Electrical workshop.	Electrical workshop	Practical workshop training	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Practical workshop training	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	عمليات تصنيع المعادن، عبد الخالق عبد حسن ومازن عبد الستار المفتي.
<b>Main Reference source</b>	عمليات تصنيع المعادن، عبد الخالق عبد حسن ومازن عبد الستار المفتي.
<b>Recommended Books</b>	مبادئ عمليات الإنتاج، الدكتور قحطان خلف الخزرجي والدكتور عادل محمود حسن.
<b>Electronics References Websites</b>	

# COMPUTER SCIENCE

## Course Description Computer Science

Course Name: Computer Science
Course Code: ENG-104
Semester / Year: 2025-2026 - First Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
75/3
7. Course administrator's name (mention all, if more than one name)
Name: Saad Sami Farhan Email: saadsami@tu.edu.iq
To provide students with a comprehensive understanding of the key concepts and principles of computer science, including history, data representation, computer components, algorithms, programming languages, operating systems, applications, internet and networking, and cybersecurity.
The learning and teaching <b>strategy</b> is designed to: use a range of learning and teaching strategies, including lectures to provide an overview of main concepts, labs for hands-on experience of programming, algorithms and data representation, and assignments/quizzes to apply knowledge to real-world problems and check understanding.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	3	The student will be able to understand and apply concepts related to: Introduction to computer: hardware and software components, computing, data and	Introduction to computer: hardware and software components, computing, data and information, IECT applications	Theoretical lecture + laboratory session	Homework / class activity

		information, IECT applications.			
Week 2	3	The student will be able to understand and apply concepts related to: Computer components: hardware parts, input/output units, memory types, CPU components, ports.	Computer components: hardware parts, input/output units, memory types, CPU components, ports	Theoretical lecture + laboratory session	Homework / class activity
Week 3	3	The student will be able to understand and apply concepts related to: Operating system and graphical user interface (GUI).	Operating system and graphical user interface (GUI)	Theoretical lecture + laboratory session	Homework / class activity
Week 4	3	The student will be able to understand and apply concepts related to: Microsoft Word.	Microsoft Word	Theoretical lecture + laboratory session	Short quiz / homework
Week 5	3	The student will be able to understand and apply concepts related to: Microsoft Word.	Microsoft Word	Theoretical lecture + laboratory session	Homework / class activity
Week 6	3	The student will be able to understand and apply concepts related to: Microsoft Word.	Microsoft Word	Theoretical lecture + laboratory session	Homework / class activity
Week 7	3	The student will be able to understand and apply concepts related to: Midterm.	Midterm	Theoretical lecture + laboratory session	Midterm exam / written test
Week 8	3	The student will be able to understand and apply concepts related to: Microsoft Excel.	Microsoft Excel	Theoretical lecture + laboratory session	Short quiz / homework
Week 9	3	The student will be able to understand and apply concepts related to: Microsoft Excel.	Microsoft Excel	Theoretical lecture + laboratory session	Homework / class activity
Week 10	3	The student will be able to understand	Microsoft Excel	Theoretical lecture +	Homework / class activity

		and apply concepts related to: Microsoft Excel.		laboratory session	
Week 11	3	The student will be able to understand and apply concepts related to: Microsoft PowerPoint.	Microsoft PowerPoint	Theoretical lecture + laboratory session	Homework / class activity
Week 12	3	The student will be able to understand and apply concepts related to: Microsoft PowerPoint.	Microsoft PowerPoint	Theoretical lecture + laboratory session	Short quiz / homework
Week 13	3	The student will be able to understand and apply concepts related to: Introduction to internet and web browsers.	Introduction to internet and web browsers	Theoretical lecture + laboratory session	Homework / class activity
Week 14	3	The student will be able to understand and apply concepts related to: Communications and Emails.	Communications and Emails	Theoretical lecture + laboratory session	Homework / class activity
Week 15	3	The student will be able to understand and apply concepts related to: Computer troubleshooting.	Computer troubleshooting	Theoretical lecture + laboratory session	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + laboratory session	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	الخضر علي "أساسيات الحاسوب"، 2016
<b>Main Reference source</b>	الخضر علي "أساسيات الحاسوب"، 2016
<b>Recommended Books</b>	-
<b>Electronics References Websites</b>	-

# ENGINEERING DRAWING

## Course Description Engineering Drawing

Course Name: Engineering Drawing
Course Code: ENG-101
Semester / Year: 2025-2026 - First Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
125/5
7. Course administrator's name (mention all, if more than one name)
Name: Hashim Shukur Hammood Email: hashimshukur@tu.edu.iq
Define and explain the uses of different drawing equipment; identify drawing equipment; layout drawing papers and prepare a title block; practically distinguish the types of dimensioning; carry out geometrical construction of different shapes; and carry out isometric and orthographic drawing of objects.
The learning and teaching <b>strategy</b> is designed to: carefully cover in lectures the necessary fundamental material and analytical techniques, demonstrate concepts with appropriate (and where possible practical) examples, and allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	6	The student will be able to understand and apply concepts related to: Introduction to engineering drawing.	Introduction to engineering drawing	Theoretical lecture + drawing practice	Homework / class activity
Week 2	6	The student will be able to understand	Primary elements of drawings	Theoretical lecture +	Homework / class activity

		and apply concepts related to: Primary elements of drawings.		drawing practice	
Week 3	6	The student will be able to understand and apply concepts related to: Geometrical Construction.	Geometrical Construction	Theoretical lecture + drawing practice	Homework / class activity
Week 4	6	The student will be able to understand and apply concepts related to: Tangency.	Tangency	Theoretical lecture + drawing practice	Short quiz / homework
Week 5	6	The student will be able to understand and apply concepts related to: Loci applications.	Loci applications	Theoretical lecture + drawing practice	Homework / class activity
Week 6	6	The student will be able to understand and apply concepts related to: Tangency and loci applications.	Tangency and loci applications	Theoretical lecture + drawing practice	Homework / class activity
Week 7	6	The student will be able to understand and apply concepts related to: Dimensioning.	Dimensioning	Theoretical lecture + drawing practice	Homework / class activity
Week 8	6	The student will be able to understand and apply concepts related to: Theory of Projection.	Theory of Projection	Theoretical lecture + drawing practice	Short quiz / homework
Week 9	6	The student will be able to understand and apply concepts related to: Orthographic Projections.	Orthographic Projections	Theoretical lecture + drawing practice	Homework / class activity
Week 10	6	The student will be able to understand and apply concepts related to: Orthographic Projections.	Orthographic Projections	Theoretical lecture + drawing practice	Homework / class activity
Week 11	6	The student will be able to understand and apply concepts	Sections and Sectional views	Theoretical lecture + drawing	Homework / class activity

		related to: Sections and Sectional views.		practice	
Week 12	6	The student will be able to understand and apply concepts related to: Sections and Sectional views.	Sections and Sectional views	Theoretical lecture + drawing practice	Short quiz / homework
Week 13	6	The student will be able to understand and apply concepts related to: Isometric Projections.	Isometric Projections	Theoretical lecture + drawing practice	Homework / class activity
Week 14	6	The student will be able to understand and apply concepts related to: Isometric Projections.	Isometric Projections	Theoretical lecture + drawing practice	Homework / class activity
Week 15	6	The student will be able to understand and apply concepts related to: Isometric Projections.	Isometric Projections	Theoretical lecture + drawing practice	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + drawing practice	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	Engineering Drawing, Abdul-Rassul Abdul-Hussain, University of Technology, 1986.
<b>Main Reference source</b>	Engineering Drawing, Abdul-Rassul Abdul-Hussain, University of Technology, 1986.
<b>Recommended Books</b>	Simmons, C., Maguire, D., Phelps, N., 2021. Manual of Engineering Drawing,

	4th ed, Elsevier; Reddy, K., 2008. Textbook of Engineering Drawing, 2nd ed; Shah, M.B., Rana, B.C., 2007. Engineering Drawing, 2nd ed.
<b>Electronics References Websites</b>	

# PHYSICS I

## Course Description Physics I

Course Name: Physics I
Course Code: ENG-105
Semester / Year: 2025-2026 - First Semester
Description Preparation Date: 10/9/2025
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
125/5
7. Course administrator's name (mention all, if more than one name)
Name: Ali Khalid M. Ali Email: eng_ali_khalid@tu.edu.iq
To provide definitions for principles of physics in mechanics such as scalars and vectors, force, moment, couple and resultant with necessary vector algebra; to explain equilibrium of particles and rigid bodies in plane and 3D space; to give information about support types; to explain equilibrium of structures and internal forces in trusses and frames; and to give information about distributed loads.
The learning and teaching <b>strategy</b> is designed to: carefully cover in lectures the necessary fundamental material and analytical techniques, demonstrate concepts with appropriate (and where possible practical) examples, and allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	The student will be able to understand and apply concepts related to: General principles, principles of physics.	General principles, principles of physics	Theoretical lecture + tutorial problems	Homework / class activity
Week	4	The student will be	Scalar and vectors	Theoretical	Homework /

2		able to understand and apply concepts related to: Scalar and vectors.		lecture + tutorial problems	class activity
Week 3	4	The student will be able to understand and apply concepts related to: Newton's Law.	Newton's Law	Theoretical lecture + tutorial problems	Homework / class activity
Week 4	4	The student will be able to understand and apply concepts related to: Law of gravitation.	Law of gravitation	Theoretical lecture + tutorial problems	Short quiz / homework
Week 5	4	The student will be able to understand and apply concepts related to: Planar forces.	Planar forces	Theoretical lecture + tutorial problems	Homework / class activity
Week 6	4	The student will be able to understand and apply concepts related to: Planar forces.	Planar forces	Theoretical lecture + tutorial problems	Homework / class activity
Week 7	4	The student will be able to understand and apply concepts related to: Resultant of a force system.	Resultant of a force system	Theoretical lecture + tutorial problems	Homework / class activity
Week 8	4	The student will be able to understand and apply concepts related to: Resultant of a force system.	Resultant of a force system	Theoretical lecture + tutorial problems	Short quiz / homework
Week 9	3	The student will be able to understand and apply concepts related to: Midterm exam.	Midterm exam	Theoretical lecture + tutorial problems	Midterm exam / written test
Week 10	4	The student will be able to understand and apply concepts related to: The free body diagram, definition of moment, moment of a couple.	The free body diagram, definition of moment, moment of a couple	Theoretical lecture + tutorial problems	Homework / class activity
Week 11	4	The student will be able to understand	The free body diagram, definition of	Theoretical lecture +	Homework / class activity

		and apply concepts related to: The free body diagram, definition of moment, moment of a couple.	moment, moment of a couple	tutorial problems	
Week 12	4	The student will be able to understand and apply concepts related to: Equilibrium in 2-D, free body diagrams, equations of equilibrium.	Equilibrium in 2-D, free body diagrams, equations of equilibrium	Theoretical lecture + tutorial problems	Short quiz / homework
Week 13	4	The student will be able to understand and apply concepts related to: Equilibrium in 3-D, free body diagrams, equations of equilibrium.	Equilibrium in 3-D, free body diagrams, equations of equilibrium	Theoretical lecture + tutorial problems	Homework / class activity
Week 14	4	The student will be able to understand and apply concepts related to: Structures: Trusses and frames.	Structures: Trusses and frames	Theoretical lecture + tutorial problems	Homework / class activity
Week 15	4	The student will be able to understand and apply concepts related to: Structures: Trusses and frames.	Structures: Trusses and frames	Theoretical lecture + tutorial problems	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + tutorial problems	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	Engineering Mechanics-Statics, Hibbeler, R.C. 14th edition, Pearson
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	Prentice Hall, 2016, ISBN 978-0-13-31892-2.
<b>Main Reference source</b>	Engineering Mechanics-Statics, Hibbeler, R.C. 14th edition, Pearson Prentice Hall, 2016.
<b>Recommended Books</b>	Engineering Mechanics-Statics, J.L. Meriam, L.G. Kraige, Wiley, 8th Edition, 2016, ISBN: 978-1-119-04467-3.
<b>Electronics References Websites</b>	N/A

# DEMOCRACY AND HUMAN RIGHTS

## Course Description Democracy and Human Rights

Course Name: Democracy and Human Rights
Course Code: ENG-108
Semester / Year: 2025-2026 - First Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
50/3
7. Course administrator's name (mention all, if more than one name)
Name: Kumait Saeed Awad (Peer Reviewer) Email: kumait.s.awad@tu.edu.iq
To develop the ability to understand the basic concepts of human, child and democracy rights; to understand the historical origins of these concepts and their positives and negatives; to introduce human, child and democracy rights in Islam; to identify sources and characteristics of human rights and democracy; to understand the impact of technological development on these rights; and to introduce related concepts such as globalization, civil society institutions, elections, good governance, and crimes against humanity.
The learning and teaching <b>strategy</b> is designed to: provide the student with complete information covering the syllabus prepared for the subject, achieving the basic goal of making the student aware of the basic concepts of human rights and democracy, and reviewing the sources, guarantees and international covenants related to these terms.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	2	The student will be able to understand and apply concepts related to: Historical roots of human rights and democracy in ancient civilizations.	Historical roots of human rights and democracy in ancient civilizations	Theoretical lecture + discussion	Homework / class activity

Week 2	2	The student will be able to understand and apply concepts related to: Human, child and democracy rights in Islam.	Human, child and democracy rights in Islam	Theoretical lecture + discussion	Homework / class activity
Week 3	2	The student will be able to understand and apply concepts related to: Sources of human rights at the international level; characteristics of democracy.	Sources of human rights at the international level; characteristics of democracy	Theoretical lecture + discussion	Homework / class activity
Week 4	2	The student will be able to understand and apply concepts related to: Sources of human rights at the local level; advantages of democracy.	Sources of human rights at the local level; advantages of democracy	Theoretical lecture + discussion	Short quiz / homework
Week 5	2	The student will be able to understand and apply concepts related to: Guarantees of human rights at the local level; components of democracy.	Guarantees of human rights at the local level; components of democracy	Theoretical lecture + discussion	Homework / class activity
Week 6	2	The student will be able to understand and apply concepts related to: Guarantees of human rights at the international level; guarantees of the democratic system.	Guarantees of human rights at the international level; guarantees of the democratic system	Theoretical lecture + discussion	Homework / class activity
Week 7	2	The student will be able to understand and apply concepts related to: Human Rights Council; elections and their importance.	Human Rights Council; elections and their importance	Theoretical lecture + discussion	Homework / class activity
Week 8	3	The student will be able to understand and apply concepts related to: Midterm	Midterm exam	Theoretical lecture + discussion	Midterm exam / written test

		exam.			
Week 9	2	The student will be able to understand and apply concepts related to: Technological development and its impact on human, child and democracy rights.	Technological development and its impact on human, child and democracy rights	Theoretical lecture + discussion	Homework / class activity
Week 10	2	The student will be able to understand and apply concepts related to: Concept of globalization; civil society institutions.	Concept of globalization; civil society institutions	Theoretical lecture + discussion	Homework / class activity
Week 11	2	The student will be able to understand and apply concepts related to: Good governance (principles, standards); referendum.	Good governance (principles, standards); referendum	Theoretical lecture + discussion	Homework / class activity
Week 12	2	The student will be able to understand and apply concepts related to: The constitution and its types.	The constitution and its types	Theoretical lecture + discussion	Short quiz / homework
Week 13	2	The student will be able to understand and apply concepts related to: Child rights in international charters and covenants.	Child rights in international charters and covenants	Theoretical lecture + discussion	Homework / class activity
Week 14	2	The student will be able to understand and apply concepts related to: Crimes against humanity (genocide) and their impact on human, child and democratic rights.	Crimes against humanity (genocide) and their impact on human, child and democratic rights	Theoretical lecture + discussion	Homework / class activity
Week 15	2	The student will be able to understand and apply concepts related to:	Contemporary democracy and human/child rights;	Theoretical lecture + discussion	Homework / class activity

		Contemporary democracy and human/child rights; case studies.	case studies		
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + discussion	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	كتاب حقوق الانسان والديمقراطية، من تأليف مجموعة من الأساتذة، 2009
<b>Main Reference source</b>	كتاب حقوق الانسان والديمقراطية، 2009
<b>Recommended Books</b>	الديمقراطية، تشارلز تيللي، ترجمة محمد فاضل طباح، 2010; حقوق الانسان الاساسية، مبارك علوي محمد، 2019
<b>Electronics References Websites</b>	N/A

# BASICS OF ELECTRICITY

## Course Description Basics of Electricity

Course Name: Basics of Electricity
Course Code: MECH-104
Semester / Year: 2025-2026 - First Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
100/4
7. Course administrator's name (mention all, if more than one name)
Name: Ahmed Hefdhi Mohsin Email: Ahmed.h.mohsin@tu.edu.iq
Theoretical and practical study to develop problem solving skills and understanding of circuit theory through the application of techniques: to understand voltage, current and power; the basic concepts of electrical circuits; Kirchhoff's current and voltage laws for DC and AC circuits; and Mesh, Nodal analysis, superposition, Thevenin, Norton and maximum power transfer theorems for DC and AC circuits.
The learning and teaching <b>strategy</b> is designed to: encourage students' participation in exercises while refining and expanding their critical thinking skills, achieved through classes, interactive tutorials, and simple experiments involving sampling activities that are interesting to the students.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	5	The student will be able to understand and apply concepts related to: Current, Voltage, Ohm's Law, Power and Energy Concepts.	Current, Voltage, Ohm's Law, Power and Energy Concepts	Theoretical lecture + laboratory experiment	Homework / class activity

Week 2	5	The student will be able to understand and apply concepts related to: DC Series, Parallel Circuits and DC Series – Parallel networks.	DC Series, Parallel Circuits and DC Series – Parallel networks	Theoretical lecture + laboratory experiment	Homework / class activity
Week 3	5	The student will be able to understand and apply concepts related to: DC Bridge networks, Star –Delta conversions.	DC Bridge networks, Star –Delta conversions	Theoretical lecture + laboratory experiment	Homework / class activity
Week 4	5	The student will be able to understand and apply concepts related to: Methods of DC Analysis – Mesh.	Methods of DC Analysis – Mesh	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 5	5	The student will be able to understand and apply concepts related to: Methods of DC Analysis – Nodal.	Methods of DC Analysis – Nodal	Theoretical lecture + laboratory experiment	Homework / class activity
Week 6	5	The student will be able to understand and apply concepts related to: DC Network Theorem - Superposition.	DC Network Theorem - Superposition	Theoretical lecture + laboratory experiment	Homework / class activity
Week 7	5	The student will be able to understand and apply concepts related to: DC Thevenin Theorem.	DC Thevenin Theorem	Theoretical lecture + laboratory experiment	Homework / class activity
Week 8	3	The student will be able to understand and apply concepts related to: Midterm exam, DC Norton Theorem and Maximum Power Transfer Theorem.	Midterm exam, DC Norton Theorem and Maximum Power Transfer Theorem	Theoretical lecture + laboratory experiment	Midterm exam / written test
Week 9	5	The student will be able to understand and apply concepts related to: The Basic Elements of AC Circuits and Sinusoidal Alternating	The Basic Elements of AC Circuits and Sinusoidal Alternating Waveforms	Theoretical lecture + laboratory experiment	Homework / class activity

		Waveforms.			
Week 10	5	The student will be able to understand and apply concepts related to: AC Series, Parallel Circuits and AC Series – Parallel networks.	AC Series, Parallel Circuits and AC Series – Parallel networks	Theoretical lecture + laboratory experiment	Homework / class activity
Week 11	5	The student will be able to understand and apply concepts related to: AC Bridge networks, Star –Delta conversions.	AC Bridge networks, Star –Delta conversions	Theoretical lecture + laboratory experiment	Homework / class activity
Week 12	5	The student will be able to understand and apply concepts related to: Methods of AC Analysis – Mesh.	Methods of AC Analysis – Mesh	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 13	5	The student will be able to understand and apply concepts related to: Methods of AC Analysis – Nodal.	Methods of AC Analysis – Nodal	Theoretical lecture + laboratory experiment	Homework / class activity
Week 14	5	The student will be able to understand and apply concepts related to: AC Network Theorem - Superposition.	AC Network Theorem - Superposition	Theoretical lecture + laboratory experiment	Homework / class activity
Week 15	5	The student will be able to understand and apply concepts related to: AC Thevenin Theorem, Norton Theorem and Maximum Power Transfer Theorem.	AC Thevenin Theorem, Norton Theorem and Maximum Power Transfer Theorem	Theoretical lecture + laboratory experiment	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + laboratory experiment	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and

individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

<b>Learning and Teaching Resources</b>	
<b>Text Book</b>	Introductory Circuit Analysis, Robert L. Boylestad, Pearson Publishing Company, 12th Edition, 2022.
<b>Main Reference source</b>	Introductory Circuit Analysis, Robert L. Boylestad, Pearson Publishing Company, 12th Edition, 2022.
<b>Recommended Books</b>	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education.
<b>Electronics References Websites</b>	

