



جامعة البيان



Academic Program Description Bologna path

Al-Bayan University

Technical College of Engineering

2025-2024

Department of power mechanics
Engineering techniques

2024/9/16

University Al-Bayan University
Faculty/Institute Technical College of Engineering
Scientific Department Department power Mechanics Engineering techniques
Academic/Professional Program Name Bachelor of Science in power Mechanics engineering techniques
Final Certificate Name Bachelor in power mechanics Engineering techniques
Academic System Bologna path
Description Preparation Date 01-09-2024
File Completion Date 16-09-2024

Head of Department

Signe

Name Dr.Sami Khadim Hassan

Date 16-9-2024

Scientific Associate

Signe

Name Dr. Nouf Thabit Mahmood

Date 16-9-2024

This File has been checked by Quality Assurance and University Performance
Director of Quality Assurance and University Performance Department

**Head of Quality Assurance
Section**

Signe

Name Dr. Maryam Qutaiba
Abdalrazak

Date

16-9-2024

Dean Approval

1. Program Vision

The core vision of the department is to equip students to become proficient applied engineers in the field of Mechanical Power Engineering Techniques (PMET). Additionally, it aims to provide an academic environment and community services that keep pace with the rapid advancements in the field of mechanics, offering the latest academic programs to match the scientific departments equivalent to the PMET Department in reputable Arab and international universities.

2. Program Mission

The mission of the PMET Department lies in providing an educational, technological, and research-oriented environment for students through modern educational programs and curricula that highlight the importance of this specialization. It also aims to deliver scientific and practical curricula, as well as advanced applied research, to simulate the needs of the job market. The department strives to engage with industrial institutions, contribute to enhancing service realities on both international and regional levels, and foster collaboration with industrial enterprises.

3. Program Objectives

- Graduating an engineering staff equipped with both scientific and practical skills in diagnosing and repairing faults in systems.
- Preparing competent engineers capable of keeping pace with the rapid developments in the field of mechanics and imparting the necessary skills to develop and update medical devices.
- Designing, installing, operating, and maintaining various thermal and electromechanical systems.
- Contributing to and supervising the continuity, maintenance, and calibration of various refrigeration and air conditioning systems.
- Designing, developing, and exploring alternatives for some components related to systems.
- Scheduling and programming periodic maintenance tasks.

4. The Program Accreditation

N/A

5. Other External Influences

N/A

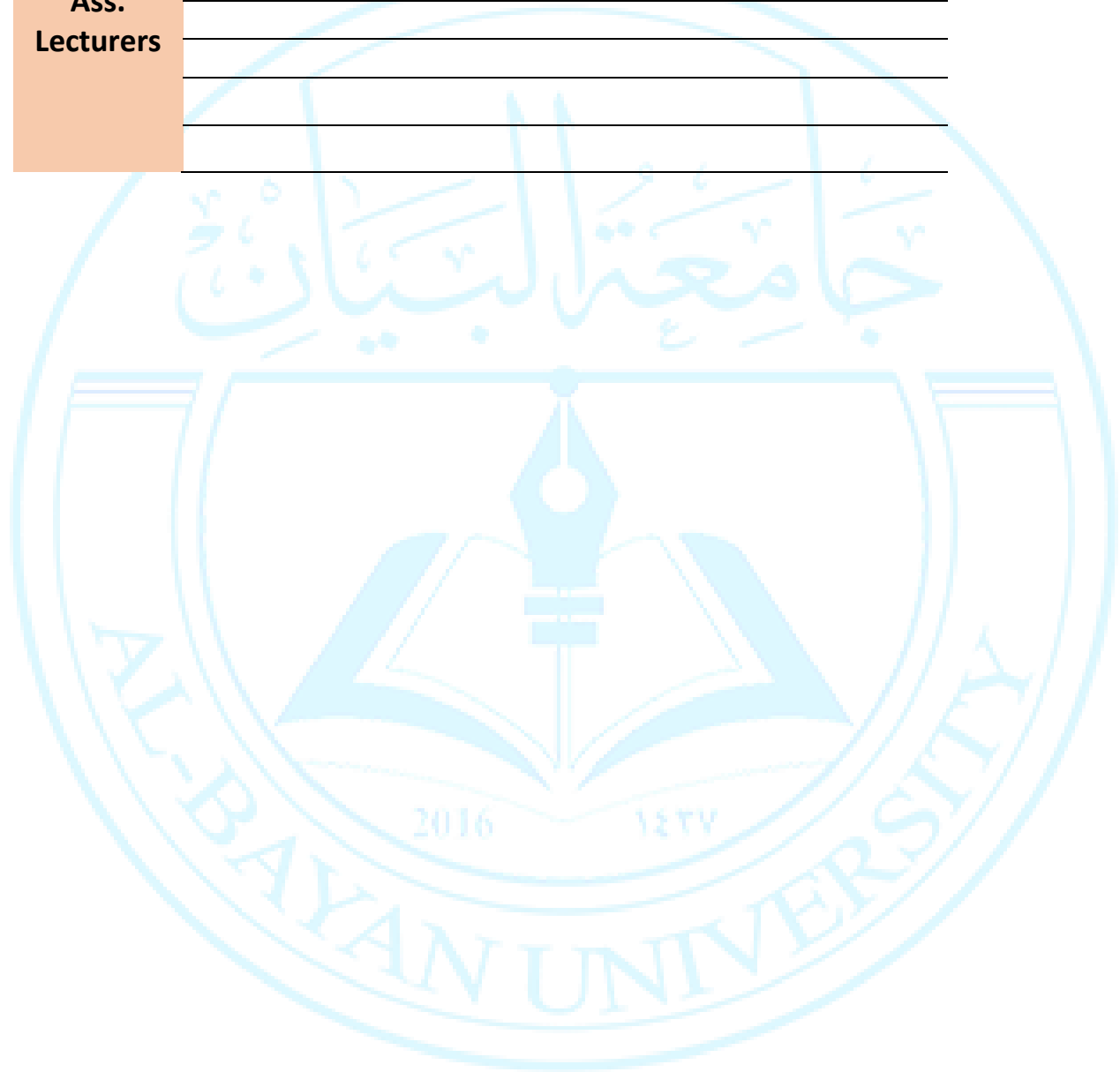
6. Program Description

Year / Level	Course Code	Course Name	Credit Hours	
			Theoretical	Practical
1 st		Bologna path		
2 nd		Bologna path		

7. Faculty Members

Titles	Specialization		Numbers	
	General	Special	Staff	Lec
Prof	Mechanical engineering	Mechanical engineering	1	
Ass. Prof	Mechanical engineering	Mechanical engineering	1	
	Mechanical engineering	Mechanical engineering		

Lecturers	Electronics engineering	Electronics engineering	3
	Nuclear engineering	Nuclear engineering	
Ass. Lecturers	Mechanical engineering	Mechanical engineering	2



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
Module Title	Electrical Machines	Module Delivery	
Module Type	Basic	<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Seminar	
Module Code	PM 206		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2		
Administering Department	PM	College	
Module Leader	Safwan Assaf Hamoodi	e-mail	Safwan79azb@ntu.edu.iq
Module Leader's Acad. Title	Assist. Prof.	Module Leader's Qualification	M.Sc.
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	1/6/2023	Version Number	1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	<ol style="list-style-type: none"> 1. Building a foundation for studying electrical calculations in both AC and DC circuits, and familiarizing students with the various theories used in these calculations. 2. Gaining a comprehensive understanding of electrical principles and concepts, such as voltage, current, resistance, and power. This knowledge will be applied to the analysis of electrical circuits and systems. 3. Developing practical skills in electrical measurements and testing by using various instruments and equipment. Students will learn how to accurately measure electrical parameters, interpret the results, and troubleshoot electrical systems. 4. Applying the acquired knowledge to the operation and maintenance of electrical machines, including motors and generators. Students will

	<p>also explore the fundamentals of power systems, including power generation, transmission, and distribution.</p>
<p style="text-align: center;">Module Learning Outcomes</p>	<ol style="list-style-type: none"> 1. Mastery of electrical circuit theory: Students will acquire a comprehensive understanding of the fundamental principles of electrical circuit theory, encompassing key concepts such as voltage, current, resistance, and power. They will be proficient in applying this knowledge to analyze and solve basic electrical circuits. 2. Proficiency in electrical measurements and testing: Students will develop expertise in utilizing electrical instruments and equipment for precise measurements and thorough testing of electrical parameters. They will learn to interpret measurement outcomes accurately and effectively troubleshoot electrical systems to identify and rectify faults. 3. Application of electrical machines and power systems: Students will explore the principles and workings of electrical machines, including motors and generators, gaining insight into their applications and performance characteristics. Additionally, they will develop a foundational understanding of power systems, encompassing power generation, transmission, and distribution aspects, enabling them to comprehend the broader context of electrical engineering.
<p style="text-align: center;">Indicative Contents</p>	<p>Part A: Fundamentals of Electrical Principles, Measurements, and Instruments [20 hours]</p> <p>Introduction to Electrical Machines, Power Systems, Safety, and Direct Current Circuits [20 hours]</p> <p>Revision Session and Quiz [1.5 hours]</p> <p>Part B: 4. Alternating Current Circuits, Circuit Theory, and Analogue Electronics [20 hours]</p> <p>Control Systems, Renewable Energy, Troubleshooting, and Maintenance [10 hours]</p> <p>Revision Session and Quiz [1.5 hours]</p> <p>Revised Description: Part A of the course focuses on building a strong foundation in electrical engineering. Students will start by understanding the basic principles of electricity, along with electrical measurements and the use of instruments. They will then explore electrical machines, power systems, and safety considerations in the context of direct current circuits. A revision session and quiz will help reinforce the learned concepts.</p>
<p>Learning and Teaching Strategies</p>	