# ARABIC LANGUAGE 1

## Course Description Arabic Language 1

Course Name: Arabic Language 1
Course Code: ENG-113
Semester / Year: 2025-2026 - First Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
50/2
7. Course administrator's name (mention all, if more than one name)
Name: Wasna Younis Abdullah Email: Wasna.y.abdullah@tu.edu.iq
To develop language skills and memorize some Quranic verses while strengthening students' love of the language; to understand how to apply grammatical rules in daily life and learn linguistic terms in the fields of engineering and science; to recognize the importance of Arabic in daily life; to use grammatical rules correctly when writing reports and scientific research; and to enhance self-learning and independence in learning.
The learning and teaching <b>strategy</b> is designed to: based on reorganizing and adapting information in a way that enables access to new information, making the student active and positive, with the teacher's role as guide, mentor and planner, enabling knowledge to be discovered smoothly by students.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	2	The student will be able to understand and apply concepts related to: Surat Al-Doha.	Surat Al-Doha	Theoretical lecture + recitation practice	Homework / class activity
Week 2	2	The student will be able to understand	The story of Dhul-Qarnayn	Theoretical lecture +	Homework / class activity

		and apply concepts related to: The story of Dhul-Qarnayn.		recitation practice	
Week 3	2	The student will be able to understand and apply concepts related to: The story of Prophet Musa with Al-Khidr.	The story of Prophet Musa with Al-Khidr	Theoretical lecture + recitation practice	Homework / class activity
Week 4	2	The student will be able to understand and apply concepts related to: Mu'allaqat Amr ibn Kulthum.	Mu'allaqat Amr ibn Kulthum	Theoretical lecture + recitation practice	Short quiz / homework
Week 5	2	The student will be able to understand and apply concepts related to: Al-Mutanabbi's poem Sha'b Bawwan.	Al-Mutanabbi's poem Sha'b Bawwan	Theoretical lecture + recitation practice	Homework / class activity
Week 6	2	The student will be able to understand and apply concepts related to: Mohammed Mahdi Al-Jawahiri's poem Ya Dijlat Al-Khair.	Mohammed Mahdi Al-Jawahiri's poem Ya Dijlat Al-Khair	Theoretical lecture + recitation practice	Homework / class activity
Week 7	2	The student will be able to understand and apply concepts related to: Hamzat Al-Qat' and Hamzat Al-Wasl.	Hamzat Al-Qat' and Hamzat Al-Wasl	Theoretical lecture + recitation practice	Homework / class activity
Week 8	3	The student will be able to understand and apply concepts related to: Midterm exam.	Midterm exam	Theoretical lecture + recitation practice	Midterm exam / written test
Week 9	2	The student will be able to understand and apply concepts related to: Medial and final Hamza.	Medial and final Hamza	Theoretical lecture + recitation practice	Homework / class activity
Week 10	2	The student will be able to understand and apply concepts related to: Punctuation marks.	Punctuation marks	Theoretical lecture + recitation practice	Homework / class activity

Week 11	2	The student will be able to understand and apply concepts related to: Writing the letters Dhad and Za.	Writing the letters Dhad and Za	Theoretical lecture + recitation practice	Homework / class activity
Week 12	2	The student will be able to understand and apply concepts related to: The sound verb.	The sound verb	Theoretical lecture + recitation practice	Short quiz / homework
Week 13	2	The student will be able to understand and apply concepts related to: The defective verb.	The defective verb	Theoretical lecture + recitation practice	Homework / class activity
Week 14	2	The student will be able to understand and apply concepts related to: The active participle (Ism al-Fa'il).	The active participle (Ism al-Fa'il)	Theoretical lecture + recitation practice	Homework / class activity
Week 15	2	The student will be able to understand and apply concepts related to: The passive participle (Ism al-Maf'ul).	The passive participle (Ism al-Maf'ul)	Theoretical lecture + recitation practice	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + recitation practice	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	اللغة العربية لأقسام غير الاختصاص
<b>Main Reference source</b>	اللغة العربية لأقسام غير الاختصاص
<b>Recommended Books</b>	التفسير الوسيط، أ.د. وهبة الزحيلي؛ المنهاج في

	القواعد والإعراب، محمد الأنطاكي
<b>Electronics References Websites</b>	N/A

# CALCULUS II (MATH 2)

## Course Description Calculus 2

1. Course Name: Calculus 2					
2. Course Code: ENg102					
3. Semester / Year: 2025- 2026- Second Semester					
4. Description Preparation Date: 01/06/2023					
5. Available Attendance Forms: in-person attendance.					
6. Number of Credit Hours (Total) / Number of Units (Total)					
150/6					
7. Course administrator's name (mention all, if more than one name)					
Name: Thamir K. Ibrahim , Hamza R. Yaseen Email: <a href="mailto:thamirmathcad@tu.edu.iq">thamirmathcad@tu.edu.iq</a> , e-mail hamza.r.yaseen94@tu.edu.iq					
8. Course Objectives					
<b>Course Objectives</b>			Developing students' ability in the general mathematics principles and applications.		
9. Teaching and Learning Strategies					
<b>Strategy</b>		The learning and teaching <b>strategy</b> is designed to: We designed teaching strategies to support students' development of mathematical knowledge and problem-solving as well as communication and teamwork skills. We used an action research perspective, as various methods within this stance can ensure flexibility in responding to the dynamics of interaction between the teachers and the students.			
10. Course Structure					
Wee k	Hour s	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Wee	1	The student will be able to	Vectors in Space,	Theoretical	Short quiz /

k 1		understand and represent vectors in space and perform basic vector operations.	Dot Product, and Cross Product	lecture + solved examples	homework
Week 2	7	The student will be able to determine equations of lines and planes in three-dimensional space.	Equations of Lines and Planes in Space	Theoretical lecture + problem solving	Homework
Week 3	7	The student will be able to identify functions of two or more variables and calculate their partial derivatives using suitable rules.	Functions of Two or More Variables, Partial Derivatives, and Chain Rule	Interactive lecture + classroom exercises	Short quiz
Week 4	7	The student will be able to calculate partial derivatives while correctly identifying constant variables.	Partial Derivatives with Constant Variables	Explanation + solved applications	Homework / class activity
Week 5	7	The student will be able to apply the concepts of gradient and directional derivatives to determine the rate of change in a given direction.	Gradient and Directional Derivatives	Lecture + applied problems	Short quiz
Week 6	7	The student will be able to find the equation of the tangent plane and normal line to surfaces.	Tangent Plane and Normal Lines	Theoretical lecture + engineering applications	Homework
Week 7	7	The student will be able to use partial derivatives to determine maximum points, minimum points, and saddle points.	Applications of Partial Derivatives: Maximum, Minimum, and Saddle Points	Lecture + step-by-step problem solving	Midterm exam / written test
Week 8	7	The student will be able to understand the concept of multiple integrals and evaluate double integrals.	Multiple Integrals: Double Integral	Lecture + solved examples	Homework
Week 9	7	The student will be able to evaluate double integrals using polar coordinates.	Double Integral in Polar Coordinates	Explanation + sketching regions of integration	Short quiz
Week 10	7	The student will be able to convert integrals from Cartesian coordinates to polar coordinates and determine the new limits of integration.	Changing Cartesian Integrals into Polar Integrals	Lecture + exercises with graphical representation	Homework / class activity
Week 11	7	The student will be able to evaluate triple integrals in rectangular, cylindrical, and spherical coordinates.	Triple Integral: Rectangular, Cylindrical, and Spherical Coordinates	Theoretical lecture + geometric applications	Short quiz / homework

Week 12	7	The student will be able to recognize complex numbers and perform addition and subtraction operations.	Complex Numbers: Addition and Subtraction	Lecture + numerical examples	Short homework
Week 13	7	The student will be able to perform multiplication and division of complex numbers.	Complex Numbers: Multiplication and Division	Explanation + problem solving	Short quiz
Week 14	7	The student will be able to represent complex numbers in polar form and convert between algebraic and polar forms.	Polar Representation of Complex Numbers	Lecture + applications	Homework
Week 15	7	The student will be able to calculate roots of complex numbers using polar representation.	Roots of Complex Numbers	Lecture + applied problems	Class assessment / homework
Week 16	7	The student's ability to apply the mathematical concepts studied throughout the semester will be evaluated.	Final Examination	General revision + final exam	Final exam

• **Course Evaluation**

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

**Learning and Teaching Resources**

<b>Text Book</b>	"Calculus" by George B. Thomas, Jr. publishing company, 2010 "Engineering Mathematics" by K. A. Stroud, Dexter J. Booth, 5th edition, Industrial press Inc., New York, 2001.
<b>Main Reference source</b>	"Calculus" by George B. Thomas, Jr. publishing company, 2010 "Engineering Mathematics" by K. A. Stroud, Dexter J. Booth, 5th edition, Industrial press Inc., New York, 2001.
<b>Recommended Books</b>	Advanced_Engineering_Mathematics_By_Erwin_Kreyszig_tenth_Edition, 2011 Higher Engineering Mathematics by JOHN, 2010
<b>Electronics References Websites</b>	



# ENGLISH I

## Course Description English I

<b>Course Name</b>	English I
<b>Course Code</b>	ENG-107
<b>Semester / Year</b>	2025-2026 / First Semester (Year 1)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	50 / 2
<b>Course administrator's name</b>	Ahmed Subhi Abdulla Email: Ahmedsubhi1981@tu.edu.iq
<b>Course Aims</b>	Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines, or applying academic knowledge to self-life problems.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate examples. Students are allowed adequate time to practice the techniques using carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	2	Develop secondary research skills and present engineering topics.	Technical Presentation: Research Skills and Presentation Techniques	Lecture + guided practice	Seminar
Week 2	2	Apply technical presentation skills to engineering contexts.	Technical Presentation: Conducting a Short Presentation	Student presentations + feedback	Seminar
Week 3	2	Synthesize research results into a customised engineering solution.	Technical Discussions and Proposal Writing: Solution Development	Group discussion + lecture	Assignment
Week 4	2	Write proposals in recognized engineering format.	Technical Discussions and Proposal Writing: Blueprint Format	Guided writing + examples	Assignment
Week 5	2	Plan and conduct simulated technical team meetings.	Technical Discussions and Proposal Writing: Team Meeting Simulation	Role-play + discussion	Assignment

Week 6	2	Identify technical discussion skills through exploratory activities.	Conducting Technical Discussions: Exploring Discussion Skills	Video analysis + discussion	Assignment
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	2	Apply technical discussion skills in simulated engineering discussions.	Conducting Technical Discussions: Simulated Team Discussions	Role-play + feedback	Assignment
Week 9	2	Consolidate discussion skills for engineering project contexts.	Conducting Technical Discussions: Practice	Practice sessions	Quiz
Week 10	2	Produce a structured technical report using research findings.	A Technical Report: Structure and Content	Guided writing	Assignment
Week 11	2	Write a complete technical report for engineering contexts.	A Technical Report: Writing Practice	Writing workshop	Assignment
Week 12	2	Draft professional business email correspondence.	Writing Business Correspondence: Email Format	Lecture + writing practice	Assignment
Week 13	2	Produce professional business emails based on project outcomes.	Writing Business Correspondence: Practice	Guided writing + peer review	Assignment
Week 14	2	Review and consolidate all course skills.	Review and Consolidation	Review session	Homework
Week 15	2	Demonstrate integrated communication skills.	Review and Final Preparation	Group review + Q&A	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, assignments, and seminars to monitor progress and reinforce learning. The midterm exam (10%) measures comprehension of concepts covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Beer, D. & McMurrey, D. 2004, A Guide to Writing as an Engineer (2nd ed), New York: Wiley.	Yes
<b>Main Reference source</b>	Beer, D. & McMurrey, D. 2004, A Guide to Writing as an Engineer (2nd ed), New York: Wiley.	Yes
<b>Recommended Books</b>	Borowick, Jerome N., 2002, Technical Communication and its Applications (2nd ed), New Jersey: Prentice-Hall, Inc.	No
<b>Electronics References Websites</b>	<a href="http://umich.edu/~elements/5e/lectures/index.html">http://umich.edu/~elements/5e/lectures/index.html</a>	

# MECHANICAL DRAWING

## Course Description Mechanical Drawing

<b>Course Name</b>	Mechanical Drawing
<b>Course Code</b>	MECH-102
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 1)
<b>Description Preparation Date</b>	05/03/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Dr. Farouk M. Mahdi Email: Farouk_1959_1996@tu.edu.iq
<b>Course Aims</b>	Develop skills in reading and interpretation of mechanical drawings. Enable students to read and construct various methods of joining mechanical parts. Enable students to understand various types of fits and tolerances. Enable students to construct detailed and assembly drawings of mechanical parts and systems.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover in lectures the necessary fundamental material with practical class and homework beside a teamwork project. Actual mechanical equipment and systems are included in the course.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	6	Understand and draw riveted joints.	Riveted joints	Lecture + practical drawing	Onsite assignment
Week 2	6	Understand screw joints and threaded fasteners.	Screw joints (threaded fasteners)	Lecture + drawing exercises	Homework
Week 3	6	Understand and draw welded joints with symbols.	Welded joints	Lecture + practical drawing	Quiz
Week 4	6	Understand keyed joints and their applications.	Keyed joints	Lecture + examples	Onsite assignment
Week 5	6	Understand and apply surface finish symbols.	Surface finish	Lecture + examples	Homework
Week 6	6	Draw and represent mechanical springs.	Mechanical Springs	Lecture + drawing practice	Quiz
Week 7	3	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	6	Draw and represent spur gears correctly.	Spur gears	Lecture + drawing exercises	Onsite assignment

Week 9	6	Draw and represent worm and worm gear assemblies.	Worm and worm gear	Lecture + drawing practice	Homework
Week 10	6	Draw rack and pinion gear arrangements.	Rack and pinion	Lecture + drawing exercises	Quiz
Week 11	6	Understand fits and tolerances and apply them in drawings.	Fits and Tolerances	Lecture + applied examples	Onsite assignment
Week 12	6	Apply fits and tolerances in detailed drawings.	Fits and Tolerances (continued)	Lecture + project work	Project (Week 12)
Week 13	6	Produce assembly drawings of mechanical systems.	Assembly drawings	Lecture + drawing project	Onsite assignment
Week 14	6	Produce complete assembly drawings.	Assembly drawing (continued)	Drawing practice + supervision	Outsite assignment
Week 15	6	Produce disassembly drawings.	Disassembly drawing	Lecture + practice	Homework
Week 16	3	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

## Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Engineering Drawing and Graphic Technology, Thomas E. French, Charles J. Vierck, and Robert J. Foster, 1986.	Yes
<b>Main Reference source</b>	Engineering Drawing and Graphic Technology, Thomas E. French, Charles J. Vierck, and Robert J. Foster, 1986.	Yes
<b>Recommended Books</b>	Technical Drawing Part 201: Mechanical Engineering Drawing, Australian Standard, 1992. Engineering Drawing and CAD, School of Engineering, University of Plymouth.	No
<b>Electronics References Websites</b>	Engineering Drawing, M.B Shah B.C. Rana, India, second edition 2007. Geometric and Engineering Drawing, Kenneth Morling, Third edition 2010.	

# MANUFACTURING PROCESSES 1

## Course Description Manufacturing Processes 1

Course Name: Manufacturing Processes 1
Course Code: MECH-103
Semester / Year: 2025-2026 - Second Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
100/4
7. Course administrator's name (mention all, if more than one name)
Name: Abd Fares Ali Email: abdfaris@tu.edu.iq
To develop the student's knowledge and introduce him to the importance of engineering materials in industry; the physical and mechanical properties and important tests carried out on engineering materials such as the tensile test, shock resistance test and hardness test, in addition to methods of preparing and identifying metals for forming operations.
The learning and teaching <b>strategy</b> is designed to: carefully cover in lectures the necessary fundamental material and analytical techniques and demonstrate concepts with appropriate (and where possible practical) examples; allow students adequate time to practice the techniques using carefully selected tutorial problems, in addition to a set of experiments delivered to consolidate the theoretical concepts.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	3	The student will be able to understand and apply concepts related to: Production of Metallic Material.	Production of Metallic Material	Theoretical lecture + laboratory experiment	Homework / class activity
Week 2	3	The student will be able to understand and apply concepts related to: Production	Production of Metallic Material	Theoretical lecture + laboratory experiment	Homework / class activity

		of Metallic Material.			
Week 3	3	The student will be able to understand and apply concepts related to: Physical & Mechanical Properties of Metallic Material.	Physical & Mechanical Properties of Metallic Material	Theoretical lecture + laboratory experiment	Homework / class activity
Week 4	3	The student will be able to understand and apply concepts related to: Physical & Mechanical Properties of Metallic Material.	Physical & Mechanical Properties of Metallic Material	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 5	3	The student will be able to understand and apply concepts related to: Machining of Metals.	Machining of Metals	Theoretical lecture + laboratory experiment	Homework / class activity
Week 6	3	The student will be able to understand and apply concepts related to: Machining of Metals.	Machining of Metals	Theoretical lecture + laboratory experiment	Homework / class activity
Week 7	3	The student will be able to understand and apply concepts related to: Midterm exam.	Midterm exam	Theoretical lecture + laboratory experiment	Midterm exam / written test
Week 8	3	The student will be able to understand and apply concepts related to: Casting.	Casting	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 9	3	The student will be able to understand and apply concepts related to: Casting.	Casting	Theoretical lecture + laboratory experiment	Homework / class activity
Week 10	3	The student will be able to understand and apply concepts related to: Metal Forming.	Metal Forming	Theoretical lecture + laboratory experiment	Homework / class activity
Week 11	3	The student will be able to understand and apply concepts related to: Metal Forming.	Metal Forming	Theoretical lecture + laboratory experiment	Homework / class activity
Week	3	The student will be	Plastics	Theoretical	Short quiz /

12		able to understand and apply concepts related to: Plastics.		lecture + laboratory experiment	homework
Week 13	3	The student will be able to understand and apply concepts related to: Metal Connection.	Metal Connection	Theoretical lecture + laboratory experiment	Homework / class activity
Week 14	3	The student will be able to understand and apply concepts related to: Metal Connection.	Metal Connection	Theoretical lecture + laboratory experiment	Homework / class activity
Week 15	3	The student will be able to understand and apply concepts related to: Engineering Tolerances.	Engineering Tolerances	Theoretical lecture + laboratory experiment	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + laboratory experiment	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	Williams D Callister, "Material Science and Engineering", Wiley India Pvt Ltd, Revised Indian Edition, 2014.
<b>Main Reference source</b>	Williams D Callister, "Material Science and Engineering", Wiley India Pvt Ltd, Revised Indian Edition, 2014.
<b>Recommended Books</b>	U.C. Jindal: Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012; Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd., 2015.
<b>Electronics References Websites</b>	N/A



# THERMODYNAMICS

## Course Description Thermodynamics

Course Name: Thermodynamics
Course Code: MECH-101
Semester / Year: 2025-2026 - Second Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
100/4
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Raaid R. Jassim Email: raaidaldoury@tu.edu.iq
To cover the basic principles of thermodynamics; to present real-world engineering examples showing how thermodynamics is applied in engineering practice; and to develop an intuitive understanding of thermodynamics by emphasizing the physics and physical arguments.
The learning and teaching <b>strategy</b> is designed to: carefully cover in lectures the necessary fundamental material and analytical techniques, demonstrate concepts with appropriate (and where possible practical) examples, and allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	The student will be able to understand and apply concepts related to: Basic concepts related to thermodynamics, definitions of engineering thermodynamics and thermodynamics.	Basic concepts related to thermodynamics, definitions of engineering thermodynamics and thermodynamics	Theoretical lecture + laboratory experiment	Homework / class activity
Week 4	4	The student will be	Definition of	Theoretical	Homework /

2		able to understand and apply concepts related to: Definition of thermodynamic laws, thermodynamic systems.	thermodynamic laws, thermodynamic systems	lecture + laboratory experiment	class activity
Week 3	4	The student will be able to understand and apply concepts related to: Thermodynamic systems: closed/open system, control volume, isolated and adiabatic systems, properties, state, process, cycle.	Thermodynamic systems: closed/open system, control volume, isolated and adiabatic systems, properties, state, process, cycle	Theoretical lecture + laboratory experiment	Homework / class activity
Week 4	4	The student will be able to understand and apply concepts related to: Point and path functions, temperature, Zeroth law, pressure definitions, reversible/irreversible processes, work and heat.	Point and path functions, temperature, Zeroth law, pressure definitions, reversible/irreversible processes, work and heat	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 5	4	The student will be able to understand and apply concepts related to: Tutorial sheets.	Tutorial sheets	Theoretical lecture + laboratory experiment	Homework / class activity
Week 6	4	The student will be able to understand and apply concepts related to: First law of thermodynamics and its applications, corollaries, PMM1, the perfect gas, Boyle's and Charle's laws.	First law of thermodynamics and its applications, corollaries, PMM1, the perfect gas, Boyle's and Charle's laws	Theoretical lecture + laboratory experiment	Homework / class activity
Week 7	3	The student will be able to understand and apply concepts related to: Midterm exam.	Midterm exam	Theoretical lecture + laboratory experiment	Midterm exam / written test
Week 8	4	The student will be able to understand and apply concepts related to: Specific heats, Joule's law,	Specific heats, Joule's law, internal energy, enthalpy, forms of energy	Theoretical lecture + laboratory experiment	Short quiz / homework

		internal energy, enthalpy, forms of energy.			
Week 9	4	The student will be able to understand and apply concepts related to: Applications of first law to non-flow processes: isochoric, isobaric, isothermal, adiabatic and polytropic processes.	Applications of first law to non-flow processes: isochoric, isobaric, isothermal, adiabatic and polytropic processes	Theoretical lecture + laboratory experiment	Homework / class activity
Week 10	4	The student will be able to understand and apply concepts related to: Applications of first law to steady-flow processes: water/steam/gas turbines, centrifugal pump, compressors.	Applications of first law to steady-flow processes: water/steam/gas turbines, centrifugal pump, compressors	Theoretical lecture + laboratory experiment	Homework / class activity
Week 11	4	The student will be able to understand and apply concepts related to: Steam and two-phase systems, formation of steam, saturation temperature and pressure, triple point.	Steam and two-phase systems, formation of steam, saturation temperature and pressure, triple point	Theoretical lecture + laboratory experiment	Homework / class activity
Week 12	4	The student will be able to understand and apply concepts related to: Enthalpy and formation of steam at constant pressure, steam tables.	Enthalpy and formation of steam at constant pressure, steam tables	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 13	4	The student will be able to understand and apply concepts related to: Temperature-enthalpy diagram, volume of steam and water.	Temperature-enthalpy diagram, volume of steam and water	Theoretical lecture + laboratory experiment	Homework / class activity
Week 14	4	The student will be able to understand and apply concepts related to: Dryness fraction of wet steam,	Dryness fraction of wet steam, examples	Theoretical lecture + laboratory experiment	Homework / class activity

		examples.			
Week 15	4	The student will be able to understand and apply concepts related to: Summary of subject course.	Summary of subject course	Theoretical lecture + laboratory experiment	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + laboratory experiment	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	Cengel, Y., Thermodynamics: An Engineering Approach, 5th edition.
<b>Main Reference source</b>	Cengel, Y., Thermodynamics: An Engineering Approach, 5th edition.
<b>Recommended Books</b>	Michael J. Moran et al., "Fundamentals of Engineering Thermodynamics", 9th edition.
<b>Electronics References Websites</b>	-

# ENGINEERING MECHANICS STATICS

## Course Description Engineering Mechanics - Statics

Course Name: Engineering Mechanics - Statics
Course Code: ENG-102
Semester / Year: 2025-2026 - First Semester
Description Preparation Date: 10/9/2025
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
125/5
7. Course administrator's name (mention all, if more than one name)
Name: Ali Khalid M. Ali Email: eng_ali_khalid@tu.edu.iq
To provide definitions of distributed forces, beams, flexible cables and fluid statics; to give information about center of mass; to explain centroid of lines, area and volumes; to provide information on moment of inertia; to provide information on composite bodies and figures; to explain friction phenomena and its applications (wedge, screw and belts); and to give information about virtual work, potential energy and stability.
The learning and teaching <b>strategy</b> is designed to: carefully cover in lectures the necessary fundamental material and analytical techniques, demonstrate concepts with appropriate (and where possible practical) examples, and allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	The student will be able to understand and apply concepts related to: Distributed force systems.	Distributed force systems	Theoretical lecture + tutorial problems	Homework / class activity
Week 2	4	The student will be able to understand and apply concepts related to:	Concentrated equivalent force of cables and fluids	Theoretical lecture + tutorial problems	Homework / class activity

		Concentrated equivalent force of cables and fluids.			
Week 3	4	The student will be able to understand and apply concepts related to: Center of mass, gravity and volume.	Center of mass, gravity and volume	Theoretical lecture + tutorial problems	Homework / class activity
Week 4	4	The student will be able to understand and apply concepts related to: Centroids of lines, areas, and volumes.	Centroids of lines, areas, and volumes	Theoretical lecture + tutorial problems	Short quiz / homework
Week 5	4	The student will be able to understand and apply concepts related to: Centroids of lines, areas, and volumes.	Centroids of lines, areas, and volumes	Theoretical lecture + tutorial problems	Homework / class activity
Week 6	4	The student will be able to understand and apply concepts related to: Composite bodies and figures.	Composite bodies and figures	Theoretical lecture + tutorial problems	Homework / class activity
Week 7	4	The student will be able to understand and apply concepts related to: Moments of inertia.	Moments of inertia	Theoretical lecture + tutorial problems	Homework / class activity
Week 8	4	The student will be able to understand and apply concepts related to: Moments of inertia.	Moments of inertia	Theoretical lecture + tutorial problems	Short quiz / homework
Week 9	3	The student will be able to understand and apply concepts related to: Midterm exam.	Midterm exam	Theoretical lecture + tutorial problems	Midterm exam / written test
Week 10	4	The student will be able to understand and apply concepts related to: Friction (dry friction).	Friction (dry friction)	Theoretical lecture + tutorial problems	Homework / class activity
Week 11	4	The student will be able to understand and apply concepts related to: Wedges.	Wedges	Theoretical lecture + tutorial problems	Homework / class activity

Week 12	4	The student will be able to understand and apply concepts related to: Screws.	Screws	Theoretical lecture + tutorial problems	Short quiz / homework
Week 13	4	The student will be able to understand and apply concepts related to: Belts.	Belts	Theoretical lecture + tutorial problems	Homework / class activity
Week 14	4	The student will be able to understand and apply concepts related to: Virtual work.	Virtual work	Theoretical lecture + tutorial problems	Homework / class activity
Week 15	4	The student will be able to understand and apply concepts related to: Potential energy and stability.	Potential energy and stability	Theoretical lecture + tutorial problems	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + tutorial problems	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	Engineering Mechanics-Statics, Hibbeler, R.C. 14th edition, Pearson Prentice Hall, 2016, ISBN 978-0-13-31892-2.
<b>Main Reference source</b>	Engineering Mechanics-Statics, Hibbeler, R.C. 14th edition, Pearson Prentice Hall, 2016.
<b>Recommended Books</b>	Engineering Mechanics-Statics, J.L. Meriam, L.G. Kraige, Wiley, 8th Edition, 2016, ISBN: 978-1-119-04467-3.
<b>Electronics References Websites</b>	N/A

# ENGINEERING ANALYSIS

## Course Description Engineering Analysis

<b>Course Name</b>	Engineering Analysis
<b>Course Code</b>	MATH-201
<b>Semester / Year</b>	2025-2026 / First Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Dr. Manar Salih Mahdi Email: m.aljethelah@tu.edu.iq Tutor: Israa Sami Farhan Email: israa.s.farhan@tu.edu.iq
<b>Course Aims</b>	Develop students' mathematical knowledge with a comprehensive understanding of the mathematics used in mechanical engineering and develop the necessary skills for its use. This module aims to equip students with the knowledge and skill to analyse a variety of engineering systems through a combination of practical mechanical engineering applications and theoretical knowledge.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to introduce engineering analysis through theory with work examples carried out by the students, delivered through lectures including question-and-answer sessions, problem-solving, tutorial classes, and project methods.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	5	Solve first-order ordinary differential equations using separable, linear, and exact methods.	First Order ODEs: Separable, Linear, and Exact Equations	Lecture + solved examples	Homework
Week 2	5	Solve homogeneous and non-homogeneous second-order ODEs.	Second Order ODEs: Homogeneous and Non-Homogeneous	Lecture + problem solving	Quiz (Week 2)
Week 3	5	Solve higher-order homogeneous equations and Euler-Cauchy equations.	Higher Order Homogeneous Equations; Euler-Cauchy DEs	Interactive lecture + exercises	Onsite assignment (Week 4)
Week 4	5	Apply power series methods to solve differential equations.	Power Series Solutions	Lecture + examples	Homework
Week 5	5	Solve systems of simultaneous linear differential equations.	Simultaneous Linear Differential Equations	Lecture + tutorial	Quiz (Week 5)
Week 6	5	Apply Gamma and Beta special functions in engineering problems.	Special Functions: Gamma and Euler Beta Functions	Lecture + worked examples	Homework
Week	3	Assessment of weeks	Midterm Exam	Written	Midterm exam

7		1–6 content.		exam	
Week 8	5	Apply Laplace transforms to solve engineering problems.	Laplace Transform: General Method and Special Functions	Lecture + examples	Homework
Week 9	5	Use shifting theorems and differentiation/integration of Laplace transforms.	Laplace Transform: Shifting Theorems and Differentiation/Integration	Lecture + tutorial	Online assignment (Week 11)
Week 10	5	Solve differential equations using Laplace transforms.	Solving DEs by Laplace Transform	Problem-solving session	Homework
Week 11	5	Compute Fourier series and apply Euler formulas including half-range expansions.	Fourier Series: Euler Formulas and Half-Range Expansions	Lecture + examples	Onsite assignment (Week 12)
Week 12	5	Apply Fourier transforms and solve DEs using Fourier methods.	Fourier Transform and Solving DEs by Fourier Transform	Lecture + problem solving	Seminar (Week 13)
Week 13	5	Use orthogonality properties of sine and cosine functions.	Orthogonality Properties of Sine and Cosine	Lecture + exercises	Seminar
Week 14	5	Apply separation of variables to solve heat equations.	Partial Differential Equations: Heat Equations	Lecture + examples	Homework
Week 15	5	Apply separation of variables to solve wave equations.	Partial Differential Equations: Wave Equations	Lecture + examples	Homework
Week 16	3	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

## Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Advanced Engineering Analysis, C. Ray Wylie.	Yes
<b>Main Reference source</b>	Advanced Engineering Analysis, C. Ray Wylie.	Yes
<b>Recommended Books</b>	Advanced Engineering Mathematics, Kreyszig, 10th Edition, John Wiley & Sons, Inc.	No
<b>Electronics References</b>	<a href="https://www.thriftbooks.com/w/advanced-engineering-">https://www.thriftbooks.com/w/advanced-engineering-</a>	

<b>Websites</b>	mathematics_clarence-raymond-wylie/	
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# ENGINEERING METALLURGY

## Course Description Engineering Metallurgy

<b>Course Name</b>	Engineering Metallurgy
<b>Course Code</b>	MECH-204
<b>Semester / Year</b>	2025-2026 / First Semester (Year 2)
<b>Description Preparation Date</b>	01/09/2024
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Saad Ramadhan Ahmed Email: Saadramadhan82@tu.edu.iq
<b>Course Aims</b>	Impart knowledge on the structure, properties, treatment, testing, and applications of metals and non-metallic materials. Students will learn to identify and select appropriate materials for various engineering applications.
<b>Teaching and Learning Strategy</b>	The teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques through lectures with practical examples. Laboratory experiments are conducted to consolidate theoretical concepts.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Explain alloys, phase diagrams, and the Iron-carbon equilibrium diagram.	Alloys and Phase Diagrams; Iron-Carbon Diagram; Steel Classification	Lecture + microstructure examples	Homework
Week 2	4	Classify steel and cast iron by microstructure, properties, and applications.	Steel and Cast Iron Classification (continued)	Lecture + discussion	Assignment
Week 3	4	Understand heat treatment processes including annealing, normalising, hardening, and tempering.	Heat Treatment: Annealing, Normalising, Hardening, Tempering; IT Diagrams	Lecture + diagram analysis	Quiz (Week 5)
Week 4	4	Understand case-hardening methods and advanced heat treatment techniques.	Case Hardening; Austempering; Martempering; Flame and Induction Hardening	Lecture + examples	Homework
Week 5	4	Explain the effect of alloying elements on ferrous and non-ferrous metals.	Alloying Elements; Stainless and Tool Steels; Non-Ferrous Metals	Lecture + case studies	Assignment

Week 6	4	Describe properties and applications of non-ferrous alloys.	Aluminium, Copper, Titanium, Nickel Alloys; Precipitation Strengthening	Lecture + examples	Seminar (cont.)
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	4	Summarise properties and applications of polymers, ceramics, and composites.	Non-Metallic Materials: Polymers, Ceramics, Composites (continued)	Lecture + examples	Homework
Week 9	4	Describe engineering ceramics and composite materials.	Polymers, Ceramics, and Composites (continued)	Lecture + laboratory	Laboratory report
Week 10	4	Summarise properties and applications of non-metallic materials.	Non-Metallic Materials: Properties and Applications	Lecture + seminar	Seminar
Week 11	4	Explain mechanisms of plastic deformation and types of fracture.	Deformation Mechanisms; Types of Fracture	Lecture + lab observation	Homework
Week 12	4	Apply mechanical testing methods to evaluate material properties.	Mechanical Properties Testing: Tension, Compression, Hardness, Impact	Laboratory + lecture	Laboratory report
Week 13	4	Understand fatigue and creep failure mechanisms.	Fatigue and Creep Failure Mechanisms	Lecture + case studies	Assignment
Week 14	4	Consolidate knowledge of material properties and failure modes.	Review: Material Properties, Testing, and Failure	Discussion + problem solving	Homework
Week 15	4	Integrate knowledge of metallurgy for engineering material selection.	Integrated Review and Application	Discussion + examples	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

## Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Williams D Callister, "Material Science and Engineering", Wiley India Pvt Ltd, Revised Indian Edition 2014.	Yes
<b>Main Reference source</b>	Williams D Callister, "Material Science and Engineering", Wiley India Pvt Ltd, Revised Indian Edition 2014.	Yes
<b>Recommended Books</b>	U.C. Jindal, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012. Raghavan V., "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd., 2015.	No
<b>Electronics References Websites</b>	N/A	

# FLUID MECHANICS 1

## Course Description Fluid Mechanics 1

<b>Course Name</b>	Fluid Mechanics 1
<b>Course Code</b>	MECH-201
<b>Semester / Year</b>	2025-2026 / First Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Dr. Thamer K. Salem & Dr. Samer M. Khalaf Email: thamersa1974@tu.edu.iq / samerkhalaf@tu.edu.iq
<b>Course Aims</b>	Provide students with the fundamental physical and analytical principles of fluid mechanics through the understanding of conservation of mass, energy, and momentum equations. Students will evaluate potential industrial applications of fluid theory through physical induction and mathematical analysis.
<b>Teaching and Learning Strategy</b>	The module uses lectures, laboratory sessions, and assignments/quizzes. Lectures provide an overview of main concepts and principles. Labs provide hands-on experience of fluid applications. Assignments and quizzes give students opportunities to apply knowledge to real-world problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand the fundamental principles and application areas of fluid mechanics.	Introduction to Fluid Mechanics Principles	Lecture + discussion	Homework
Week 2	4	Classify fluid flows and understand their characteristics.	Application Areas of Fluid Mechanics; Classification of Fluid Flows	Lecture + examples	Online assignment (Week 2)
Week 3	4	Analyse pressure variation in static fluids.	Pressure Variation in Static Fluid	Lecture + problem solving	Homework
Week 4	4	Apply pressure measurement methods to engineering problems.	Fluids at Rest: Pressure Applications	Lecture + tutorial	Online assignment (Week 4)
Week 5	4	Calculate hydrostatic forces on submerged surfaces.	Fluids at Rest: Hydrostatic Force Applications	Lecture + problem solving	Quiz (Week 5)
Week 6	4	Analyse forces on submerged bodies	Forces on Submerged Bodies	Lecture + examples	Onsite assignment

		and surfaces.	and Surfaces		(Week 6)
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	4	Analyse fluid acceleration and relative motion.	Fluid Acceleration and Relative Motion	Lecture + tutorial	Homework
Week 9	4	Calculate buoyancy forces on submerged and floating bodies.	Buoyancy Force	Lecture + examples	Online assignment (Week 9)
Week 10	4	Analyse stability of floating and submerged bodies.	Stability of Floating and Submerged Bodies	Lecture + seminar	Seminar (Week 10)
Week 11	4	Analyse fluid behaviour in rigid-body motion.	Introduction to Fluid in Rigid-Body Motion	Lecture + problem solving	Online assignment (Week 11)
Week 12	4	Apply rigid-body motion principles to engineering problems.	Fluid in Rigid-Body Motion (continued)	Lecture + examples	Onsite assignment (Week 12)
Week 13	4	Apply the continuity equation to fluid flow problems.	Continuity Equation	Lecture + tutorial	Online assignment (Week 13)
Week 14	4	Solve fluid motion problems using governing equations.	Fluid Motion Equations and Applications	Lecture + problem solving	Quiz (Week 14)
Week 15	4	Integrate fluid statics and dynamics knowledge for engineering applications.	Review and Integrated Applications	Tutorial + discussion	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, assignments, lab reports, and seminars to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Fluid Mechanics Fundamentals and Applications, Yunus A. Cengel, John M. Cimbala.	Yes
<b>Main Reference source</b>	Fluid Mechanics Fundamentals and Applications, Yunus	Yes

	A. Cengel, John M. Cimbala.	
<b>Recommended Books</b>	Fluid Mechanics, Victor Lyle Streeter. Fluid Mechanics with Engineering Applications, Robert L. Daugherty.	No
<b>Electronics References Websites</b>	Fundamentals of Fluid Mechanics, Munson, Young, Okiishi. Introduction to Fluid Mechanics, Fox and McDonald.	

# COMPUTER SCIENCE II

## Course Description Computer Science II

<b>Course Name</b>	Computer Science II (MATLAB, Security & Networks, E-Commerce, AI)
<b>Course Code</b>	UOT-031
<b>Semester / Year</b>	2025-2026 / First Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	75 / 3
<b>Course administrator's name</b>	Asst. Prof. Saif S. Irhayyim Email: saiof11@tu.edu.iq Asst. Lecturer: Noor S. Saleh Email: noor.s.saleh@tu.edu.iq
<b>Course Aims</b>	Equip students with skills in MATLAB programming, including syntax, variables, data types, control flow, and numerical problem solving. Introduce foundational concepts of network security, e-commerce, and artificial intelligence applications.
<b>Teaching and Learning Strategy</b>	The module uses lectures to provide an overview of concepts and principles; labs to provide hands-on programming experience; assignments to apply knowledge to real-world problems; and reports to encourage broader research and exploration.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand the MATLAB environment and basic operations.	Introduction to MATLAB: Installation, Environment, and GUI	Lecture + lab practice	Lab report
Week 2	4	Navigate and use the MATLAB desktop effectively.	MATLAB Desktop Program	Lecture + lab	Homework
Week 3	4	Declare and manipulate constants and variables in MATLAB.	Constants and Variables in MATLAB	Lab + guided practice	Online assignment
Week 4	4	Write and evaluate arithmetic expressions in MATLAB.	Arithmetic Expressions in MATLAB	Lab + examples	Quiz (Week 4)
Week 5	4	Use arithmetic and string statements in MATLAB programs.	Arithmetic and String Statements	Lab + practice	Online assignment
Week 6	4	Apply built-in library functions for computation.	Library Functions in MATLAB	Lab + tutorial	Homework

Week 7	4	Create and manipulate matrices in MATLAB.	Matrices and Matrix Operations in MATLAB	Lab + problem solving	Lab report
Week 8	2	Assessment of weeks 1–7 MATLAB content.	Midterm Exam	Written/practical exam	Midterm exam
Week 9	4	Understand the history and evolution of computer science.	History and Evolution of Computer Science; Computing Pioneers	Lecture + discussion	Online assignment
Week 10	4	Understand basic concepts of network security and threat analysis.	Security and Networks: Principles, Protocols, and Threat Analysis	Lecture + case studies	Homework
Week 11	4	Understand e-commerce models, digital transactions, and online business.	E-Commerce: Models, Digital Transactions, and Online Business	Lecture + discussion	Online assignment
Week 12	4	Identify and apply basic troubleshooting methods for computers.	Computer Troubleshooting	Lecture + lab	Lab report
Week 13	4	Understand AI concepts including machine learning and computer vision.	Introduction to Artificial Intelligence and Its Applications	Lecture + examples	Project
Week 14	2	Assessment of weeks 8–13 content.	Second Midterm / Review	Written exam	Quiz
Week 15	4	Integrate all course topics and prepare for final exam.	Course Review and Consolidation	Review session	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written/practical exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, online assignments, onsite assignments, projects, and lab sessions to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	Text	Available in the Library?