Strategies	<ol style="list-style-type: none"> 1. Active Participation: Actively participate in class discussions to engage with the subject matter and deepen your understanding. 2. Problem-Solving Skills: Develop and enhance your problem-solving skills, as they are essential in Electrical and Electronic Engineering. 3. Practical Application: Gain hands-on experience through laboratory sessions and projects, allowing you to apply theoretical concepts to real-world scenarios. 4. Collaborative Learning: Foster collaborative learning by actively engaging in group discussions and study sessions with your peers. 5. Utilize Learning Resources: Make effective use of various resources such as textbooks, online tutorials, video lectures, and educational websites to supplement your learning and broaden your knowledge. 6. Time Management: Manage your time effectively by creating a study schedule and dedicating specific time slots for studying Electrical and Electronic Engineering. 7. Regular Review and Recap: Continuously review previously covered topics to reinforce your understanding and ensure long-term retention of the learned material.
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Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

Module Evaluation					
	As	Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	Continuous	LO #5,#7,#9 and #11
	Assignments	4	5% (10)	Continuous	LO #1,#5 and #6
	Projects / Lab.	4	15% (10)	Continuous	LO #3,#8,#9 and #10
	Report	4	10% (10)	Continuous	LO #2,#4,#5 and #6
Summative assessment	Midterm Exam	2hr.	10% (10)	7	LO #1 - #2
	Final Exam	2hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
Week	Material Covered
Week 1	D.C motors, construction, commutator, types of D.C motors
Week 2	Back e.m.f, speed equation, speed control
Week 3	Load Toque Requirement, types Load Torque
Week 4	Starting of D.C motor, starter connection, torque of D.C motors
Week 5	Speed-torque characteristics of each type of D.C motor
Week 6	Examples to evaluate the starting current of D.C motor with and without starter, speed control
Week 7	Single phase induction motor, split-phase, capacitor-start, shaded-pole type
Week 8	3-phase induction motor, construction, synch. Speed, slip.
Week 9	Control of three-phase induction motor using voltage frequency control.
Week 10	Starting of 3-phase induction motor, star-delta method, step down transformer
Week 11	Torque characteristic, max torque
Week 12	3-phase system, star and delta connection, line current, line voltage, phase current and voltage
Week 13	Instruments and measurements, ammeters, voltmeter, ohmmeter, kw - h meters.
Week 14	Contactors, relays, timers
Week 15	Thermal overload, starter (contactor +timer)
Week 16	Final Examination

Delivery Plan (Weekly Lab. Syllabus)

Week	Material Covered
Week 1	Lab 1: Basic wiring diagram for electrical measurements
Week 2	Lab 2: Measurement of inductive reactance of comp. windings
Week 3	Lab 3: Test of current, voltage and solid-state relay
Week 4	Lab 4: Test and calibrate pressure switch and thermostat
Week 5	Lab 5: Test of overload and defrost.
Week 6	Lab 6: Start-up compressor with solid state relay.
Week 7	Lab 7: Start-up compressor with current relay
Week 8	Lab 8: Rotor Voltage Control of Induction Motor
Week 9	Lab 9: Frequency Control of Induction Motor
Week 11	Lab 10: slip power control by dc converter of Induction Motor
Week 12	Lab 11: Single phase Dismantling of induction motor
Week 13	Lab 12: Make fault on voltage and current relay, effect of faults
Week 14	Lab 13: damage, notice the effects
Week 15	Lab 14: Dismantling of induction motor

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	<ol style="list-style-type: none"> "Electric Machinery and Power System Fundamentals" by Stephen J. Chapman "Electricity and Electronics for HVAC" by Rex Miller and Mark R. Miller "Principles of Electric Machines and Power Electronics" by P.C. Sen "Electrical Power Systems: Design and Analysis" by Mohamed E. El-Hawary 	
Recommended Texts	<ol style="list-style-type: none"> "Electrical Wiring Residential" by Ray C. Mullin and Phil Simmons "Industrial Electrical Troubleshooting" by Lynn Lundquist "Electrical Safety Handbook" by John Cadick, Mary Capelli - Schellpfeffer, and Dennis Neitzel "Digital Control Systems" by Benjamin C. Kuo "Electromechanical Energy Conversion" by David J. Braun 	
Websites	<p>(www.allaboutcircuits.com) (www.electrical4u.com) (www.khanacademy.org)</p>	

Grading Scheme

مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module 1

Code	Course/Module Title	ECTS	Semester
PM 206	Electrical Machines	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	2	63	87
Description			
<p>Electrical and Electronic Engineering is a dynamic and rapidly evolving field that focuses on the study, design, and application of electrical systems, devices, and technologies. This discipline plays a critical role in shaping the modern world, as it encompasses a wide range of areas, including power generation and distribution, communication systems, electronics, control systems, and renewable energy.</p> <p>In Electrical and Electronic Engineering, students delve into the fundamental principles of electricity, circuits, and electromagnetism. They learn how to analyze and design electrical systems, apply mathematical and scientific principles to solve complex problems, and utilize advanced tools and software for simulation and modeling.</p> <p>The field emphasizes hands-on experience through laboratory work, where students gain practical skills in building, testing, and troubleshooting electrical circuits and devices. They also explore emerging technologies, such as renewable energy sources and sustainable power systems, to address the growing demand for cleaner and more efficient energy solutions.</p> <p>Through their studies, students develop a strong foundation in engineering principles, critical thinking, problem-solving, and project management. They become adept at designing, implementing, and maintaining electrical and electronic systems that are safe, reliable, and sustainable. Graduates of Electrical and Electronic Engineering programs find diverse career opportunities in industries such as power generation, telecommunications, electronics, automation, and research and development.</p>			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Engineering Materials		Module Delivery	
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	PM 204			
ECTS Credits	7			
SWL (hr/sem)	175			
Module Level	2	Semester of Delivery		4
Administering Department	PM	College	TEMO	
Module Leader	Dr. Jamal. N. Sultan		e-mail	Jamal.nayyef@ntu.edu.iq
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.
Module Tutor			e-mail	
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date	01/09/2024	Version Number		

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Objectives أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> 1. Understand the Structure of Materials: Learn about the atomic and molecular structure of materials, including the arrangement of atoms, crystal structures, and the relationship between structure and material properties. 2. Study Material Properties: Explore the various physical and mechanical properties of materials such as strength, hardness, elasticity, conductivity, thermal expansion, and corrosion resistance. Understand how these properties influence the behavior of materials in different applications. 3. Learn about Material Processing: Gain knowledge about different manufacturing and processing techniques used to modify the structure and properties of materials. This may include topics such as casting, forging, welding, heat treatment, and surface treatment. 4. Comprehend Material Selection: Understand the principles and criteria for selecting materials for specific engineering applications. Consider factors such as mechanical requirements, environmental conditions, cost, and sustainability in the material selection process. 5. Explore Material Failure and Fracture: Study the causes and mechanisms of material failure, including fracture, fatigue, creep, and wear. Learn how to analyze and prevent failures through the application of material science principles. 6. Examine Material Testing and Characterization: Familiarize yourself with different experimental techniques and methods used to evaluate material properties and performance. This may include tensile testing, hardness testing, microscopy, spectroscopy, and non-destructive testing. 7. Understand Material Behavior under Different Conditions: Learn how materials respond to external factors such as temperature, pressure, and loading conditions. Study the concepts of elasticity, plasticity, viscoelasticity, and the behavior of materials at extreme temperatures. 8. Gain Knowledge of Material Sustainability: Explore the concepts of sustainable materials, recycling, and environmental impact assessment. Understand the importance of considering the lifecycle of materials and their ecological footprint. 9. Develop Material Design Skills: Apply material selection principles and knowledge of material properties to design components and systems that meet specific engineering requirements. Understand the relationship between material properties, manufacturing processes, and design optimization. 10. Enhance Problem-Solving Abilities: Develop critical thinking and problem-solving skills related to material selection, material performance, and failure analysis. Apply theoretical knowledge to practical engineering challenges.
<p>Module Learning Outcomes</p>	<ol style="list-style-type: none"> 1. Knowledge of Material Properties: Students should gain a comprehensive understanding of the fundamental properties of different engineering materials such as metals, polymers, ceramics, and composites. This includes knowledge of mechanical properties (strength, stiffness, toughness), thermal properties (conductivity, expansion), electrical