<b>Text Book</b>	Graham Brown, David Watson, "Cambridge IGCSE Information and Communication Technology", 3rd edition, 2020.	Yes
<b>Main Reference source</b>	Technology in Action Complete, Alan Evans, Kendall Martin, Mary Anne Poatsy, 16th Edition, 2020.	Yes
<b>Recommended Books</b>	Introduction to Artificial Intelligence (AI), Ahmed Banafa, 1st Edition 2024.	No
<b>Electronics References Websites</b>	N/A	

# STRENGTH OF MATERIALS I

## Course Description Strength of Materials I

<b>Course Name</b>	Strength of Materials I
<b>Course Code</b>	MECH-203
<b>Semester / Year</b>	2025-2026 / First Semester (Year 2)
<b>Description Preparation Date</b>	18/09/2024
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Sulaiman Inad Email: Sulaimaninad63@tu.edu.iq Tutor: Muhammed Muhana Meteab Email: Muh.mhana@tu.edu.iq
<b>Course Aims</b>	Review important principles of statics and apply them to determine internal resultant loadings. Introduce concepts of normal and shear stress and specific applications in analysis and design of members subjected to axial load or direct shear. Enable students to develop a comprehensive understanding of the methodology of solving strength of materials problems.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, demonstrate concepts with appropriate examples, allow students adequate time to practice techniques, and provide practical learning through well-selected lab experiments.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Define and calculate normal stress in structural members.	Simple Stress: Normal Stress	Lecture + examples	Homework
Week 2	4	Calculate shearing stress and bearing stress.	Shearing Stress; Bearing Stress	Lecture + problem solving	Online assignment (Week 2)
Week 3	4	Apply Hooke's Law and calculate axial deformation.	Simple Strain; Hooke's Law; Axial Deformation	Lecture + tutorial	Homework
Week 4	4	Calculate shearing deformation in members.	Shearing Deformation	Lecture + examples	Online assignment
Week 5	4	Analyse biaxial deformation and apply Poisson's ratio.	Biaxial Deformation; Poisson's Ratio	Lecture + problem solving	Quiz (Week 5)
Week 6	4	Analyse statically indeterminate members.	Statically Indeterminate Members	Lecture + examples	Onsite assignment (Week 6)
Week	2	Assessment of	Midterm Exam	Written exam	Midterm exam

7		weeks 1–6 content.			
Week 8	4	Calculate thermal stresses and apply torsion formulas.	Thermal Stresses; Torsion Formulas	Lecture + tutorial	Homework
Week 9	4	Apply torsion analysis to shafts and circular members.	Torsion: Analysis of Circular Shafts	Lecture + problem solving	Homework
Week 10	4	Determine shear and moment in beams using equations.	Shear and Moment in Beams	Lecture + examples	Online assignment
Week 11	4	Construct shear and bending moment diagrams.	Shear and Bending Moment Diagrams	Lecture + tutorial	Onsite assignment (Week 12)
Week 12	4	Calculate bending stresses in beams.	Stresses in Beams: Bending Stresses	Lecture + problem solving	Lab
Week 13	4	Apply bending stress analysis to various beam cross-sections.	Stresses in Beams: Bending Stresses (continued)	Lecture + examples	Lab
Week 14	4	Analyse unsymmetrical beams under bending loads.	Unsymmetrical Beams	Lecture + problem solving	Online assignment (Week 13)
Week 15	4	Calculate shearing stresses in beams.	Shearing Stresses in Beams	Lecture + tutorial	Seminar (Week 10)
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, online assignments, onsite assignments, laboratory reports, and seminars. The midterm exam (10%) measures comprehension of concepts covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Mechanics of Materials, Andrew Pytel, Jaan Kiusalaas, Second Edition, 2011.	Yes
<b>Main Reference source</b>	Mechanics of Materials, Andrew Pytel, Jaan Kiusalaas, Second Edition, 2011.	Yes
<b>Recommended Books</b>	Mechanics of Materials, R. C. Hibbeler, Eighth Edition.	No
<b>Electronics References Websites</b>	N/A	



# ENGINEERING MECHANICS PARTICLE DYNAMICS

## Course Description Engineering Mechanics – Particle Dynamics

<b>Course Name</b>	Engineering Mechanics – Particle Dynamics
<b>Course Code</b>	MECH-205
<b>Semester / Year</b>	2025-2026 / First Semester (Year 2)
<b>Description Preparation Date</b>	20/05/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Ghazwan Saud Prerequisite: ENG-102 Engineering Mechanics – Statics
<b>Course Aims</b>	Introduce the basic principles of engineering mechanics dynamics. Introduce the basic analysis methods of particle dynamics. Analyse the patterns and relationships of given problems with practical examples. Strengthen the basic mechanical sense of the student and the utilisation of mathematical tools.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practice techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand the fundamental concepts of dynamics.	Introduction to Dynamics	Lecture + discussion	Homework
Week 2	4	Analyse rectilinear motion of particles including position, velocity, and acceleration.	Absolute Motion: Rectilinear Motion	Lecture + examples	Online assignment
Week 3	4	Apply rectilinear motion equations to engineering problems.	Absolute Motion: Rectilinear Motion (continued)	Lecture + problem solving	Homework
Week 4	4	Analyse curvilinear motion of particles in different coordinate systems.	Absolute Motion: Curvilinear Motion	Lecture + examples	Online assignment
Week 5	4	Solve curvilinear motion problems using Cartesian coordinates.	Absolute Motion: Curvilinear Motion (continued)	Lecture + tutorial	Quiz
Week	4	Analyse motion	Absolute Motion:	Lecture +	Onsite

6		using normal and tangential coordinates.	Normal and Tangential Coordinate System	problem solving	assignment
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	4	Analyse particle motion using polar coordinate systems.	Absolute Motion: Polar Coordinate System	Lecture + examples	Homework
Week 9	4	Apply polar coordinates to engineering dynamics problems.	Absolute Motion: Polar Coordinate System (continued)	Lecture + problem solving	Online assignment
Week 10	4	Calculate relative velocity and acceleration between particles.	Relative Motion: Velocity and Acceleration	Lecture + examples	Onsite assignment
Week 11	4	Apply relative motion analysis to complex particle systems.	Relative Motion: Velocity and Acceleration (continued)	Lecture + tutorial	Project
Week 12	4	Apply Newton's second law to kinetics of particles.	Kinetics of Particles: Newton's Second Law	Lecture + problem solving	Homework
Week 13	4	Solve kinetics problems involving rectilinear and curvilinear motion.	Kinetics of Particles: Rectilinear and Curvilinear Motion	Lecture + examples	Quiz
Week 14	4	Apply work-energy methods to particle kinetics problems.	Kinetics of Particles: Work and Energy	Lecture + problem solving	Online assignment
Week 15	4	Solve engineering problems using work and energy principles.	Kinetics of Particles: Work and Energy (continued)	Lecture + tutorial	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

## Learning and Teaching Resources

	Text	Available in
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		<b>the Library?</b>
<b>Text Book</b>	Engineering Mechanics: Dynamics, 6th edition, by Meriam, J. L. and Kraige, L. G. (2006).	Yes
<b>Main Reference source</b>	Engineering Mechanics: Dynamics, 6th edition, by Meriam, J. L. and Kraige, L. G. (2006).	Yes
<b>Recommended Books</b>	Engineering Mechanics: Dynamics, by R. C. Hibbeler, 2004.	No
<b>Electronics References Websites</b>	<a href="https://www.engineer4free.com/dynamics.html">https://www.engineer4free.com/dynamics.html</a>	

# CRIMES OF BAATH REGIME

## Course Description Crimes of the Baath Regime in Iraq

<b>Course Name</b>	Crimes of the Baath Regime in Iraq (جرائم نظام البعث في العراق)
<b>Course Code</b>	UOT005
<b>Semester / Year</b>	2025-2026 / First Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	50 / 2
<b>Course administrator's name</b>	Anwar Tawfiq Abd Email: @tu.edu.iq
<b>Course Aims</b>	Identify the crimes of the Baath Party and the violations it committed during its rule. Understand the negative effects of this party on the psychological, social, and cultural aspects of the Iraqi people. Identify the negative impact on the Iraqi environment and population.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to provide students with complete information covering the course curriculum, raising awareness of the crimes and negative effects of the party on Iraqi society, in order to prevent the recurrence of such experiences in the future.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	2	Understand the political systems in Iraq from 1921 to 2003.	Political Systems in Iraq: 1921–2003 Overview	Lecture + discussion	Homework
Week 2	2	Identify the Baath regime's violations of rights and public freedoms.	Violations of Rights and Public Freedoms by the Baath Regime	Lecture + seminar	Assignment
Week 3	2	Analyse the behavioural impact of the Baath regime on society.	Effect of Baath Regime Behaviour on Iraqi Society	Lecture + discussion	Quiz (Week 3)
Week 4	2	Understand the transitional phase in combating authoritarian policies.	The Transitional Phase in Combating Authoritarian Policy	Lecture + case studies	Homework
Week 5	2	Describe the psychological impact of the Baath regime on individuals.	Psychological Impact of the Baath Regime	Lecture + discussion	Quiz (Week 5)
Week 6	2	Describe the social impact of the Baath regime on Iraqi	Social Impact of the Baath Regime	Lecture + discussion	Homework

		communities.			
Week 7	2	Understand the relationship between religion and the Baath state.	Religion and the State under the Baath Regime	Lecture + discussion	Assignment
Week 8	2	Assessment of weeks 1–7 content.	Midterm Exam	Written exam	Midterm exam
Week 9	2	Analyse cultural manipulation and militarisation of society.	Culture, Media, and Militarisation of Society	Lecture + analysis	Report
Week 10	2	Understand the use of internationally prohibited weapons and environmental pollution.	Use of Prohibited Weapons and Environmental Pollution	Lecture + documentation	Homework
Week 11	2	Understand the scorched-earth policy and its consequences.	Scorched-Earth Policy	Lecture + case studies	Seminar
Week 12	2	Understand the draining of the marshes and its effects.	Draining of the Marshes (Ahwar)	Lecture + environmental analysis	Report
Week 13	2	Identify mass graves and the destruction of places of worship.	Mass Graves and Destruction of Houses of Worship	Lecture + examples	Quiz (Week 13)
Week 14	2	Examine real-life examples of the party's crimes in Iraqi society.	Real-Life Examples of Baath Crimes in Iraqi Society	Case study review + discussion	Homework
Week 15	2	Consolidate knowledge of all topics covered.	Course Review and Summary	Review session	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (50%) includes quizzes, assignments, reports, and seminars to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	Text	Available in the Library?
Text Book	Ministry-approved curriculum.	Yes

<b>Main Reference source</b>	Ministry-approved curriculum.	Yes
<b>Recommended Books</b>	N/A	No
<b>Electronics References Websites</b>	N/A	

## ENGLISH II

### Course Description English II

<b>Course Name</b>	English II
<b>Course Code</b>	UOT021
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	50 / 2
<b>Course administrator's name</b>	Asst. Prof. Ahmed S. Abdullah Email: Ahmedsubhi1981@tu.edu.iq
<b>Course Aims</b>	Develop the ability and skills needed to earn a job and develop critical thinking skills to work, develop, and communicate effectively in professional and academic contexts.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practice techniques using carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	2	Understand job application processes and recruitment procedures.	Job Applications and Recruitment Procedures	Lecture + discussion	Onsite assignment
Week 2	2	Use correct terminology in job applications and recruitment.	Terminology in Job Applications and Recruitment	Lecture + examples	Homework
Week 3	2	Design a professional letter of application and CV.	Letter of Application and CV Design	Guided writing + examples	Homework
Week 4	2	Prepare effectively for job interviews.	Interview Preparation and Behaviour	Lecture + role-play	Homework
Week 5	2	Write a letter of intent/statement of purpose for academic applications.	Letter of Intent (Statement of Purpose)	Lecture + writing practice	Homework
Week 6	2	Understand the structure and purpose of letters of recommendation.	Letter of Recommendation for Academic Programmes	Lecture + examples	Homework

Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	2	Apply effective presentation techniques in professional contexts.	Presentation Techniques	Lecture + student presentations	Seminar
Week 9	2	Deliver structured professional presentations.	Presentation Techniques (continued)	Student presentations + feedback	Seminar
Week 10	2	Understand and apply the basic principles of paragraph writing.	Paragraph Writing: Principles and Structure	Lecture + writing exercises	Homework
Week 11	2	Apply paragraph writing principles to produce coherent paragraphs.	Paragraph Writing: Practice	Guided writing + feedback	Homework
Week 12	2	Write paragraphs with correct topic sentence, supporting sentences, and conclusion.	Paragraph Writing: Topic Sentence, Supporting Sentences, Concluding Sentence, Unity, and Coherence	Writing workshop	Report
Week 13	2	Apply unity and coherence principles to paragraph writing.	Paragraph Writing: Unity and Coherence (continued)	Practice + peer review	Homework
Week 14	2	Understand the essential principles of essay writing.	Essay Writing: Principles and Structure	Lecture + examples	Homework
Week 15	2	Apply essay writing principles to produce structured essays.	Essay Writing: Practice	Guided writing	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, onsite assignments, seminars, and reports to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	Text	Available in the Library?

<b>Text Book</b>	Beer, D. & McMurrey, D. 2004, A Guide to Writing as an Engineer (2nd ed), New York: Wiley.	Yes
<b>Main Reference source</b>	Beer, D. & McMurrey, D. 2004, A Guide to Writing as an Engineer (2nd ed), New York: Wiley.	Yes
<b>Recommended Books</b>	Borowick, Jerome N., 2002, Technical Communication and its Applications (2nd ed), New Jersey: Prentice-Hall, Inc.	No
<b>Electronics References Websites</b>	<a href="http://umich.edu/~elements/5e/lectures/index.html">http://umich.edu/~elements/5e/lectures/index.html</a>	

# ENGINEERING MECHANICS RIGID BODY DYNAMICS

## Course Description Engineering Mechanics – Rigid Body Dynamics

<b>Course Name</b>	Engineering Mechanics – Rigid Body Dynamics
<b>Course Code</b>	MECH-206
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 2)
<b>Description Preparation Date</b>	20/05/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	150 / 6
<b>Course administrator's name</b>	Prerequisite: ENG-102 Engineering Mechanics – Statics
<b>Course Aims</b>	Introduce the basic principles of engineering mechanics dynamics for rigid bodies. Introduce the basic analysis methods of rigid body dynamics. Analyse patterns and relationships of given problems with practical examples. Strengthen the basic mechanical sense of the student and the utilisation of mathematical tools.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practice techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	5	Analyse translational and rotational kinematics of rigid bodies.	Kinematics of Rigid Body: Translation	Lecture + examples	Homework
Week 2	5	Analyse rotational motion of rigid bodies.	Kinematics of Rigid Body: Rotation	Lecture + problem solving	Homework
Week 3	5	Calculate relative velocity in rigid body motion.	Kinematics of Rigid Body: Relative Velocity	Lecture + tutorial	Online assignment
Week 4	5	Apply relative velocity analysis to linked mechanisms.	Kinematics of Rigid Body: Relative Velocity (continued)	Lecture + examples	Homework
Week 5	5	Analyse rotating bodies and their kinematics.	Kinematics of Rigid Body: Rotating Bodies	Lecture + problem solving	Quiz
Week 6	5	Analyse connected systems and their kinematic relationships.	Kinematics of Rigid Body: Connected Systems	Lecture + examples	Onsite assignment
Week	3	Assessment of	Midterm Exam	Written exam	Midterm exam

7		weeks 1–6 content.			
Week 8	5	Apply Newton's laws to translational kinetics of rigid bodies.	Kinetics of Rigid Body: Translation	Lecture + problem solving	Online assignment
Week 9	5	Analyse kinetics of rigid bodies under fixed-axis rotation.	Kinetics of Rigid Body: Fixed-Axis Rotation	Lecture + examples	Homework
Week 10	5	Apply fixed-axis rotation equations to engineering problems.	Kinetics of Rigid Body: Fixed-Axis Rotation (continued)	Lecture + tutorial	Project
Week 11	5	Analyse general plane motion in rigid body kinetics.	Kinetics of Rigid Body: General Motion	Lecture + problem solving	Online assignment
Week 12	5	Apply work and energy methods to rigid body problems.	Kinetics of Rigid Body: Work and Energy	Lecture + examples	Homework
Week 13	5	Solve engineering problems using work-energy principles for rigid bodies.	Kinetics of Rigid Body: Work and Energy (continued)	Lecture + tutorial	Quiz
Week 14	5	Apply impulse and momentum principles to rigid bodies.	Kinetics of Rigid Body: Impulse and Momentum	Lecture + problem solving	Onsite assignment
Week 15	5	Solve engineering problems using impulse and momentum for rigid bodies.	Kinetics of Rigid Body: Impulse and Momentum (continued)	Lecture + examples	Homework
Week 16	3	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

## Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Engineering Mechanics: Dynamics, 6th edition, by	Yes

<b>Main Reference source</b>	Meriam, J. L. and Kraige, L. G. (2006).	
	Engineering Mechanics: Dynamics, 6th edition, by Meriam, J. L. and Kraige, L. G. (2006).	Yes
<b>Recommended Books</b>	Engineering Mechanics: Dynamics, by R. C. Hibbeler, 2004.	No
<b>Electronics References Websites</b>	<a href="https://www.engineer4free.com/dynamics.html">https://www.engineer4free.com/dynamics.html</a>	

# STRENGTH OF MATERIALS II

## Course Description Strength of Materials II

<b>Course Name</b>	Strength of Materials II
<b>Course Code</b>	MECH-207
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Sulaiman Inad Email: @tu.edu.iq Peer Reviewer: Dr. Hazim Khaleel Email: HazimKhalil@tu.edu.iq
<b>Course Aims</b>	Develop an understanding of stress, strain, and material behaviour under various loading conditions. Equip students with the ability to analyse and design structural and mechanical components. Introduce material failure criteria and their implications in engineering design. Provide practical skills in experimental techniques and computational tools for material analysis.
<b>Teaching and Learning Strategy</b>	Interactive lectures, problem-solving sessions, hands-on lab demonstrations, case studies, group projects, active learning techniques, visual models, and formative assessments are employed. Scaffolding is used to build from simple concepts to complex topics such as combined stresses and failure criteria.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Calculate bending stresses in beams under applied loads.	Bending Stress in Beams	Lecture + examples	Insite assignment
Week 2	4	Apply bending stress equations to various beam cross-sections.	Bending Stress in Beams (continued)	Lecture + problem solving	Homework
Week 3	4	Calculate shearing stresses in beams.	Shearing Stress in Beams	Lecture + examples	Insite assignment
Week 4	4	Apply shearing stress analysis to different beam profiles.	Shearing Stress in Beams (continued)	Lecture + tutorial	Onsite assignment
Week 5	4	Calculate deflection in beams using appropriate methods.	Deflection in Beams	Lecture + problem solving	Quiz (Week 5)
Week 6	4	Apply deflection analysis to engineering beam problems.	Deflection in Beams (continued)	Lecture + examples	Onsite assignment

Week 7	4	Calculate deflection using double integration and superposition.	Deflection in Beams (continued)	Lecture + tutorial	Homework
Week 8	3	Assessment of weeks 1–7 content.	Mid-term Exam	Written exam	Midterm exam
Week 9	4	Analyse combined stresses in eccentrically loaded members.	Combined Stresses: Eccentrically Loaded Members	Lecture + examples	Insite assignment
Week 10	4	Analyse stress at a point using analytical methods.	Stress at a Point: Analytical Method	Lecture + problem solving	Quiz (Week 10)
Week 11	4	Construct and use Mohr's circle for stress analysis.	Stress at a Point: Mohr's Circle (Graphical Method)	Lecture + graphical practice	Onsite assignment
Week 12	4	Apply Euler's formula to analyse long column buckling.	Columns: Euler's Formula for Long Columns	Lecture + examples	Insite assignment
Week 13	4	Analyse stresses in thin-walled pressure vessels.	Pressure Vessels	Lecture + problem solving	Homework
Week 14	4	Analyse stresses in riveted joints.	Riveted Joints	Lecture + examples	Seminar
Week 15	3	Review and consolidate all course topics.	Final Exam	Written exam	Final exam
Week 16	3	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

## Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Strength of Materials by Ferdinand L. Singer, Andrew Pytel.	Yes
<b>Main Reference source</b>	Strength of Materials by Ferdinand L. Singer, Andrew Pytel.	Yes

<b>Recommended Books</b>	Mechanics of Materials by E. J. Hearn.	No
<b>Electronics References Websites</b>	N/A	

# FLUID MECHANICS 2

## Course Description Fluid Mechanics 2

<b>Course Name</b>	Fluid Mechanics 2
<b>Course Code</b>	MECH-208
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	150 / 6
<b>Course administrator's name</b>	Dr. Thamer K. Salem & Dr. Samer M. Khalaf Email: thamersa1974@tu.edu.iq / samerkhalaf@tu.edu.iq
<b>Course Aims</b>	Provide students with the fundamental physical and analytical principles of incompressible fluid mechanics including conservation of mass, energy, and momentum. Develop students' ability to evaluate industrial applications through dimensional analysis, dynamic similarity, and viscous flow resistance analysis.
<b>Teaching and Learning Strategy</b>	The module uses lectures to provide an overview of incompressible fluid mechanics concepts; labs to provide hands-on experience; and assignments/quizzes to give students opportunities to apply knowledge and check understanding through exams, tests, reports, and laboratory performance.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	5	Understand fluid flow concepts and basic governing equations.	Fluid Flow Concepts and Basic Equations	Lecture + discussion	Homework
Week 2	5	Apply the Reynolds Transport Theorem to control volume analysis.	Reynolds Transport Theorem (RTT)	Lecture + examples	Online assignment (Week 2)
Week 3	5	Distinguish between static, dynamic, and stagnation pressures.	Static, Dynamic, and Stagnation Pressures	Lecture + problem solving	Homework
Week 4	5	Analyse forces on fixed and moving vanes; apply moment theory for propellers.	Fixed and Moving Vanes; Moment Theory for Propeller	Lecture + examples	Online assignment (Week 4)
Week 5	5	Apply dimensional analysis to fluid engineering problems.	Dimensional Analysis and Dynamic Similarity	Lecture + tutorial	Quiz (Week 5)
Week 6	5	Apply the Buckingham Pi	Dimensions and Units; Buckingham	Lecture + problem solving	Online assignment

		theorem to derive non-dimensional parameters.	Pi Theorem		
Week 7	3	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	5	Apply dynamic similarity and modelling principles.	Similarity Principles and Dynamic Simulation	Lecture + examples	Homework
Week 9	5	Identify and apply non-dimensional parameters for flow simulation.	Non-dimensional Parameters and Simulation	Lecture + problem solving	Online assignment (Week 9)
Week 10	5	Understand viscous effects and their role in flow resistance.	Viscous Effects and Flow Resistance	Lecture + examples	Project (Week 10)
Week 11	5	Analyse steady viscous flow between parallel plates.	Steady Flow Between Parallel Plates	Lecture + problem solving	Online assignment
Week 12	5	Distinguish and analyse laminar and turbulent pipe flow.	Laminar and Turbulent Flow in Pipes	Lecture + examples	Onsite assignment (Week 12)
Week 13	5	Analyse entrance region and fully developed pipe flow.	Entrance Region and Fully Developed Flow	Lecture + tutorial	Online assignment (Week 13)
Week 14	5	Calculate major and minor losses in pipe systems.	Minor and Major Losses in Pipes	Lecture + problem solving	Quiz (Week 14)
Week 15	5	Analyse complete pipeline systems including losses.	Pipeline Analysis	Lecture + tutorial	Homework
Week 16	3	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, online/onsite assignments, laboratory reports, and a project to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Fluid Mechanics Fundamentals and Applications, Yunus A. Cengel, John M. Cimbala.	Yes
<b>Main Reference source</b>	Fluid Mechanics Fundamentals and Applications, Yunus	Yes

	A. Cengel, John M. Cimbala.	
<b>Recommended Books</b>	Fluid Mechanics, Victor Lyle Streeter. Fluid Mechanics with Engineering Applications, Robert L. Daugherty.	No
<b>Electronics References Websites</b>	Fundamentals of Fluid Mechanics, Munson, Young, Okiishi. Introduction to Fluid Mechanics, Fox and McDonald.	

# APPLIED THERMODYNAMICS

## Course Description Applied Thermodynamics

<b>Course Name</b>	Applied Thermodynamics
<b>Course Code</b>	MECH-209
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Dr. Hameed Jassim Khalaf / Asst. Prof. Saad Sami Farhan / Dr. Israa Sami Farhan Email: hameed.j.khalaf@tu.edu.iq / saadsami@tu.edu.iq / israa.s.farhan@tu.edu.iq
<b>Course Aims</b>	Cover the second law of thermodynamics statements. Present real-world engineering examples to give students a feel for how thermodynamics is applied in engineering practice. Develop an intuitive understanding of thermodynamics by emphasising the physics and physical arguments.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practice techniques using carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand the second law of thermodynamics and its statements.	Second Law of Thermodynamics: Introduction, Kelvin-Planck and Clausius Statements; Heat Reservoir, Heat Source, Heat Sink	Lecture + discussion	Homework
Week 2	4	Analyse the Carnot cycle and calculate thermal efficiency.	Cycle Efficiency; Carnot Cycle and Carnot Theorem	Lecture + problem solving	Homework
Week 3	4	Understand the coefficient of performance for refrigerators and heat pumps.	Corollaries of Carnot's Theorem; COP for Refrigerators and Heat Pumps; Thermodynamic Temperature Scale	Lecture + examples	Online assignment
Week 4	4	Define entropy and apply the Clausius inequality.	Entropy: Definition, Clausius Inequality, Increase of Entropy Principle	Lecture + problem solving	Homework
Week	4	Calculate entropy	Entropy Change for	Lecture +	Quiz (Week 5)

5		changes for closed systems under various processes.	Closed Systems: Constant Volume, Constant Pressure, Adiabatic, Polytropic Processes	examples	
Week 6	4	Analyse the ideal Rankine cycle and steady-flow energy equations.	Steam Cycle: Ideal Rankine Cycle; First Law Analysis of Vapour Power Cycle	Lecture + problem solving	Onsite assignment (Week 6)
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	4	Understand air-standard efficiency and the Carnot air-standard cycle.	Gas Power Cycles: Air-Standard Efficiency; Carnot Cycle	Lecture + examples	Online assignment
Week 9	4	Analyse the Otto and Diesel cycles.	Otto Cycle (Constant-Volume); Diesel Cycle (Constant-Pressure)	Lecture + problem solving	Homework
Week 10	4	Analyse the dual combustion cycle and the Brayton/Joule cycle.	Dual Combustion Cycle; Brayton/Joule Cycle	Lecture + tutorial	Project (Week 10)
Week 11	4	Solve tutorial problems on gas power cycles.	Tutorial: Gas Power Cycle Examples	Tutorial session	Online assignment
Week 12	4	Analyse gas mixtures and their properties.	Gas Mixtures: Composition, Mass and Mole Fractions	Lecture + problem solving	Onsite assignment (Week 12)
Week 13	4	Apply Dalton's and Amagat's laws to ideal gas mixtures.	P-V-T Behaviour of Gas Mixtures: Dalton's and Amagat's Laws	Lecture + examples	Homework
Week 14	4	Analyse chemical reactions, combustion, and enthalpy of combustion.	Chemical Reactions: Fuel and Combustion; Enthalpy of Formation and Combustion; First Law Analysis	Lecture + tutorial	Homework
Week 15	4	Apply entropy and the second law to reacting systems.	Entropy Change and Second Law Analysis of Reacting Systems	Lecture + examples	Online assignment
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, assignments, laboratory reports, and projects to monitor progress

throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

### Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Cengel, Y., Thermodynamics: An Engineering Approach, Seventh Edition.	Yes
<b>Main Reference source</b>	Cengel, Y., Thermodynamics: An Engineering Approach, Seventh Edition.	Yes
<b>Recommended Books</b>	Applied Thermodynamics for Engineering Technologists, Third Edition, by T.D. Eastop.	No
<b>Electronics References Websites</b>	N/A	

# COMPUTER AIDED DRAWING

## Course Description Computer Aided Drawing

<b>Course Name</b>	Computer Aided Drawing (SolidWorks)
<b>Course Code</b>	MECH-210
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	100 / 4
<b>Course administrator's name</b>	Omar Jamal Abdulkareem Email: omaralkayalany@tu.edu.iq
<b>Course Aims</b>	Develop skills in reading, interpretation, and production of mechanical engineering drawings conforming to ASTM and ISO standards. Enable students to understand IS conventions, methods of dimensioning, title boxes, and to draw machine elements and simple parts. Enable students to draw assemblies of machine parts and their sectional views using CAD software.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with practical examples. Students are allowed adequate time to practice techniques using carefully selected tutorial problems, with experiments to consolidate theoretical concepts.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	3	Understand the SolidWorks interface and basic part modelling concepts.	Section A: Basics – Graphic User Interface; System Requirements	Lecture + lab demo	Homework
Week 2	3	Apply parametric design principles and basic part modelling in SolidWorks.	Parametric Design; Basic Part Modelling; Feature-Based Modelling; File Management	Lab + guided practice	Onsite assignment (Week 2)
Week 3	3	Create and define 2D sketches on sketch planes.	Section B: Sketching – 2D Sketching; Sketch Planes; Defining Sketches	Lab + practice	Homework
Week 4	3	Use sketching tools to create lines, rectangles, circles, and arcs.	Sketching Tools: Lines, Rectangles, Squares, Circles, and Arcs	Lab + examples	Onsite assignment (Week 4)
Week 5	3	Apply advanced sketching tools including slots,	Sketching Tools: Slot Tool, Fillets, and Chamfers	Lab + practice	Online assignment (Week 5)

		fillets, and chamfers.			
Week 6	3	Apply dimensions and special sketching commands in SolidWorks.	Dimensions; Special Sketching Commands: Mirror, Convert Entity, Move & Copy, Trimming	Lab + guided exercises	Onsite assignment (Week 6)
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written/practical exam	Midterm exam
Week 8	3	Create circular and linear sketch patterns.	Creating Sketch Patterns: Circular and Linear Patterns	Lab + practice	Homework
Week 9	3	Create extruded and cut-extruded features in part modelling.	Section C: Part Modelling – Extrude and Cut Extrude	Lab + examples	Onsite assignment
Week 10	3	Create revolved, swept features and reference geometries.	Revolve; Sweep; Creating Reference Geometries	Lab + practice	Online assignment (Week 12)
Week 11	3	Apply fillet, chamfer, hole wizard, and calculate mass properties.	Fillet; Chamfer; Hole Wizard; Mass/Weight Calculation; CAD File Import/Export	Lab + examples	Quiz (Week 10)
Week 12	3	Apply advanced part modelling features including ribs, draft, and patterns.	Section D: Advanced Part Modelling – Ribs, Draft, Circular and Rectangular Patterns, Shell	Lab + practice	Homework
Week 13	3	Create configurations and assign materials using design tables.	Configuration and Design Tables; Material Library; Boolean Operations	Lab + guided practice	Homework
Week 14	3	Create and manage assemblies using top-down and bottom-up approaches.	Section E: Assembly Mode – Inserting Components; Top-Down Assembly; Feature Manager	Lab + examples	Project (Week 14)
Week 15	3	Apply mates, smart fasteners, and detect interference in assemblies.	Using Mates; Smart Fasteners; Bottom-Up Assembly; Interference Detection; Exploding Assemblies	Lab + project work	Onsite assignment
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written/practical exam	Final exam

## Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

## Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Engineering Design with SOLIDWORKS 2021: A Step-by-Step Project Based Approach Utilizing 3D Solid Modeling, 1st Edition.	Yes
<b>Main Reference source</b>	Engineering Design with SOLIDWORKS 2021: A Step-by-Step Project Based Approach Utilizing 3D Solid Modeling, 1st Edition.	Yes
<b>Recommended Books</b>	Learn SOLIDWORKS: Get up to speed with key concepts and tools to become an accomplished SOLIDWORKS Associate and Professional, 2nd Edition.	No
<b>Electronics References Websites</b>	N/A	

# ARABIC LANGUAGE II

## Course Description Arabic Language II

<b>Course Name</b>	Arabic Language II (اللغة العربية II)
<b>Course Code</b>	UOT011
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	50 / 2
<b>Course administrator's name</b>	Wasna Younis Abdullah Email: Wasna.y.abdullah@tu.edu.iq
<b>Course Aims</b>	Develop language skills and memorise selected Quranic surahs while fostering love of the Arabic language. Understand how to apply grammatical rules in daily life and know linguistic terminology in engineering and science. Encourage self-learning and independence and encourage students to take initiative in learning Arabic.
<b>Teaching and Learning Strategy</b>	The learning strategy relies on reorganising and adapting information in a way that enables access to new knowledge. This strategy makes the student active and positive, while the teacher serves as a guide and planner, enabling students to discover knowledge smoothly.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	2	Memorise and understand Surat Al-Duha and its linguistic features.	Surat Al-Duha (سورة الضحى)	Recitation + explanation	Quiz
Week 2	2	Understand the story of Dhul-Qarnayn and its linguistic elements.	Story of Dhul-Qarnayn (قصة ذي القرنين)	Reading + discussion	Online assignment
Week 3	2	Understand the story of Prophet Moses with Al-Khidr and derive language lessons.	Story of Prophet Moses with Al-Khidr (قصة النبي موسى مع الخضر)	Reading + analysis	Homework
Week 4	2	Analyse the ode of Amr ibn Kulthum and its poetic structure.	Mu'allaqat of Amr ibn Kulthum (معلقة عمرو بن كلثوم)	Lecture + literary analysis	Online assignment
Week 5	2	Analyse the poetry of Al-Mutanabbi and identify its themes.	Al-Mutanabbi's Poem: Sha'b Buwan (قصيدة المتنبي شعب بوان)	Lecture + analysis	Homework
Week 6	2	Analyse Al-Jawahiri's poem and identify its national themes.	Al-Jawahiri's Poem: Ya Dijlat al-Khayr (قصيدة الجواهري يا دجلة الخير)	Lecture + discussion	Homework

Week 7	2	Distinguish between Hamzat al-Qat' and Hamzat al-Wasl and apply correctly.	Hamzat al-Qat' and Hamzat al-Wasl (همزة القطع وهمزة الوصل)	Lecture + grammar exercises	Quiz
Week 8	2	Assessment of weeks 1–7 content.	Midterm Exam	Written exam	Midterm exam
Week 9	2	Use medial and final Hamza correctly in writing.	Medial and Final Hamza (الهمزة المتوسطة والمتطرفة)	Lecture + writing exercises	Homework
Week 10	2	Apply punctuation rules correctly in Arabic writing.	Punctuation Marks (علامات الترقيم)	Lecture + writing practice	Online assignment
Week 11	2	Distinguish and correctly write Daad and Dhaa.	Writing Daad and Dhaa (كتابة الضاد والظاء)	Lecture + dictation	Homework
Week 12	2	Understand the conjugation and uses of the sound verb.	The Sound Verb (الفعل الصحيح)	Lecture + grammar exercises	Homework
Week 13	2	Understand the conjugation and uses of the weak verb.	The Weak Verb (الفعل المعتل)	Lecture + grammar exercises	Homework
Week 14	2	Form and use the active participle correctly.	Active Participle (اسم الفاعل)	Lecture + writing exercises	Homework
Week 15	2	Form and use the passive participle correctly.	Passive Participle (اسم المفعول)	Lecture + writing exercises	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, assignments, and discussions to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Arabic Language for Non-Specialisation Departments (اللغة العربية لأقسام غير الاختصاص)	Yes
<b>Main Reference source</b>	Arabic Language for Non-Specialisation Departments (اللغة العربية لأقسام غير الاختصاص)	Yes
<b>Recommended Books</b>	Al-Tafsir al-Wasit, Prof. Dr. Wahba al-Zuhayli. Al-Minhaj fi	No

<b>Electronics References Websites</b>	al-Qawa'id wa al-l'rab, Muhammad al-Antaki.	
	N/A	

# ADVANCED ARABIC LANGUAGE II

## Course Description Advanced Arabic Language II

<b>Course Name</b>	Advanced Arabic Language II (اللغة العربية المتقدمة II)
<b>Course Code</b>	ENG213
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 2)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	75 / 3
<b>Course administrator's name</b>	Dr. Wasna Younis Abdullah Email: Wasna.y.abdullah@tu.edu.iq
<b>Course Aims</b>	Deepen language skills and enhance understanding of advanced Arabic literature. Improve fluency in classical and contemporary Arabic prose and poetry. Encourage critical analysis of Arabic texts to foster linguistic appreciation and cultural understanding. Develop advanced language skills for scientific and academic writing including technical terminology.
<b>Teaching and Learning Strategy</b>	This module adopts active learning through student-led discussions, analysis sessions, and practical projects, with critical engagement with Arabic texts. Audio-visual media are integrated to enhance understanding of pronunciation, rhythm, and intonation.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Analyse the linguistic beauty and structure of Surat Al-Rahman.	Surat Al-Rahman: Linguistic Beauty in the Quranic Context	Recitation + lecture	Quiz
Week 2	4	Analyse the story of the Prophets of Steadfastness for ethical values.	Story of the Prophets of Steadfastness (Ulu al-Azm)	Reading + discussion	Homework
Week 3	4	Read selected passages from Ibn Khaldun's Muqaddimah and appreciate its historical significance.	Ibn Khaldun's Muqaddimah: Selected Reading and Historical Importance	Lecture + text analysis	Homework
Week 4	4	Analyse Antarah ibn Shaddad's Mu'allaqah for themes of courage and chivalry.	Mu'allaqat of Antarah ibn Shaddad: Courage and Chivalry	Lecture + literary analysis	Online assignment
Week 5	4	Analyse Mahmoud Darwish's poetry for themes of identity	Mahmoud Darwish's Poetry: National Identity and Exile	Lecture + discussion	Homework

		and exile.			
Week 6	4	Understand advanced grammatical structures including verb forms.	Advanced Grammar: Verb Forms	Lecture + grammar exercises	Quiz
Week 7	4	Apply conditional sentences and optative forms correctly.	Advanced Grammar: Conditional Sentences and Optative Form	Lecture + writing exercises	Quiz
Week 8	3	Assessment of weeks 1–7 content.	Midterm Exam	Written exam	Midterm exam
Week 9	4	Analyse and critique scientific texts written in Arabic.	Analysis of Scientific Texts in Arabic	Reading + critical discussion	Homework
Week 10	4	Study the evolution of Arabic language in contemporary media.	Contemporary Arabic in Media: Language Evolution in Journalism and Broadcasting	Lecture + media analysis	Online assignment
Week 11	4	Construct complex sentences using advanced Arabic grammar.	Sentence Structure and Advanced Grammar	Lecture + grammar workshop	Homework
Week 12	4	Read and appreciate classical Arabic prose.	Classical Arabic Prose	Reading + discussion	Homework
Week 13	4	Analyse contemporary Arabic short stories.	Contemporary Arabic Short Stories	Reading + analysis	Homework
Week 14	4	Apply editing and proofreading skills to Arabic writing.	Editing and Linguistic Revision	Writing workshop	Assignment
Week 15	4	Consolidate and review all course topics.	Course Review and Summary	Review session	Homework
Week 16	3	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

### Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (45%) includes quizzes, assignments, and discussion activities to monitor progress throughout the semester. The midterm exam (15%) assesses comprehension of content covered in the first half. The final exam (55%) provides a comprehensive evaluation of all course outcomes.

### Learning and Teaching Resources

	Text	Available in
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		the Library?
<b>Text Book</b>	Advanced Arabic Grammar and Morphology (النحو والصرف المتقدم).	Yes
<b>Main Reference source</b>	Advanced Arabic Grammar and Morphology (النحو والصرف المتقدم).	Yes
<b>Recommended Books</b>	Ibn Khaldun's Muqaddimah. Arabic Scientific Articles. Selected Poetry of Mahmoud Darwish.	No
<b>Electronics References Websites</b>	Advanced grammar exercises and literary analysis articles.	

# NUMERICAL ANALYSIS

## Course Description Numerical Analysis

<b>Course Name</b>	Numerical Analysis
<b>Course Code</b>	MATH-301
<b>Semester / Year</b>	2025-2026 / First Semester (Year 3)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	100 / 4
<b>Course administrator's name</b>	Dr. Ibrahim Thamer Nazzal Email: dribrahimthamer@tu.edu.iq
<b>Course Aims</b>	Motivate, describe, analyse, and implement numerical methods for problems including solving nonlinear equations, approximation of integrals, numerical interpolation, and solution of differential equations. Develop skills in programming numerical methods. Equip students with knowledge to analyse various engineering systems through practical applications and theoretical knowledge.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy introduces numerical methods through theory with worked examples carried out by the students, delivered via lectures, question-and-answer sessions, problem-solving, tutorial classes, and project methods with coursework assignments.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	3	Perform matrix operations including addition and multiplication.	Mathematical Background: Matrix Operations	Lecture + examples	Homework
Week 2	3	Calculate determinants and compute matrix inverses.	Determinant; Matrix Inversion	Lecture + problem solving	Assignment
Week 3	3	Solve systems of linear algebraic equations using Gauss Elimination.	System of Linear Algebraic Equations: Gauss Elimination	Lecture + examples	Quiz (Week 5)
Week 4	3	Apply matrix inversion and the Gauss-Seidel iterative method.	Matrix Inversion; Gauss-Seidel Method	Lecture + problem solving	Homework
Week 5	3	Apply open methods including Newton-Raphson and Secant methods to find roots.	Open Methods for Root Estimation: Newton-Raphson and Secant Methods	Lecture + examples	Quiz
Week	3	Apply linear	Curve Fitting: Linear	Lecture +	Assignment

6		regression and Newton divided-difference interpolation.	Regression; Newton's Divided-Difference Interpolation	problem solving	
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	3	Apply Lagrange interpolation to approximate function values.	Lagrange Interpolation Polynomials	Lecture + examples	Assignment
Week 9	3	Apply the Trapezoidal Rule for numerical integration.	Numerical Integration: Trapezoidal Rule	Lecture + problem solving	Seminar
Week 10	3	Apply Simpson's rules for numerical integration.	Numerical Integration: Simpson's Rules	Lecture + examples	Seminar
Week 11	3	Apply Richardson Extrapolation for numerical differentiation.	Numerical Differentiation: Richardson Extrapolation	Lecture + problem solving	Seminar
Week 12	3	Apply Euler's method and Modified Euler's method to solve ODEs.	Ordinary Differential Equations: Euler's Method and Modified Euler's Method	Lecture + examples	Assignment
Week 13	3	Apply Runge-Kutta methods to solve ODEs numerically.	Runge-Kutta Methods	Lecture + problem solving	Assignment
Week 14	3	Apply the finite difference method to solve elliptic partial differential equations.	Partial Differential Equations: Finite Difference Method for Elliptic Equations	Lecture + examples	Homework
Week 15	3	Apply the finite difference method to solve parabolic PDEs.	Finite Difference Method for Parabolic Equations	Lecture + problem solving	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

### Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, assignments, and seminars to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

### Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Numerical Methods for Engineers, by Stephen Chapra.	Yes
<b>Main Reference source</b>	Numerical Methods for Engineers, by Stephen Chapra.	Yes
<b>Recommended Books</b>	Numerical Methods for Engineers and Scientists: An Introduction with Applications Using MATLAB, by Amos Gilat.	No
<b>Electronics References Websites</b>	<a href="http://umich.edu/~elements/5e/lectures/index.html">http://umich.edu/~elements/5e/lectures/index.html</a>	

# THEORY OF MACHINES

## Course Description Theory of Machines

<b>Course Name</b>	Theory of Machines
<b>Course Code</b>	MECH-302
<b>Semester / Year</b>	2025-2026 / First Semester (Year 3)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	150 / 6
<b>Course administrator's name</b>	Dr. Amir M. Al-Sammarraie Email: amircraft@tu.edu.iq
<b>Course Aims</b>	Study relative motion between numerous machine components and the forces acting on them. Provide knowledge essential for designing various machine parts through the study of position, displacement, velocity, and acceleration of machine parts. Introduce power transmission mechanisms and their analysis.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover essential materials, programmes, and modern analytical techniques in lectures, demonstrate concepts with appropriate examples, and allow students sufficient time to practise techniques using carefully selected learning problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Weeks 1–2	10	Understand the fundamental concepts of machines and mechanisms.	Introduction to Theory of Machines	Lecture + discussion	Homework
Weeks 3–5	15	Calculate velocities in mechanisms using graphical and analytical methods.	Velocity in Mechanisms	Lecture + problem solving	Quiz; Assignment
Weeks 6–8	15	Calculate accelerations in mechanisms.	Acceleration in Mechanisms	Lecture + examples	Assignment; Seminar
Weeks 9–11	15	Analyse balancing of rotating masses including static and dynamic balancing.	Balancing of Rotating Masses	Lecture + tutorial	Quiz; Seminar
Weeks 12–13	10	Analyse friction clutches and their design parameters.	Friction Clutches	Lecture + examples	Assignment
Weeks 14–15	10	Analyse belt, rope, and chain drives for power transmission.	Belts, Ropes, and Chain Drives	Lecture + problem solving	Assignment; Seminar

Week 16	3	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam
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### Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, assignments, and seminars to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

### Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Theory of Machines and Mechanisms, Fifth Edition, John J. Uicker Jr., Gordon R. Pennock, Joseph E. Shigley.	Yes
<b>Main Reference source</b>	Theory of Machines and Mechanisms, Fifth Edition, John J. Uicker Jr., Gordon R. Pennock, Joseph E. Shigley.	Yes
<b>Recommended Books</b>	Machine Design: An Integrated Approach, Robert L. Norton, Worcester Polytechnic Institute, Fourth Edition.	No
<b>Electronics References Websites</b>	<a href="https://www.amazon.com/Machine-Design-4th-Robert-Norton/dp/0136123708">https://www.amazon.com/Machine-Design-4th-Robert-Norton/dp/0136123708</a>	

# HEAT TRANSFER CONDUCTION

## Course Description Heat Transfer (Conduction)

<b>Course Name</b>	Heat Transfer (Conduction)
<b>Course Code</b>	MECH-303
<b>Semester / Year</b>	2025-2026 / First Semester (Year 3)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	150 / 6
<b>Course administrator's name</b>	Dr. Tadahmun A. Yassen Email: tadahmunahmed@tu.edu.iq
<b>Course Aims</b>	Provide a comprehensive introduction to heat transfer fundamentals and their applications. Introduce students to the analysis of steady-state and transient one- and multi-dimensional heat conduction, extended surfaces, and numerical analysis of two-dimensional conduction.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practise techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand the three modes of heat transfer and their governing equations.	Introduction to Heat Transfer	Lecture + examples	Homework
Week 2	4	Apply heat transfer fundamentals to engineering problems.	Introduction to Heat Transfer (continued)	Lecture + problem solving	Assignment
Week 3	4	Analyse steady-state conduction in plane walls without heat generation.	Steady-State 1D Conduction in Plane Wall without Heat Generation	Lecture + examples	Quiz
Week 4	4	Analyse steady-state conduction in cylinders and spheres without heat generation.	Steady-State 1D Conduction in Cylinder and Sphere without Heat Generation	Lecture + problem solving	Assignment
Week 5	4	Analyse steady-state conduction in plane walls with heat generation.	Steady-State 1D Conduction in Plane Wall with Heat Generation	Lecture + examples	Quiz
Week 6	4	Analyse steady-state conduction in	Steady-State 1D Conduction in	Lecture + problem solving	Assignment

		cylinders and spheres with heat generation.	Cylinder and Sphere with Heat Generation		
Week 7	3	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	4	Perform general conduction analysis of extended surfaces (fins).	Extended Surfaces (Fins): General Conduction Analysis	Lecture + examples	Assignment
Week 9	4	Calculate fin efficiency for various fin geometries.	Fin Efficiency	Lecture + problem solving	Homework
Week 10	4	Evaluate fin effectiveness for engineering design.	Fin Effectiveness	Lecture + examples	Assignment
Week 11	4	Determine the critical thickness of insulation for cylindrical systems.	Critical Thickness of Insulation	Lecture + problem solving	Homework
Week 12	4	Apply numerical analysis to steady-state two-dimensional conduction.	Steady-State 2D Conduction: Numerical Analysis	Lecture + computational examples	Assignment
Week 13	4	Apply numerical methods to 2D conduction problems.	Steady-State 2D Conduction: Numerical Analysis (continued)	Lecture + problem solving	Quiz
Week 14	4	Analyse transient conduction using the lumped heat capacity method.	Unsteady-State Conduction: Lumped Heat Capacity System	Lecture + examples	Assignment
Week 15	4	Analyse transient heat flow in semi-infinite solids.	Transient Heat Flow in a Semi-Infinite Solid	Lecture + problem solving	Homework
Week 16	3	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes and assignments to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	Text	Available in the Library?

<b>Text Book</b>	Cengel, Y., Heat Transfer: A Practical Approach, Second Edition, 2003.	Yes
<b>Main Reference source</b>	Cengel, Y., Heat Transfer: A Practical Approach, Second Edition, 2003.	Yes
<b>Recommended Books</b>	Holman, J. P. (2010), Heat Transfer. Bergman, T. L. et al. (2011), Introduction to Heat Transfer, John Wiley & Sons.	No
<b>Electronics References Websites</b>	N/A	

# GAS DYNAMICS

## Course Description Gas Dynamics

<b>Course Name</b>	Gas Dynamics
<b>Course Code</b>	MECH-304
<b>Semester / Year</b>	2025-2026 / First Semester (Year 3)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Dr. Ali Ahmed Gitan Email: aliagitan@tu.edu.iq Tutor: Seenaa Khudhayer Samnan Email: s.khudhayer@tu.edu.iq
<b>Course Aims</b>	Define the main concepts of compressible flow. Explain the physical differences of compressible flows. Derive the equations of one-dimensional isentropic flow and study flow characteristics in variable area ducts. Analyse two-dimensional flow through normal and oblique shock waves. Develop knowledge of frictional flow in constant area ducts and heat exchange effects. Introduce applications such as converging-diverging nozzles, jet engines, and fluid machines.
<b>Teaching and Learning Strategy</b>	The module uses lectures to provide an overview of main concepts and principles; labs for hands-on experience with devices and instruments; assignments and quizzes to apply knowledge to real-world problems; scientific visits to industrial sites; and a project to test knowledge of compressible flow concepts.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand compressible flow concepts including Mach number, velocity of sound, and flow classifications.	Basic Concepts of Compressible Flow: Velocity of Sound, Mach Number, Physical Differences Between Flow Types	Lecture + discussion	Homework
Week 2	4	Apply stagnation and critical state concepts to compressible flows.	Adiabatic Steady Flow Ellipse; Stagnation State; Critical State	Lecture + examples	Homework
Week 3	4	Analyse isentropic flow in variable area ducts and determine Mach number variation.	Isentropic Flow in Variable Area Duct: General Features; Mach Number vs. Area Variation; Critical Conditions; Choking	Lecture + problem solving	Homework
Week 4	4	Analyse isentropic flow in converging and converging-	Isentropic Flow in Converging Nozzle; Converging-	Lecture + examples	Quiz (Week 4)

		diverging nozzles.	Diverging Nozzle; Impulse Function		
Week 5	4	Analyse normal shock waves and their governing equations.	Shock Waves: Introduction; Governing Equations of Normal Shock Waves; Non-Isentropic Flow in CD Nozzle; Normal Shock Table	Lecture + problem solving	Homework
Week 6	4	Analyse moving normal shock waves and oblique shock wave fundamentals.	Moving Normal Shock Wave; Shock Wave Strength	Lecture + examples	Homework
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	4	Analyse oblique shock waves and their properties.	Oblique Shock Wave	Lecture + problem solving	Project (continuous)
Week 9	4	Analyse Fanno flow: frictional flow in constant area ducts.	Constant Area Duct Flow: Frictional Flow; Governing Equations; Fanno Line; Relations for Frictional Flow	Lecture + examples	Homework
Week 10	4	Analyse Rayleigh flow: frictionless flow with heat transfer in constant area ducts.	Frictionless Flow with Heat Transfer in Constant Area Duct; Rayleigh Line	Lecture + problem solving	Quiz (Week 10)
Week 11	4	Understand the working principles and performance of axial and centrifugal compressors.	Turbomachinery: Axial Compressor; Centrifugal Compressor	Lecture + examples	Lab report
Week 12	4	Understand the working principles of gas and steam turbines and jet engines.	Gas and Steam Turbines; Jet Engine	Lecture + discussion	Lab report
Week 13	4	Analyse impulse and reaction turbines.	Impulse Turbine; Radial Reaction Turbine	Lecture + problem solving	Lab report
Week 14	4	Analyse axial reaction turbines and understand cavitation.	Axial Reaction Turbine; Cavitation Phenomenon	Lecture + examples	Homework
Week 15	4	Understand pump characteristics and performance.	Pumps: Types and Performance	Lecture + lab	Lab report
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, a project, and laboratory reports to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Compressible Fluid Flow, Patrick H. Oosthuizen & William E. Carscallen, 1997.	Yes
<b>Main Reference source</b>	Compressible Fluid Flow, Patrick H. Oosthuizen & William E. Carscallen, 1997.	Yes
<b>Recommended Books</b>	Gas Dynamics, James E. A. John & Theo G. Keith, 2006. A Textbook of Hydraulic Machines, R. S. Khurmi.	No
<b>Electronics References Websites</b>	N/A	

# MANUFACTURING PROCESSES 2

## Course Description Manufacturing Processes 2

<b>Course Name</b>	Manufacturing Processes 2
<b>Course Code</b>	MECH-305
<b>Semester / Year</b>	2025-2026 / First Semester (Year 3)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Mohammed Salih Ahmed Email: Mohammed.Ahmed72@tu.edu.iq
<b>Course Aims</b>	Develop the student's knowledge of metal casting, furnace types, and their advantages and disadvantages. Study casting processes including expandable mould casting and permanent mould casting. Cover welding and forming processes in detail.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practise techniques using carefully selected tutorial problems, with experiments to consolidate theoretical concepts.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand metal casting processes and their classification.	Metal Casting: Definition and Classification	Lecture + examples	Homework
Week 2	4	Apply metal casting principles to engineering production.	Metal Casting: Processes and Applications	Lecture + discussion	Quiz (Week 4)
Week 3	4	Identify types of furnaces and their operating principles.	Types of Furnaces: Classification and Operation	Lecture + examples	Homework
Week 4	4	Evaluate the advantages and limitations of different furnace types.	Types of Furnaces: Advantages, Disadvantages, and Selection	Lecture + seminar	Quiz
Week 5	4	Understand different welding processes and their principles.	Welding Processes: Types and Principles	Lecture + examples	Homework
Week 6	4	Analyse welding methods and their suitability for different	Welding Processes: Methods, Advantages, and Applications	Lecture + discussion	Seminar

		applications.			
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	4	Understand metal forming processes and their classification.	Forming Processes: Classification and Principles	Lecture + examples	Homework
Week 9	4	Analyse bulk and sheet forming processes.	Forming Processes: Bulk Forming and Sheet Metal Forming	Lecture + problem solving	Seminar
Week 10	4	Apply forming process principles to engineering manufacturing.	Forming Processes: Applications and Process Selection	Lecture + discussion	Discussion
Week 11	4	Understand the principles of mechanical machining operations.	Mechanical Machining: Turning Operations	Lecture + examples	Homework
Week 12	4	Analyse milling, drilling, and grinding machining operations.	Mechanical Machining: Milling, Drilling, and Grinding	Lecture + problem solving	Discussion
Week 13	4	Understand non-conventional machining processes.	Mechanical Machining: Non-Conventional Processes	Lecture + examples	Seminar
Week 14	4	Evaluate machining process selection for different engineering applications.	Mechanical Machining: Process Selection and Economics	Lecture + discussion	Discussion
Week 15	4	Integrate knowledge of casting, welding, forming, and machining for process planning.	Mechanical Machining: Integrated Review and Applications	Lecture + tutorial	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, assignments, seminars, and discussions to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	Text	Available in
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		<b>the Library?</b>
<b>Text Book</b>	Williams D Callister, "Material Science and Engineering", Wiley India Pvt Ltd, Revised Indian Edition 2014.	Yes
<b>Main Reference source</b>	Williams D Callister, "Material Science and Engineering", Wiley India Pvt Ltd, Revised Indian Edition 2014.	Yes
<b>Recommended Books</b>	U.C. Jindal, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012.	No
<b>Electronics References Websites</b>	N/A	

# MACHINE DESIGN 1

## Course Description Machine Design 1

<b>Course Name</b>	Machine Design 1
<b>Course Code</b>	MECH-306
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 3)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	150 / 6
<b>Course administrator's name</b>	Hazim Khaleel Email: Hazimkhalil@tu.edu.iq
<b>Course Aims</b>	Introduce students to modern mechanical design with emphasis on machine elements, analysing these elements based on physics, mathematics, and core mechanical engineering principles. Enable students to learn major machine elements such as shafts, couplings, and bearings, and develop recommendations to make designs more economical and environmentally friendly.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practise techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand the principles and procedures of mechanical design.	Introduction to Machine Design: Principles and Procedures	Lecture + discussion	Assignment
Week 2	4	Review stress and strain concepts essential for machine design.	Review of Stresses and Strain	Lecture + problem solving	Assignment
Week 3	4	Apply stress and strain analysis to machine components.	Review of Stresses and Strain (continued)	Lecture + examples	Assignment
Week 4	4	Apply factor of safety principles and relevant design codes.	Factor of Safety and Design Codes	Lecture + examples	Assignment
Week 5	4	Analyse stress concentration effects in machine components.	Stress Concentration	Lecture + problem solving	Assignment
Week	4	Apply static failure	Static Failure	Lecture +	Assignment

6		theories to machine design problems.	Theories	examples	
Week 7	4	Understand fatigue phenomena and their significance in design.	Fatigue: Introduction and Concepts	Lecture + discussion	Midterm exam
Week 8	4	Apply fatigue analysis methods to machine component design.	Fatigue: Analysis and Design Applications	Lecture + problem solving	Assignment
Week 9	4	Design shafts, keys, and couplings for power transmission.	Shafts, Keys, and Couplings	Lecture + design examples	Assignment
Week 10	4	Apply shaft and coupling design procedures to engineering problems.	Shafts, Keys, and Couplings (continued)	Lecture + problem solving	Assignment
Week 11	4	Understand fits, tolerances, and their role in machine design.	Fits and Tolerances	Lecture + examples	Assignment
Week 12	4	Select and design rolling element bearings for engineering applications.	Rolling Bearings: Selection and Design	Lecture + examples	Assignment
Week 13	4	Apply rolling bearing design procedures to machine systems.	Rolling Bearings (continued)	Lecture + problem solving	Assignment
Week 14	4	Understand the principles and design of sliding (journal) bearings.	Sliding (Journal) Bearings: Principles and Design	Lecture + examples	Assignment
Week 15	4	Apply sliding bearing design to engineering problems.	Sliding Bearings (continued)	Lecture + problem solving	Assignment
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

### Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes and assignments to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

### Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Mechanical Engineering Design, Tenth Edition, Shigley.	Yes
<b>Main Reference source</b>	Mechanical Engineering Design, Tenth Edition, Shigley.	Yes
<b>Recommended Books</b>	Machine Elements in Mechanical Design, Sixth Edition, Robert L. Mott. Machine Design, Childs.	No
<b>Electronics References Websites</b>	N/A	

# ENERGY CONVERSION

## Course Description Energy Conversion

<b>Course Name</b>	Energy Conversion
<b>Course Code</b>	MECH-311
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 3)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	100 / 4
<b>Course administrator's name</b>	Dr. Manar S. M. Al-Jethelah Email: m.aljethelah@tu.edu.iq
<b>Course Aims</b>	Introduce students to knowledge and concepts in energy conversion, analysis, and management. Study present and developing technologies for conversion of thermal, nuclear, mechanical, renewable, and alternative energy. Emphasise efficiency, performance, and environmental impact of energy systems.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practise techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	3	Understand the scope of energy conversion and forms of energy.	Introduction and Scope of Energy Conversion; Energy Forms, Conversion Systems, and Energy Intensity	Lecture + discussion	Homework
Week 2	3	Understand fossil fuel resources, energy contents, and combustion calculations.	Fossil Energy: Fossil Fuel Resources; Energy Contents; Fuel and Combustion Calculations	Lecture + examples	Assignment
Week 3	3	Understand nuclear reaction physics and nuclear power systems.	Nuclear Energy: Nuclear Reaction and Energy Conversion Physics; Nuclear Power Systems	Lecture + discussion	Assignment
Week 4	3	Understand geothermal energy resources and conversion systems.	Geothermal Energy: Resources and Conversion Systems	Lecture + examples	Assignment

Week 5	3	Understand the operating principles and applications of fuel cells.	Fuel Cell: Principles and Applications	Lecture + discussion	Assignment
Week 6	3	Understand solar thermal radiation physics and collection systems.	Solar-Thermal Energy: Solar Thermal Radiation Physics	Lecture + examples	Assignment
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	3	Analyse active and passive solar-thermal energy collection and conversion systems.	Solar-Thermal Energy: Active and Passive Collection and Conversion Systems	Lecture + problem solving	Assignment
Week 9	3	Evaluate solar-thermal energy applications in engineering.	Solar-Thermal Energy: Applications	Lecture + examples	Assignment
Week 10	3	Understand photoelectric physics and solar photovoltaic technology.	Photoelectric Energy: Photoelectric Physics; Solar Photovoltaic Cell Materials and Technology	Lecture + examples	Assignment
Week 11	3	Analyse wind-fluid interaction and wind energy potential.	Wind Energy: Wind Interaction with Objects; Fluid Dynamics	Lecture + problem solving	Assignment
Week 12	3	Understand wind harvesting devices and system design.	Wind Energy: Wind Harvesting Devices and Systems	Lecture + examples	Assignment
Week 13	3	Design and analyse hybrid solar-wind energy systems.	Hybrid Solar-Wind Design	Lecture + design exercise	Assignment
Week 14	3	Understand biomass and waste-to-energy conversion methods.	Biomass and Waste to Energy: Potential, Resources, Thermal-Chemical and Bio-Chemical Conversion Methods	Lecture + discussion	Assignment
Week 15	3	Integrate energy conversion knowledge for system evaluation and selection.	Review and Integrated Energy System Analysis	Tutorial + discussion	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes and assignments to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Demirel, Yasar. Energy: Production, Conversion, Storage, Conservation, and Coupling. Springer Science & Business Media, 2012. ISBN: 978-1-4471-2371-2.	Yes
<b>Main Reference source</b>	Demirel, Yasar. Energy: Production, Conversion, Storage, Conservation, and Coupling. Springer Science & Business Media, 2012.	Yes
<b>Recommended Books</b>	Goswami, D. Yogi, and Frank Kreith, eds. Energy Conversion. CRC Press, 2nd edition, 2017. ISBN: 978-1-4665-8482-2.	No
<b>Electronics References Websites</b>	N/A	

# GRADUATION PROJECT I

## Course Description Graduation Project I

<b>Course Name</b>	Graduation Project I
<b>Course Code</b>	MECH-401
<b>Semester / Year</b>	2025-2026 / First Semester (Year 4)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance (office hours + discussions)
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	100 / 4
<b>Course administrator's name</b>	All Faculty Members Mechanical Engineering Department
<b>Course Aims</b>	Prepare students for the practical tasks of the workplace after graduation by building their ability to perform a complete engineering project, from problem identification and literature review through design, implementation, and technical report writing.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully guide students through project-based and self-directed learning, with supervisor office hours for feedback and discussion, oral presentations, and seminar sessions.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	3	Select and define a suitable engineering research problem.	Select a Research Problem	Supervisor meeting + discussion	Discussion
Week 2	3	Prepare the general framework: introduction and problem formulation.	General Framework: Introduction; Problem Formulation (Questions and Hypotheses)	Guided writing + supervisor feedback	Discussion
Week 3	3	Define key concepts and terminology relevant to the project.	Define Concepts and Terminology	Self-directed research + discussion	Discussion
Week 4	3	Identify the objectives and importance of the project.	Objectives and Importance of the Project	Guided writing + supervisor feedback	Discussion
Weeks 5-7	9	Establish the project scope, limitations, and methodology.	Limits and Methodology	Self-directed work + supervisor guidance	Discussion
Weeks 8-9	6	Present the research plan to the	Research Plan Presentation and	Supervisor meeting +	Discussion

		supervisor and incorporate feedback.	Discussion with Supervisor	revision	
Weeks 10–11	6	Prepare the theoretical background using the latest sources and references.	Theoretical Background: Literature Review Using Current Sources	Self-directed research + writing	Discussion
Weeks 12–13	6	Review and critically comment on previous studies related to the topic.	Previous Studies and Commentary	Literature analysis + writing	Discussion
Week 14	3	Submit the project proposal to the supervisor for review and final comments.	Submit Graduation Project Proposal for Supervisor Review	Written submission + feedback	Discussion
Week 15	3	Present the project orally in a structured seminar setting.	Oral Presentation	Oral presentation + Q&A	Oral Presentation
Week 16	3	Defend the project in front of a committee and respond to questions.	Final Seminar and Defence	Final seminar + committee evaluation	Final Defence

## Course Evaluation

The evaluation of this course is based on discussion sessions (30%), seminars (10%), and a final defence presentation (60%). There is no written midterm exam. Students are assessed on the quality of their project work, written report, oral presentation, and ability to respond to committee questions.

## Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Perry's Mechanical Engineers' Handbook, Ninth Edition. Don W. Green, Marylee Z. Southard. McGraw Hill Professional, 2018.	Yes
<b>Main Reference source</b>	Perry's Mechanical Engineers' Handbook, Ninth Edition. McGraw Hill Professional, 2018.	Yes
<b>Recommended Books</b>	Coulson Richardson's Mechanical Engineering Vol. 6, Mechanical Engineering Design 4th Edition. R. K. Sinnott, J. M. Coulson, J. F. Richardson. Elsevier Butterworth-Heinemann, Oxford, 2005.	No
<b>Electronics References Websites</b>	N/A	

# VIBRATION 1

## Course Description Vibration 1

<b>Course Name</b>	Vibration 1
<b>Course Code</b>	MECH-403
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 4)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Dr. Tahseen Taha Othman Email: Tahseentaha@tu.edu.iq
<b>Course Aims</b>	Enable students to develop a comprehensive understanding of the methodology of linking the behaviours of vibrating bodies. Establish fundamental knowledge of mechanical vibrations, from deriving equations of motion using Newton's second law to finding natural frequencies and mode shapes for single and two degree-of-freedom systems.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practise techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Review kinematics of rigid bodies and second-order differential equations.	Mathematical Background: Kinematics of Rigid Body; Second-Order Differential Equations	Lecture + examples	Homework
Week 2	4	Understand generalised coordinates, stiffness, and equivalent spring constants.	Basic Concepts of Vibration: Generalised Coordinates; Stiffness; Inertia; Equivalent Spring Constants	Lecture + problem solving	Assignment
Week 3	4	Analyse spring combinations in parallel and series using potential energy concepts.	Combination of Springs: Parallel, Series; Potential Energy Concept	Lecture + examples	Assignment
Week 4	4	Model translational and rotational inertia in vibrating systems.	Combination of Masses: Translational and Rotational Motion	Lecture + problem solving	Assignment

Week 5	4	Apply vibration concepts to practical engineering problems.	Applications of Basic Vibration Concepts	Lecture + examples	Assignment
Week 6	4	Derive equations of motion and determine natural frequencies for single DOF systems.	Equation of Motion for Single DOF: Natural Frequency	Lecture + problem solving	Assignment
Week 7	4	Derive and solve equations of motion for undamped single DOF systems.	Equation of Motion for Single DOF: Natural Frequency (continued)	Lecture + examples	Midterm exam
Week 8	4	Solve the equations of motion for undamped single DOF systems.	Solution of Undamped Equation of Motion: Single DOF	Lecture + problem solving	Assignment
Week 9	4	Derive equations of motion for damped single DOF systems; determine damped natural frequency and damping factor.	Equation of Motion for Damped Single DOF: Damped Natural Frequency; Damping Factor	Lecture + examples	Assignment
Week 10	4	Classify and analyse underdamped, critically damped, and overdamped systems.	Underdamped, Critically Damped, and Overdamped Systems	Lecture + problem solving	Assignment
Week 11	4	Solve equations of motion for damped single DOF systems.	Solution of Damped Equation of Motion: Single DOF	Lecture + examples	Assignment
Week 12	4	Measure damping using the logarithmic decrement method.	Measurement of Damping: Logarithmic Decrement	Lecture + lab	Lab report
Week 13	4	Apply single DOF vibration analysis to engineering problems.	Applications of Single DOF Vibration Analysis	Lecture + problem solving	Assignment
Week 14	4	Determine natural frequencies and mode shapes for free two DOF systems.	Free Two DOF Systems: Natural Frequencies and Mode Shapes	Lecture + examples	Assignment
Week 15	4	Apply two DOF vibration analysis to engineering problems.	Free Two DOF Systems: Natural Frequencies and Mode Shapes (continued)	Lecture + problem solving	Assignment
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

## Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Theory of Vibration with Applications, William T. Thomson.	Yes
<b>Main Reference source</b>	Mechanical Vibration, Rao.	Yes
<b>Recommended Books</b>	Fundamentals of Vibrations, Leonard Meirovitch.	No
<b>Electronics References Websites</b>	N/A	

# FUNDAMENTALS OF CONTROL

## Course Description Fundamentals of Control

<b>Course Name</b>	Fundamentals of Control
<b>Course Code</b>	MECH-404
<b>Semester / Year</b>	2025-2026 / First Semester (Year 4)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Adel Mahmood Bash Email: Adelbash@tu.edu.iq
<b>Course Aims</b>	Introduce the principles and applications of linear control systems and Laplace transform. Cover basic concepts of block diagram reduction, transfer function representation, time response, and time domain analysis. Study different methods of stability analysis including Routh-Hurwitz criterion and root locus techniques.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy introduces students to the fundamental concepts and mathematical models used in control systems through lectures, tutorials, and laboratory sessions covering classical control techniques including PID control, root locus, and Bode analysis.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand the concept of control systems and the effects of feedback.	Introduction: Concept of Control System; Classification of Open and Closed Loop Systems; Effects of Feedback	Lecture + discussion	Assignment
Week 2	4	Derive transfer functions and apply block diagram algebra.	Transfer Function Representation; Block Diagram Algebra	Lecture + examples	Assignment
Week 3	4	Reduce complex block diagrams to find system transfer functions.	Determining Transfer Function from Block Diagrams	Lecture + problem solving	Assignment
Week 4	4	Construct and analyse signal flow graphs using Mason's gain formula.	Signal Flow Graphs (SFG): Reduction Using Mason's Gain Formula	Lecture + examples	Assignment
Week 5	4	Determine transfer functions from signal flow graphs.	Transfer Function of Signal Flow Graphs	Lecture + problem solving	Assignment

Week 6	4	Analyse time response of first-order systems to standard test signals.	Time Response Analysis: Standard Test Signals; Time Response of First-Order Systems	Lecture + examples	Assignment
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	4	Analyse transient response of second-order systems and determine time domain specifications.	Transient Response of Second-Order Systems; Characteristic Equation; Time Domain Specifications	Lecture + problem solving	Assignment
Week 9	4	Calculate steady-state errors and error constants for control systems.	Steady-State Response; Steady-State Errors and Error Constants	Lecture + examples	Assignment
Week 10	4	Understand the effects of PD and PI controllers on system performance.	PID Controllers: Effects of PD and PI on Steady-State Error	Lecture + problem solving	Lab report
Week 11	4	Apply the Routh-Hurwitz criterion to assess system stability.	Stability Analysis in S-Domain: Concept of Stability; Routh-Hurwitz Stability Criterion	Lecture + examples	Assignment
Week 12	4	Analyse qualitative and conditional stability; understand limitations of Routh-Hurwitz.	Qualitative Stability; Conditional Stability; Limitations of Routh-Hurwitz	Lecture + problem solving	Assignment
Week 13	4	Understand the concept of root locus and its construction rules.	Root Locus Technique: Concept and Construction of Root Locus	Lecture + examples	Lab report
Week 14	4	Analyse the effect of adding poles and zeros on root loci.	Effects of Adding Poles and Zeros to $G(s)H(s)$ on Root Loci	Lecture + problem solving	Assignment
Week 15	4	Integrate control system concepts for comprehensive system analysis and design.	Review and Integrated Control System Analysis	Tutorial + discussion	Homework
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, assignments, and laboratory reports to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

### Learning and Teaching Resources

	Text	Available in the Library?
<b>Text Book</b>	Modern Control Engineering, Katsuhiko Ogata.	Yes
<b>Main Reference source</b>	Modern Control Engineering, Katsuhiko Ogata.	Yes
<b>Recommended Books</b>	Control Systems Theory and Applications, S. K. Bhattacharya. Control Systems Engineering, S. Palani.	No
<b>Electronics References Websites</b>	N/A	

# PRINCIPLES OF AIR CONDITIONING

## Course Description Principles of Air Conditioning

<b>Course Name</b>	Principles of Air Conditioning
<b>Course Code</b>	MECH-405
<b>Semester / Year</b>	2025-2026 / First Semester (Year 4)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Prof. Dr. Maki Haj Zaidan Email: makihajzaidan@tu.edu.iq Tutor: Asst. Prof. Dr. Samer Mahmoud Khalaf Email: samerkhalaf@tu.edu.iq
<b>Course Aims</b>	Define the main concepts of air conditioning including moisture content and relative humidity. Analyse humidification and dehumidification processes. Develop methods for air mixing and air supply conditions. Evaluate the effect of heat sources on cooling loads. Apply calculations for overall heat transfer coefficient and wall surface temperature. Understand heat gain from solar and renewable sources.
<b>Teaching and Learning Strategy</b>	The module uses lectures, laboratory sessions, assignments and quizzes, scientific site visits, and a project to provide students with theoretical understanding and practical experience of air conditioning systems design.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand the basic properties of moist air including velocity, pressure, and psychrometric properties.	Basic Concepts of Air Conditioning: Air Velocity, Pressure, Moist Air Properties	Lecture + discussion	Homework
Week 2	4	Apply the psychrometric chart and understand saturation and dew point concepts.	Adiabatic Steady Flow; Saturation and Dew Point; Air Psychrometric Chart	Lecture + chart exercises	Homework
Week 3	4	Calculate relative humidity using partial pressure methods.	Calculation of Relative Humidity: Partial Steam Pressure; Partial Dry Air Pressure; Critical and Saturation Conditions	Lecture + problem solving	Homework
Week 4	4	Analyse air mixing and determine air supply conditions.	Air Mixing and Air Supply Condition	Lecture + examples	Homework
Week 5	4	Calculate overall heat transfer	Overall Heat Transfer Coefficient	Lecture + problem solving	Quiz (Week 5)

		coefficient and wall surface temperature.	and Wall Surface Temperature Calculation		
Week 6	4	Understand comfortable conditions and indoor air quality requirements.	Comfortable Conditions; Indoor Air Quality	Lecture + discussion	Homework
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	4	Apply design temperature data for outdoor and indoor conditions.	Design Temperature: Outdoor and Indoor Room Temperatures	Lecture + examples	Homework
Week 9	4	Calculate heating loads for buildings.	Heating Load Calculation	Lecture + problem solving	Assignment
Week 10	4	Calculate heat loss through building structures and infiltration.	Heat Loss Through Building Structure; Infiltration and Space Heating	Lecture + examples	Assignment
Week 11	4	Calculate cooling loads and identify internal heat sources.	Cooling Load Calculation; Heat Sources	Lecture + problem solving	Quiz
Week 12	4	Calculate heat gain from solar intensity and renewable sources.	Heat Gain from Solar Intensity and Renewable Energy Sources	Lecture + examples	Seminar
Week 13	4	Calculate pressure drop in circular and rectangular ducts and fittings.	Pressure Drop of Internal Fluid Flow Through Circular and Rectangular Duct and Fittings	Lecture + problem solving	Lab report
Week 14	4	Understand the effect of cavitation on internal flow systems.	Effect of Cavitation on Internal Flow	Lecture + examples	Lab report
Week 15	4	Design and select appropriate air conditioning systems.	Design and Selection of Air Conditioning Systems	Lecture + design exercise	Project
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, assignments, seminars, and laboratory reports to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Refrigeration and Air-Conditioning, By Stoecker, First Edition, McGraw-Hill, 2006.	Yes
<b>Main Reference source</b>	Refrigeration and Air-Conditioning, By Stoecker, First Edition, McGraw-Hill, 2006.	Yes
<b>Recommended Books</b>	Air-Conditioning and Refrigeration, By Jones, First Edition, McGraw-Hill, 1983.	No
<b>Electronics References Websites</b>	N/A	

# POWER PLANT ENGINEERING

## Course Description Power Plant Engineering

<b>Course Name</b>	Power Plant Engineering
<b>Course Code</b>	MECH-406
<b>Semester / Year</b>	2025-2026 / First Semester (Year 4)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Dr. Thamir Khalil Ibrahim Email: <a href="mailto:thamirmathcad@tu.edu.iq">thamirmathcad@tu.edu.iq</a>
<b>Course Aims</b>	Provide a simple understanding of power plant engineering. Cover details of steam and gas thermal power plants, hydro power plants, and nuclear power plants, along with solar, wind, and geothermal energy power systems. Address economics of power generation and environmental aspects.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practise techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	3	Understand the energy scenario and the main components of steam power plants.	Steam Power Plants: Energy Scenario; Fuel Handling; Ash Handling; Chimney Draught	Lecture + discussion	Assignment
Week 2	3	Analyse the Rankine cycle and steam power plant processes including superheat, reheat, and feed heating.	Steam Power Plant Cycle: Rankine Cycle; Superheat; Reheat; Feed Water Heaters	Lecture + problem solving	Assignment
Week 3	3	Understand boiler types and water circulation principles.	Boiler Operation: Fire Tube Boiler; Water Tube Boiler; Water Circulation	Lecture + examples	Assignment
Week 4	3	Analyse impulse and reaction steam turbines.	Steam Turbines: Impulse Turbine; Reaction Turbine; Velocity Diagrams; Efficiency	Lecture + problem solving	Assignment
Week	3	Understand	Condensers;	Lecture +	Assignment

5		condensers, cooling towers, and their operating principles.	Cooling Towers: Classification, Operation, and Performance	examples	
Week 6	3	Analyse air compressors and combustion chambers in power plant systems.	Air Compressor: Classification and Operation; Combustion Chamber: Efficiency and Operation	Lecture + problem solving	Assignment
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	3	Analyse the performance of gas turbine power plants.	Performance Analysis of Gas Turbine Power Plants	Lecture + examples	Assignment
Week 9	3	Understand combined cycle power plant configurations and thermal analysis.	Introduction to Combined Cycle Power; Thermal Analysis of Combined Cycle Power	Lecture + problem solving	Assignment
Week 10	3	Understand hydro plant classification, hydraulic turbines, and controls.	Classification of Hydro Plants; Hydraulic Turbines; Hydro Plant Controls	Lecture + examples	Assignment
Week 11	3	Understand the principles of nuclear energy and thermal fission reactors.	Principles of Nuclear Energy; Thermal Fission Reactors and Power Plants; Fast Breeder Reactors	Lecture + discussion	Assignment
Week 12	3	Understand solar energy systems and solar thermal power generation.	Solar Energy; Solar Thermal Energy Systems	Lecture + examples	Assignment
Week 13	3	Analyse hybrid solar gas-turbine power plants.	Hybrid Solar Gas-Turbine Power Plants	Lecture + problem solving	Assignment
Week 14	3	Understand nuclear power plant types including PWR and BWR.	Nuclear Power Plant: Pressurised Water Reactor (PWR); Boiling Water Reactor (BWR)	Lecture + examples	Assignment
Week 15	3	Understand energy storage, economics, and environmental aspects of power generation.	Energy Storage; Economics of Power Generation; Environmental Aspects	Lecture + discussion	Assignment
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (30%) includes quizzes and assignments to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (60%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Cengel, Y., Thermodynamics: An Engineering Approach, Seventh Edition.	Yes
<b>Main Reference source</b>	Cengel, Y., Thermodynamics: An Engineering Approach, Seventh Edition.	Yes
<b>Recommended Books</b>	Applied Thermodynamics for Engineering Technologists, Third Edition, by T. D. Eastop.	No
<b>Electronics References Websites</b>	N/A	

# CONTROL SYSTEM ANALYSIS 2

## Course Description Control System Analysis 2

<b>Course Name</b>	Control System Analysis 2
<b>Course Code</b>	MECH-408
<b>Semester / Year</b>	2025-2026 / Second Semester (Year 4)
<b>Description Preparation Date</b>	01/06/2023
<b>Available Attendance Forms</b>	In-person attendance
<b>Number of Credit Hours (Total) / Number of Units (Total)</b>	125 / 5
<b>Course administrator's name</b>	Adel Mahmood Bash Email: Adelbash@tu.edu.iq
<b>Course Aims</b>	Understand the principles and techniques of frequency response analysis in control systems. Develop proficiency in state space analysis of continuous systems. Analyse system stability and performance using state transition matrices. Analyse controllability and observability. Apply modern control design techniques to achieve desired system performance criteria.
<b>Teaching and Learning Strategy</b>	The learning and teaching strategy is designed to carefully cover the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate practical examples. Students are allowed adequate time to practise techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	Understand frequency response characteristics including gain, phase margin, and frequency response plots.	Frequency Response Analysis: Introduction; Frequency Domain Specifications	Lecture + discussion	Homework
Week 2	4	Construct and interpret Bode plots; determine phase and gain margins.	Bode Plot Diagrams; Determination of Phase Margin and Gain Margin	Lecture + examples	Assignment
Week 3	4	Understand state variables, state equations, and state space representations.	State Space Analysis of Continuous Systems: Concepts of State, State Variables, and State Model	Lecture + problem solving	Assignment
Week 4	4	Construct simulation diagrams for state space systems.	Simulation Diagrams	Lecture + examples	Assignment
Week	4	Derive state-variable	State-Variable	Lecture +	Assignment

5		models from transfer functions.	Models from Transfer Function	problem solving	
Week 6	4	Derive transfer functions from state-variable models.	Transfer Functions from State-Variable Models	Lecture + examples	Assignment
Week 7	2	Assessment of weeks 1–6 content.	Midterm Exam	Written exam	Midterm exam
Week 8	4	Determine characteristic equations of state space systems.	Characteristic Equations	Lecture + problem solving	Assignment
Week 9	4	Calculate eigenvalues and eigenvectors of system matrices.	Eigenvalues and Eigenvectors	Lecture + examples	Assignment
Week 10	4	Apply diagonal canonical form transformation to state space systems.	Diagonal Canonical Form	Lecture + problem solving	Assignment
Week 11	4	Understand the concepts and significance of controllability and observability.	Concepts of Controllability and Observability	Lecture + discussion	Seminar
Week 12	4	Apply controllability tests to determine system controllability.	Controllability Tests	Lecture + problem solving	Discussion
Week 13	4	Apply observability tests to determine system observability.	Observability Tests	Lecture + examples	Discussion
Week 14	4	Design state feedback controllers for modern control systems.	Modern Control Design: State Feedback	Lecture + problem solving	Assignment
Week 15	4	Apply pole-placement design to achieve desired system dynamics.	Pole-Placement Design	Lecture + examples	Assignment
Week 16	2	Demonstrate comprehensive mastery of all course topics.	Final Exam	Written exam	Final exam

## Course Evaluation

The evaluation of this course is based on a balanced system of continuous and final assessment. Formative assessment (40%) includes quizzes, assignments, seminars, and discussions to monitor progress throughout the semester. The midterm exam (10%) assesses comprehension of content covered in the first half. The final exam (50%) provides a comprehensive evaluation of all course outcomes.