<p>مخرجات التعلم للمادة الدراسية</p>	<p>properties, corrosion resistance, and other relevant characteristics.</p> <ol style="list-style-type: none"> 2. Material Selection and Application: Students should learn how to select appropriate materials for specific engineering applications based on their properties, performance requirements, and cost considerations. They should be able to analyze and evaluate material properties and make informed decisions regarding material selection for various engineering designs and applications. 3. Material Processing and Manufacturing: Students should acquire knowledge of different material processing and manufacturing techniques, including casting, forming, machining, welding, heat treatment, and surface treatment. They should understand how these processes affect material properties and performance, and be able to choose appropriate manufacturing methods for specific materials and applications. 4. Material Testing and Characterization: Students should learn various techniques for testing and characterizing engineering materials, such as tensile testing, hardness testing, impact testing, microscopy, spectroscopy, and non-destructive testing methods. They should gain practical experience in conducting material tests, interpreting test results, and relating them to material properties. 5. Material Failure Analysis: Students should develop an understanding of the causes and mechanisms of material failure, including factors such as fatigue, fracture, creep, and environmental degradation. They should be able to analyze and diagnose material failures and propose appropriate solutions to prevent or mitigate such failures. 6. Material Sustainability and Environmental Impact: Students should gain an awareness of the environmental and sustainability aspects related to engineering materials. This includes understanding the life cycle of materials, recycling and waste management, energy consumption, and the environmental impact of different material choices. They should be able to consider sustainability principles when selecting and designing with materials. 7. Professional and Ethical Considerations: Students should develop an understanding of the professional and ethical responsibilities associated with working with engineering materials. This includes considerations such as safety protocols, regulatory compliance, intellectual property, and ethical practices in material selection, testing, and manufacturing. <p>These learning outcomes aim to provide students with a solid foundation in the properties, selection, processing, testing, and application of engineering materials, enabling them to make informed decisions and contribute effectively in various engineering disciplines.</p>
<p>Indicative Contents المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <ol style="list-style-type: none"> 1. Metals: <ul style="list-style-type: none"> ● Ferrous Metals: Iron, Carbon, Manganese, Chromium, Nickel, Molybdenum, etc. ● Non-Ferrous Metals: Aluminum, Copper, Zinc, Lead, Tin, Titanium, etc. 2. Polymers (Plastics): <ul style="list-style-type: none"> ● Polyethylene: Ethylene monomer units

	<ul style="list-style-type: none"> ● Polypropylene: Propylene monomer units ● Polyvinyl Chloride (PVC): Vinyl Chloride monomer units ● Polystyrene: Styrene monomer units ● Polyethylene Terephthalate (PET): Ethylene Glycol, Terephthalic Acid <p>3. Ceramics:</p> <ul style="list-style-type: none"> ● Traditional Ceramics: Clay, Feldspar, Silica, Alumina ● Advanced Ceramics: Zirconia, Silicon Carbide, Aluminum Nitride, Boron Nitride <p>4. Composites:</p> <ul style="list-style-type: none"> ● Fiber Reinforced Composites: Glass fibers, Carbon fibers, Aramid fibers ● Matrix Materials: Epoxy resins, Polyester resins, Thermoplastics <p>5. Semiconductors:</p> <ul style="list-style-type: none"> ● Silicon: Pure silicon with small amounts of impurities (dopants) like Boron or Phosphorus <p>6. Concrete:</p> <ul style="list-style-type: none"> ● Cement: Portland cement (mainly composed of Calcium, Silicon, Aluminum, Iron) ● Aggregates: Crushed stone, Sand, Gravel <p>7. Wood:</p> <ul style="list-style-type: none"> ● Cellulose: Main constituent of wood ● Lignin: Provides rigidity and strength to wood <p>8. Glass:</p> <ul style="list-style-type: none"> ● Silica: Main component of glass ● Various additives: Sodium carbonate, Calcium oxide, Aluminum oxide, etc.
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	<ol style="list-style-type: none"> 1. Active Learning: Engage students in hands-on activities, experiments, and projects that involve working with engineering materials. This could include laboratory sessions, case studies, or design projects that require students to apply their knowledge to real-world problems. 2. Visualization Tools: Utilize visualization tools such as diagrams, models, and simulations to help students understand the structure, properties, and behavior of different engineering materials. This can enhance their conceptual understanding and make complex concepts more accessible.
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3. **Practical Examples:** Provide practical examples of engineering materials used in real-world applications. Showcase the materials' properties and performance in various industries, such as aerospace, automotive, or construction. This can help students connect theoretical knowledge with practical relevance.
4. **Collaborative Learning:** Encourage collaboration among students through group discussions, team projects, and peer learning. This fosters active engagement and allows students to learn from each other's perspectives and experiences. Assigning group projects that involve materials selection, analysis, or testing can enhance teamwork and problem-solving skills.
5. **Problem-Based Learning:** Present students with real or hypothetical engineering problems that require material selection or analysis. This approach promotes critical thinking, problem-solving skills, and the application of theoretical knowledge to practical scenarios. Encourage students to research, analyze, and propose solutions using appropriate materials.
6. **Multimedia Resources:** Utilize multimedia resources such as videos, interactive websites, and online simulations to supplement classroom lectures and textbooks. These resources can provide visual representations, demonstrations, and interactive experiences that enhance understanding and engagement.
7. **Guest Speakers and Industrial Visits:** Invite industry professionals, researchers, or experts in materials engineering to give guest lectures or organize industrial visits. This exposes students to real-world applications, current research trends, and industry practices, providing valuable insights and networking opportunities.
8. **Formative Assessment:** Incorporate formative assessment methods such as quizzes, concept maps, or short assignments to gauge students' understanding of engineering materials throughout the learning process. This helps identify areas of improvement and allows for timely feedback and clarification.
9. **Scaffolded Learning:** Break down complex concepts into smaller, more manageable units and provide scaffolding to support students' learning progression. Start with foundational knowledge and gradually build up to more advanced topics, ensuring students grasp fundamental principles before moving forward.
10. **Reflective Practices:** Encourage students to reflect on their learning experiences, make connections between theory and practice, and identify areas of improvement. Incorporate reflective exercises, journals, or group discussions to promote metacognitive skills and enhance self-directed learning.



Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	112	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	Continuous	LO #1, #2, #4, #7, #8 and #9
	Assignments	4	5% (10)	Continuous	LO #1, #4, #5, #6, #8, #10 and #11
	Projects / Lab.	5	15% (10)	Continuous	LO #2, #3, #5, #7, #9 and #11
	Report	5	10 % (10)	Continuous	LO #2, #5, #7, #9 and #11
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Engineering Materials: <ul style="list-style-type: none"> • Importance of materials in engineering. • Classification and properties of materials. • Structure of materials: atomic, crystalline, and non-crystalline materials. • FCC, BCC, CPH structures.
Week 2	Atom binding: Ionic bond, covalent bond, metallic bond, Van der Waals forces.
Week 3	Crystalline defects: dislocations, types of dislocations
Week 4	Phase Diagrams and Phase Transformations: <ul style="list-style-type: none"> • Phase equilibrium and phase diagrams. • Solidification, different crystals form in an ingot, castings defects. • Heat treatment processes (e.g., annealing, quenching, tempering).
Week 5	Mechanical Properties of Materials: <ul style="list-style-type: none"> • Stress and strain. • Elasticity and plasticity. • Tensile, compressive, and shear behavior. • Hardness, toughness, and impact resistance.

Week 6	<p>Metals and Alloys:</p> <ul style="list-style-type: none"> • Strengthening mechanisms: solid solution, precipitation, and dispersion strengthening. • Ferrous and non-ferrous metals and alloys. • Corrosion and oxidation of metals.
Week 7	Creep test.
Week 8	Fatigue test.
Week 9	Iron-making and steel making.
Week 10	Thermal equilibrium diagram for Iron-iron carbide.
Week 11	Types of steels: carbon steel, alloy steel.
Week 12	<p>Advanced Topics:</p> <ul style="list-style-type: none"> • Nanomaterials and nanotechnology. • Biomaterials and medical applications.
Week 13	<p>Ceramics:</p> <ul style="list-style-type: none"> • Structure and properties of ceramics. • Types of ceramics: oxides, non-oxides, composites. • Ceramic processing techniques. • Applications and limitations of ceramics.
Week 14	<p>Polymers and Composite Materials:</p> <ul style="list-style-type: none"> • Polymer structure and properties. • Polymerization techniques. • Thermoplastics and thermosetting polymers. • Composite materials: types, properties, and applications.
Week 15	<p>Material Selection and Design:</p> <ul style="list-style-type: none"> • Material selection criteria. • Design considerations and constraints. • Failure analysis and prevention. • Sustainability and environmental aspects of materials.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to Mechanical Tests.
Week 2	Lab 2: Impact Test.
Week 3	Lab 3: Fatigue Test.
Week 4	Lab 4: Specimen Preparation For Microscopic Examination.
Week 5	Lab 5: Microscopic Examination of Different Types of Steel.
Week 6	Lab 6: Heat Treatments of Steel.
Week 7	Lab 7 Surface Hardening of Steel.
Week 8	Lab 8: Thermal Equilibrium Diagrams of Two Metals Completely Soluble in Each Other in Liquid States.
Week 9	Lab 9: Microstructure Examination of Stainless Steel .
Week 10	Lab 10: Microstructure Examination of Cast Iron.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. "Materials Science and Engineering: An Introduction" by William D. Callister Jr. and David G. Rethwisch.	Yes
Recommended Texts	1. "Introduction to Materials Science for Engineers" by James F. Shackelford. 2. "Mechanical Metallurgy" by George E. Dieter. 3. "Fundamentals of Materials Science and Engineering" by William D. Callister Jr. and David G. Rethwisch. 4. "Engineering Materials 1: An Introduction to Properties, Applications, and Design" by Michael F. Ashby and David R. H. Jones.	No
Websites	1. Materials Research Society (MRS) - The MRS website (www.mrs.org) offers a wide range of materials science resources, including journals, publications, news, events, and educational materials. It is a leading organization dedicated to advancing the field of materials research.	

2. American Ceramic Society (ACerS) - The ACerS website (www.ceramics.org) focuses specifically on ceramic materials. It provides access to journals, conferences, educational resources, and news related to ceramics and other related materials.
3. Materials Today - Materials Today (www.materialstoday.com) is an online platform that covers various aspects of materials science, including news, articles, reviews, and interviews. It covers a broad range of material classes, such as metals, polymers, composites, and nanomaterials.
4. ASM International - ASM International (www.asminternational.org) is an organization that focuses on the science and engineering of materials. Their website provides access to technical publications, educational resources, events, and a knowledge base with information on various materials and their applications.
5. National Institute of Standards and Technology (NIST) - The NIST website (www.nist.gov/materials-science-and-engineering) offers resources related to materials science and engineering, including research papers, databases, measurement techniques, and standards. It is a valuable resource for those interested in materials characterization and properties.
6. Elsevier Materials Science - Elsevier's Materials Science website (www.elsevier.com/physical-sciences/materials-science) provides access to a wide range of scientific journals and publications in the field of materials science. It covers topics such as materials synthesis, characterization, properties, and applications.

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module 1

Code	Course/Module Title	ECTS	Semester
PM 204	Engineering Materials	7	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	2	63	112
Description			
<p>7. Engineering materials are vital substances used in various engineering applications. They possess specific physical and chemical properties that make them suitable for specific purposes. These materials can be classified into metals, ceramics, polymers, composites, and specialized materials.</p> <p>8. Metals are versatile with excellent strength, ductility, and conductivity. Steel, aluminum, copper, and titanium are commonly used metals in engineering. Ceramics are hard, brittle materials with high melting points. They exhibit resistance to heat, wear, and corrosion. Alumina, silicon carbide, and porcelain are examples of ceramics.</p> <p>9. Polymers, also known as plastics, are lightweight materials with flexibility and corrosion resistance. They can be easily molded into various shapes. Polyethylene, polystyrene, and PVC are commonly used polymers. Composites are engineered materials made from different constituent materials, providing enhanced properties such as high strength and low weight. Fiberglass and carbon fiber reinforced polymers are examples of composites.</p> <p>10. Specialized materials include semiconductors for electronic devices, superconductors for energy applications, and biomaterials for medical implants. Each material type has unique characteristics and is selected based on specific engineering requirements.</p> <p>11. Overall, understanding engineering materials is essential for selecting the right materials for various applications and ensuring optimal performance in engineering projects.</p>			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Strength of Materials		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	PM 203		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	2	Semester of Delivery	
Administering Department	PM	College	TEMO
Module Leader	Hussein Mohammed Ali	e-mail	alabadi.hussein@ntu.edu.iq
Module Leader's Acad. Title	Assist. Professor	Module Leader's Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	01/09/2024	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Objectives أهداف المادة الدراسية</p>	<p>1) To know different types of the stresses which may subjected to the mechanical elements and their expected effects such as strain. 2) To study the shear forces and bending moment diagrams with essential stresses</p>
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<p>Students who successfully complete this course will have demonstrated an ability to:</p> <ol style="list-style-type: none"> 1. Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials. 2. Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings. 3. Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels. 4. Determine the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading. 5. Determine and illustrate principal stresses, maximum shearing stress, and the stresses acting on a structural member. 6. Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural. 7. Analyze slender, long columns subjected to axial loads. 8. Design simple bars, beams, and circular shafts for allowable stresses and loads.
<p>Indicative Contents المحتويات الإرشادية</p>	<ol style="list-style-type: none"> 1. Introduction to Strength of Materials A. Definition and Importance of Strength of Materials B. Historical Background C. Applications of Strength of Materials 2. Stress and Strain A. Basic Definitions B. Types of Stresses C. Types of Strains D. Hooke's Law 3. Axial Loading A. Normal Stress and Strain B. Deformation of Axially Loaded Members C. Stress-Strain Diagrams D. Elastic and Plastic Deformation E. Factor of Safety 4. Torsion A. Torque and Torsional Shear Stress B. Polar Moment of Inertia C. Torsional Deformation D. Power Transmission in Shafts 5. Bending

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	(63/15)= 4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	112	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	(112/15)= 7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	Continuous	LO #1, #2, #4, #7, #8 and #9
	Assignments	4	5% (10)	Continuous	LO #1, #4, #5, #6, #8, #10 and #11
	Projects / Lab.	5	15% (10)	Continuous	LO #2, #3, #5, #7, #9 and #11
	Report	5	10 % (10)	Continuous	LO #2, #5, #7, #9 and #11
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		



Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Simple stress
Week 2	Shearing stress, Bearing stress
Week 3	Thin wall cylinders
Week 4	Simple strain, stress-strain diagram, Hook's law
Week 5	Thermal stress
Week 6	Welded connection
Week 7	Riveted joints
Week 8	Torsion
Week 9	Spring
Week 10	Shear and moment in Beam
Week 11	Beam deflection
Week 12	Deflection cantilever Beam
Week 13	Deflection of simply supported Beam
Week 14	Combined stresses
Week 15	Stress at a point /Mohr circle
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to Strength of materials
Week 2	Lab 2: Brinell Hardness Test
Week 3	Lab 3: Rockwell Hardness Test
Week 4	Lab 4: Vickers Hardness Test
Week 5	Lab 5: Tensile Test
Week 6	Lab 6: Compression Test
Week 7	Lab 7: Torsion Test
Week 8	Lab 8: Creep Test
Week 9	Lab 9: Spring Stiffness
Week 10	Lab 10: Deflection in Cantilever Beam Test