## Learning and Teaching Resources

	<b>Text</b>	<b>Available in the Library?</b>
<b>Text Book</b>	Modern Control Engineering, Katsuhiko Ogata.	Yes
<b>Main Reference source</b>	Modern Control Engineering, Katsuhiko Ogata.	Yes
<b>Recommended Books</b>	Modern Control Systems, Richard C. Dorf and Robert H. Bishop. Feedback Control of Dynamic Systems, Gene F. Franklin, J. David Powell, and Abbas Emami-Naeini.	No
<b>Electronics References Websites</b>	N/A	

# HVAC

## Course Description Heating, Ventilation and Air Conditioning (HVAC)

Course Name: Heating, Ventilation and Air Conditioning (HVAC)
Course Code: MECH-409
Semester / Year: 2025-2026 - Second Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
150/6
7. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Maki Hag Zaidan, Assist. Prof. Dr. Samer Mahmoud Khalaf Email: makihajzaidan@tu.edu.iq, samerkhalaf@tu.edu.iq
To define the main concepts of Heating, Ventilation and Air Conditioning; to explain the physical differences of HVAC systems; to derive the equations of relative humidity and moisture content; to analyze humidification and dehumidification processes; to develop optimum methods of air mixing and air supply condition; to consider the effect of heat sources on cooling load; to gain awareness of applications such as overall heat transfer coefficient and wall surface temperature calculations; and to understand the principles and performance of heat gain from solar and renewable sources.
The learning and teaching <b>strategy</b> is designed to: use a range of learning and teaching strategies including lectures to provide an overview of main concepts and principles, labs for hands-on experience of devices and instruments, assignments and quizzes to apply knowledge and check understanding, scientific visits and trips for real-life experience, and a project to test the student's knowledge of designing, fabricating and testing one model of HVAC concepts.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	The student will be able to understand and apply concepts related to: Duct design by Constant	Duct design by Constant and regain method	Theoretical lecture + laboratory experiment	Homework / class activity

		and regain method.			
Week 2	4	The student will be able to understand and apply concepts related to: Duct design by velocity method.	Duct design by velocity method	Theoretical lecture + laboratory experiment	Homework / class activity
Week 3	4	The student will be able to understand and apply concepts related to: Fans performance.	Fans performance	Theoretical lecture + laboratory experiment	Homework / class activity
Week 4	4	The student will be able to understand and apply concepts related to: Fan system characteristics curves.	Fan system characteristics curves	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 5	4	The student will be able to understand and apply concepts related to: Fan similarity laws.	Fan similarity laws	Theoretical lecture + laboratory experiment	Homework / class activity
Week 6	4	The student will be able to understand and apply concepts related to: Friction losses in pipes, pipe design.	Friction losses in pipes, pipe design	Theoretical lecture + laboratory experiment	Homework / class activity
Week 7	3	The student will be able to understand and apply concepts related to: Midterm.	Midterm	Theoretical lecture + laboratory experiment	Midterm exam / written test
Week 8	4	The student will be able to understand and apply concepts related to: Pumps system characteristics curves and pump performance.	Pumps system characteristics curves and pump performance	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 9	4	The student will be able to understand and apply concepts related to: Compression refrigeration cycle.	Compression refrigeration cycle	Theoretical lecture + laboratory experiment	Homework / class activity
Week 10	4	The student will be able to understand	Heat pump cycle	Theoretical lecture +	Homework / class activity

		and apply concepts related to: Heat pump cycle.		laboratory experiment	
Week 11	4	The student will be able to understand and apply concepts related to: Refrigerant components for different systems.	Refrigerant components for different systems	Theoretical lecture + laboratory experiment	Homework / class activity
Week 12	4	The student will be able to understand and apply concepts related to: Refrigerant equipment and volumetric efficiency for reciprocating compressor.	Refrigerant equipment and volumetric efficiency for reciprocating compressor	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 13	4	The student will be able to understand and apply concepts related to: Thermally activated absorption technology.	Thermally activated absorption technology	Theoretical lecture + laboratory experiment	Homework / class activity
Week 14	4	The student will be able to understand and apply concepts related to: Absorption cycle.	Absorption cycle	Theoretical lecture + laboratory experiment	Homework / class activity
Week 15	4	The student will be able to understand and apply concepts related to: Heat exchanger of the absorption cycle.	Heat exchanger of the absorption cycle	Theoretical lecture + laboratory experiment	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + laboratory experiment	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

<b>Learning and Teaching Resources</b>	
<b>Text Book</b>	Refrigeration and Air-Conditioning, By Stoecher, First edition, McGraw-Hill, 2006.
<b>Main Reference source</b>	Refrigeration and Air-Conditioning, By Stoecher, First edition, McGraw-Hill, 2006.
<b>Recommended Books</b>	Air-Conditioning and Refrigeration, By Jones, First edition, McGraw-Hill, 1983; مبادئ هندسة التكييف والتدليج، د. خالد، 1986; A Text Book of Hydraulic Machines, R. S. Khurmi.
<b>Electronics References Websites</b>	

# VIBRATION II

## Course Description Vibration II

Course Name: Vibration II
Course Code: MECH-410
Semester / Year: 2025-2026 - Second Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
125/5
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Tahseen Taha Othman Email: Tahseentaha@tu.edu.iq
To enable students to develop a comprehensive understanding of the methodology of linking the behaviors of vibrated bodies, building on the fundamentals covered in Vibration I.
The learning and teaching <b>strategy</b> is designed to: carefully cover in lectures the necessary fundamental material and analytical techniques, demonstrate concepts with appropriate (and where possible practical) examples, and allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	The student will be able to understand and apply concepts related to: Response of un-damped system to harmonic excitation.	Response of un-damped system to harmonic excitation	Theoretical lecture + laboratory experiment	Homework / class activity
Week 2	4	The student will be able to understand and apply concepts related to: Response of damped system to	Response of damped system to harmonic excitation	Theoretical lecture + laboratory experiment	Homework / class activity

		harmonic excitation.			
Week 3	4	The student will be able to understand and apply concepts related to: Amplitude ratio, phase angle.	Amplitude ratio, phase angle	Theoretical lecture + laboratory experiment	Homework / class activity
Week 4	4	The student will be able to understand and apply concepts related to: Quality factor, half-power points.	Quality factor, half-power points	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 5	4	The student will be able to understand and apply concepts related to: Rotating unbalance.	Rotating unbalance	Theoretical lecture + laboratory experiment	Homework / class activity
Week 6	4	The student will be able to understand and apply concepts related to: Applications.	Applications	Theoretical lecture + laboratory experiment	Homework / class activity
Week 7	4	The student will be able to understand and apply concepts related to: Harmonic motion of the base.	Harmonic motion of the base	Theoretical lecture + laboratory experiment	Homework / class activity
Week 8	4	The student will be able to understand and apply concepts related to: Applications.	Applications	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 9	4	The student will be able to understand and apply concepts related to: Vibration measuring instruments (relative motion equation).	Vibration measuring instruments (relative motion equation)	Theoretical lecture + laboratory experiment	Homework / class activity
Week 10	4	The student will be able to understand and apply concepts related to: Accelerometer.	Accelerometer	Theoretical lecture + laboratory experiment	Homework / class activity
Week 11	4	The student will be able to understand and apply concepts related to: Whirling of shafts.	Whirling of shafts	Theoretical lecture + laboratory experiment	Homework / class activity

Week 12	4	The student will be able to understand and apply concepts related to: Harmonic excitation of two DOF systems (linear vibration).	Harmonic excitation of two DOF systems (linear vibration)	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 13	4	The student will be able to understand and apply concepts related to: Harmonic excitation of two DOF systems (torsional vibration).	Harmonic excitation of two DOF systems (torsional vibration)	Theoretical lecture + laboratory experiment	Homework / class activity
Week 14	4	The student will be able to understand and apply concepts related to: Harmonic excitation of two DOF systems (general vibration).	Harmonic excitation of two DOF systems (general vibration)	Theoretical lecture + laboratory experiment	Homework / class activity
Week 15	4	The student will be able to understand and apply concepts related to: Vibration absorbers.	Vibration absorbers	Theoretical lecture + laboratory experiment	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + laboratory experiment	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	Theory of Vibration with Application, William T. Thomson; Mechanical Vibration, Rao.
<b>Main Reference source</b>	Theory of Vibration with Application, William T. Thomson; Mechanical Vibration, Rao.

<b>Recommended Books</b>	Fundamentals of Vibrations, Leonard Meirovitch.
<b>Electronics References Websites</b>	

# INDUSTRIAL ENGINEERING

## Course Description Industrial Engineering

Course Name: Industrial Engineering
Course Code: MECH-412
Semester / Year: 2025-2026 - Second Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
125/5
7. Course administrator's name (mention all, if more than one name)
Name: Mohammed Salih Ahmed Email: Mohammed.Ahmed72@tu.edu.iq
To develop the student's knowledge and introduce him to the importance of industrial engineering and its applications: concepts of industrial engineering, the most important applications of operations research in the industrial field, and the most important features of industry and modern industrial engineering.
The learning and teaching <b>strategy</b> is designed to: carefully cover in lectures the necessary fundamental material and analytical techniques and demonstrate concepts with appropriate (and where possible practical) examples; allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems, in addition to a set of experiments delivered to consolidate the theoretical concepts.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	5	The student will be able to understand and apply concepts related to: Concepts of industrial engineering, applications of operations	Concepts of industrial engineering, applications of operations research in industry, features of modern industrial	Theoretical lecture + discussion/seminar	Homework / class activity

		research in industry, features of modern industrial engineering.	engineering		
Week 2	5	The student will be able to understand and apply concepts related to: Industrial engineering functions.	Industrial engineering functions	Theoretical lecture + discussion/seminar	Homework / class activity
Week 3	5	The student will be able to understand and apply concepts related to: Administrative and technological organization of an industrial facility, plant layout, factors affecting factory layout.	Administrative and technological organization of an industrial facility, plant layout, factors affecting factory layout	Theoretical lecture + discussion/seminar	Homework / class activity
Week 4	5	The student will be able to understand and apply concepts related to: Economic and technical feasibility studies, production costs, break-even analysis.	Economic and technical feasibility studies, production costs, break-even analysis	Theoretical lecture + discussion/seminar	Short quiz / homework
Week 5	5	The student will be able to understand and apply concepts related to: The relationship between cost, profit and volume of production; types of productivity.	The relationship between cost, profit and volume of production; types of productivity	Theoretical lecture + discussion/seminar	Homework / class activity
Week 6	5	The student will be able to understand and apply concepts related to: Work study: main steps of a work study, measuring work content and setting standard time.	Work study: main steps of a work study, measuring work content and setting standard time	Theoretical lecture + discussion/seminar	Homework / class activity

Week 7	3	The student will be able to understand and apply concepts related to: Midterm exam.	Midterm exam	Theoretical lecture + discussion/seminar	Midterm exam / written test
Week 8	5	The student will be able to understand and apply concepts related to: Operations research, linear programming, graphical method.	Operations research, linear programming, graphical method	Theoretical lecture + discussion/seminar	Short quiz / homework
Week 9	5	The student will be able to understand and apply concepts related to: Linear programming: simplex method, basis theorem, dual model, transportation models.	Linear programming: simplex method, basis theorem, dual model, transportation models	Theoretical lecture + discussion/seminar	Homework / class activity
Week 10	5	The student will be able to understand and apply concepts related to: Scheduling and sequence of operations.	Scheduling and sequence of operations	Theoretical lecture + discussion/seminar	Homework / class activity
Week 11	5	The student will be able to understand and apply concepts related to: Storage management: types of storage, inventory control, economic order quantity.	Storage management: types of storage, inventory control, economic order quantity	Theoretical lecture + discussion/seminar	Homework / class activity
Week 12	5	The student will be able to understand and apply concepts related to: Maintenance and replacement.	Maintenance and replacement	Theoretical lecture + discussion/seminar	Short quiz / homework
Week 13	5	The student will be able to understand and apply concepts related to: Reliability:	Reliability: importance and reliability systems	Theoretical lecture + discussion/seminar	Homework / class activity

		importance and reliability systems.			
Week 14	5	The student will be able to understand and apply concepts related to: Location models, project management and PERT technologies, network diagram rules.	Location models, project management and PERT technologies, network diagram rules	Theoretical lecture + discussion/seminar	Homework / class activity
Week 15	5	The student will be able to understand and apply concepts related to: Quality control: types of quality control, sample examination.	Quality control: types of quality control, sample examination	Theoretical lecture + discussion/seminar	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + discussion/seminar	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	
<b>Main Reference source</b>	
<b>Recommended Books</b>	
<b>Electronics References Websites</b>	N/A

# ELECTRICAL MACHINES AND DC GENERATORS

## Course Description Electrical Machines and DC Generators

Course Name: Electrical Machines and DC Generators
Course Code: MECH-412
Semester / Year: 2025-2026 - Second Semester
Description Preparation Date: 01/06/2023
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
125/5
7. Course administrator's name (mention all, if more than one name)
Name: Mohammed Omer Salih Email: eng.mos@tu.edu.iq
To introduce students to the fundamental principles of electric and magnetic fields at low frequencies and provide an overview of the working principles of transformers and DC electrical machines; to teach the construction of DC machines and the principles of commutation and armature reaction; and to introduce various types of DC machines, including their characteristics.
The learning and teaching <b>strategy</b> is designed to: carefully cover in lectures the necessary fundamental material and analytical techniques, demonstrate concepts with appropriate (and where possible practical) examples, and allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	The student will be able to understand and apply concepts related to: General principle of rotating electrical machines.	General principle of rotating electrical machines	Theoretical lecture + laboratory experiment	Homework / class activity
Week 2	4	The student will be able to understand and apply concepts	Construction of DC machines	Theoretical lecture + laboratory	Homework / class activity

		related to: Construction of DC machines.		experiment	
Week 3	4	The student will be able to understand and apply concepts related to: EMF and torque equation of DC machines.	EMF and torque equation of DC machines	Theoretical lecture + laboratory experiment	Homework / class activity
Week 4	4	The student will be able to understand and apply concepts related to: Types of armature winding of DC machines.	Types of armature winding of DC machines	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 5	4	The student will be able to understand and apply concepts related to: Armature reaction in DC machines.	Armature reaction in DC machines	Theoretical lecture + laboratory experiment	Homework / class activity
Week 6	4	The student will be able to understand and apply concepts related to: Calculating demagnetizing and cross-magnetizing force.	Calculating demagnetizing and cross-magnetizing force	Theoretical lecture + laboratory experiment	Homework / class activity
Week 7	3	The student will be able to understand and apply concepts related to: Midterm exam.	Midterm exam	Theoretical lecture + laboratory experiment	Midterm exam / written test
Week 8	4	The student will be able to understand and apply concepts related to: Classification of DC generators.	Classification of DC generators	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 9	4	The student will be able to understand and apply concepts related to: The fundamental characteristics of DC generators.	The fundamental characteristics of DC generators	Theoretical lecture + laboratory experiment	Homework / class activity
Week 10	4	The student will be able to understand and apply concepts related to: Condition required for build-up	Condition required for build-up voltage for self-excited DC generator	Theoretical lecture + laboratory experiment	Homework / class activity

		voltage for self-excited DC generator.			
Week 11	4	The student will be able to understand and apply concepts related to: Formulas and equations of different types of DC generators.	Formulas and equations of different types of DC generators	Theoretical lecture + laboratory experiment	Homework / class activity
Week 12	4	The student will be able to understand and apply concepts related to: Parallel operation of DC generators.	Parallel operation of DC generators	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 13	4	The student will be able to understand and apply concepts related to: Losses and efficiency of DC generator.	Losses and efficiency of DC generator	Theoretical lecture + laboratory experiment	Homework / class activity
Week 14	4	The student will be able to understand and apply concepts related to: Voltage regulation of DC generator.	Voltage regulation of DC generator	Theoretical lecture + laboratory experiment	Homework / class activity
Week 15	4	The student will be able to understand and apply concepts related to: Round up.	Round up	Theoretical lecture + laboratory experiment	Homework / class activity
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + laboratory experiment	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	Electrical Machinery Fundamentals, Stephen J
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	Chapman, 4th edition, McGraw Hill, 2005.
<b>Main Reference source</b>	Electrical Machinery Fundamentals, Stephen J Chapman, 4th edition, McGraw Hill, 2005.
<b>Recommended Books</b>	Electrical Machines, D. P. Kothari and I. J. Nagrath, 4th edition, McGraw Hill, 2010.
<b>Electronics References Websites</b>	<a href="http://umich.edu/~elements/5e/lectures/index.html">http://umich.edu/~elements/5e/lectures/index.html</a>

# ENGINEERING MATERIALS FOR PARTICULAR APPLICATIONS

## Course Description Engineering Materials for Particular Applications

Course Name: Engineering Materials for Particular Applications
Course Code: MECH-211
Semester / Year: 2025-2026 - First/Second Semester
Description Preparation Date: 01/09/2025
5. Available Attendance Forms: in-person attendance.
6. Number of Credit Hours (Total) / Number of Units (Total)
125/5
7. Course administrator's name (mention all, if more than one name)
Name: Saad Ramadhan Ahmed Email: Saadramadhan82@tu.edu.iq
To provide students with a solid understanding of the structure, properties, and performance of engineering materials and their selection for specific applications; to develop the ability to evaluate and choose suitable materials based on mechanical, thermal, chemical, and environmental requirements while considering sustainability, cost, and safety; and to introduce advanced and emerging materials and real-world case studies of performance and failure.
The learning and teaching <b>strategy</b> is designed to: carefully cover in lectures the necessary fundamental material and analytical techniques and demonstrate concepts with appropriate (and where possible practical) examples; allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems, in addition to a set of experiments delivered to consolidate the theoretical concepts.

Week	Hours	Required Learning Outcomes	Unit / Topic Title	Learning Method	Assessment Method
Week 1	4	The student will be able to understand and apply concepts related to: Constitution of alloys, solid solutions, phase diagrams, iron-carbon equilibrium diagram, classification of steel and cast iron.	Constitution of alloys, solid solutions, phase diagrams, iron-carbon equilibrium diagram, classification of steel and cast iron	Theoretical lecture + laboratory experiment	Homework / class activity

Week 2	4	The student will be able to understand and apply concepts related to: Continuation of Week 1 topics.	Continuation of Week 1 topics	Theoretical lecture + laboratory experiment	Homework / class activity
Week 3	4	The student will be able to understand and apply concepts related to: Full annealing, stress relief, normalizing, hardening and tempering of steel; isothermal transformation diagrams; hardenability; case hardening.	Full annealing, stress relief, normalizing, hardening and tempering of steel; isothermal transformation diagrams; hardenability; case hardening	Theoretical lecture + laboratory experiment	Homework / class activity
Week 4	4	The student will be able to understand and apply concepts related to: Continuation of Week 3 topics.	Continuation of Week 3 topics	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 5	4	The student will be able to understand and apply concepts related to: Effect of alloying additions on steel; stainless and tool steels; cast iron; copper and aluminum alloys; bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.	Effect of alloying additions on steel; stainless and tool steels; cast iron; copper and aluminum alloys; bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys	Theoretical lecture + laboratory experiment	Homework / class activity
Week 6	4	The student will be able to understand and apply concepts related to: Continuation of alloying additions topics.	Continuation of alloying additions topics	Theoretical lecture + laboratory experiment	Homework / class activity
Week 7	3	The student will be able to understand and apply concepts related to: Midterm exam.	Midterm exam	Theoretical lecture + laboratory experiment	Midterm exam / written test
Week 8	4	The student will be able to understand and apply concepts related to: Continuation of alloying additions topics.	Continuation of alloying additions topics	Theoretical lecture + laboratory	Short quiz / homework

				experiment	
Week 9	4	The student will be able to understand and apply concepts related to: Continuation of alloying additions topics.	Continuation of alloying additions topics	Theoretical lecture + laboratory experiment	Homework / class activity
Week 10	4	The student will be able to understand and apply concepts related to: Polymers – types, properties and applications; engineering ceramics; composites and applications.	Polymers – types, properties and applications; engineering ceramics; composites and applications	Theoretical lecture + laboratory experiment	Homework / class activity
Week 11	4	The student will be able to understand and apply concepts related to: Continuation of polymers/ceramics/composites topics.	Continuation of polymers/ceramics/composites topics	Theoretical lecture + laboratory experiment	Homework / class activity
Week 12	4	The student will be able to understand and apply concepts related to: Continuation of polymers/ceramics/composites topics.	Continuation of polymers/ceramics/composites topics	Theoretical lecture + laboratory experiment	Short quiz / homework
Week 13	4	The student will be able to understand and apply concepts related to: Mechanisms of plastic deformation, types of fracture, mechanical testing, hardness, impact, fatigue and creep failure mechanisms.	Mechanisms of plastic deformation, types of fracture, mechanical testing, hardness, impact, fatigue and creep failure mechanisms	Theoretical lecture + laboratory experiment	Homework / class activity
Week 14	4	The student will be able to understand and apply concepts related to: Continuation of Week 13 topics.	Continuation of Week 13 topics	Theoretical lecture + laboratory experiment	Homework / class activity
Week 15	4	The student will be able to understand and apply concepts related to: Continuation of Week 13	Continuation of Week 13 topics	Theoretical lecture + laboratory	Homework / class activity

		topics.		experiment	
Week 16	3	The student will be able to understand and apply concepts related to: Final Exam.	Final Exam	Theoretical lecture + laboratory experiment	Final exam

### Course Evaluation

The evaluation of mechanical engineering courses is based on a balanced system of continuous and final assessment to ensure achievement of intended learning outcomes. Formative assessment (40%) includes quizzes, homework, class activities, seminars, and individual or group projects to monitor progress and reinforce learning throughout the semester. The midterm exam (10%) measures comprehension of concepts covered in the first half of the course, while the final exam (50%) provides a comprehensive evaluation of students' mastery of course outcomes at the end of the semester.

### Learning and Teaching Resources

<b>Text Book</b>	Williams D Callister, "Material Science and Engineering", Wiley India Pvt Ltd, Revised Indian Edition, 2014.
<b>Main Reference source</b>	Williams D Callister, "Material Science and Engineering", Wiley India Pvt Ltd, Revised Indian Edition, 2014.
<b>Recommended Books</b>	U.C. Jindal: Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012; Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd., 2015.
<b>Electronics References Websites</b>	N/A