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Strength of Materials, Ferdinand L. Singer and Andrew Pytel.	Yes
Recommended Texts	Schaum's Outline of Strength of Materials	No
Websites	https://www.coursera.org/learn/mechanics-1	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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Module 1

Code	Course/Module Title	ECTS	Semester
PM 203	Strength of Materials	7	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	2	63	112

Description

The field of strength of materials, also known as mechanics of materials, focuses on analyzing the stresses and strains experienced by structural components like beams, columns, and shafts. Engineers use different techniques to determine how these structures will respond to loads and potential failure modes. This analysis takes into consideration material properties, including yield strength, ultimate strength, Young's modulus, and Poisson's ratio. By understanding these properties, engineers can predict the behavior of a structure and design it to withstand the expected forces and stresses. Strength of materials is essential in ensuring the structural integrity and safety of engineering projects.



MODULE DESCRIPTION FORM

Module Information				
Module Title	Thermodynamics		Module Delivery	
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	PM 201			
ECTS Credits	8			
SWL (hr/sem)	123			
Module Level	2	Semester of Deliver		4
Administering Department	PM	College	TEMO	
Module Leader	Anwar Ahmed Yousif		e-mail	nawarayousif@ntu.edu.iq
Module Leader's Acad. Title	lecturer	Module Leader's Qualification	MSc. Mechanical Engineering	
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	01/09/2024	Version Number	1.0	

Relation with other Modules				
Prerequisite module			Semester	
Co-requisites module	PM 102		Semester	2

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	<ol style="list-style-type: none"> 1. The aim is to enhance problem-solving abilities and gain a comprehensive comprehension of thermodynamics theory by utilizing various methodologies. 2. The objective is to grasp the principles of thermodynamics and the laws governing energy. 3. The course primarily focuses on the fundamental notions of heat, work, and energy. 4. This subject serves as a foundational component for understanding different systems employed in thermodynamics. 5. The goal is to comprehend the principles that govern the conversion of energy between different thermodynamic systems. 6. Students will be introduced to the field of thermodynamics through the examination of thermal systems and their interactions with the surrounding environment in terms of energy.
Module Learning Outcomes	<ol style="list-style-type: none"> 1. Classify and define various terms related to thermodynamics. 2. Provide a concise explanation of the concept of thermodynamics. 3. Analyze the involvement and behavior of atoms in chemical reactions. 4. Explain the concepts of thermal energy, work, and energy in the context of thermodynamics. 5. Define Boyle's law and understand its significance in thermodynamics. 6. Differentiate between open and closed systems and comprehend their respective applications. 7. Explore the processes of heat transfer between thermal systems. 8. Evaluate the characteristics and functions of measuring devices used in laboratory settings. 9. Elaborate on Joule's law and its implications in thermodynamics. 10. Identify and apply relevant mathematical relationships for problem-solving purposes.
Indicative Contents	<p>Part A</p> <p>Course Introduction: This initial module provides an introduction to the course, including an overview of the content and objectives. It also introduces the recommended textbooks and outlines the different units that will be covered. [15 hrs]</p> <p>Key Definitions: In this module, we will focus on important definitions related to force, pressure, and system. By understanding these fundamental concepts, students will be better equipped to grasp the subsequent topics. [15 hrs]</p> <p>Pressure and its Types: This module explores the concept of pressure in detail, examining its various types and their respective characteristics and</p>

applications. Students will spend significant time understanding and analyzing pressure in different contexts.. [10 hrs]

Specific Heat at Constant Pressure and Volume: This module covers specific heat and its variations under constant pressure and constant volume conditions. Students will gain an understanding of the significance of specific heat and its practical implications. The module will also address closed system procedures, including those related to constant volume and constant pressure conditions. [15 hrs]

Revision problem classes [6 hrs]

Part B

Fundamentals:

Temperature: This section covers the measurement of temperature, including units of measurement, conversion between different scales, various measuring methods, and the principles of the Zeroth Law of Thermodynamics.

Energy: The concept of energy is defined, and different forms of energy such as potential, kinetic, and thermal energy are explained. Work, capacity, flow work, and pressure diagrams are also discussed. Internal energy and enthalpy are introduced as important thermodynamic properties. [9 hrs]

Steam Procedures and Pressure-Volume Chart: This topic focuses on the procedures related to steam and their representation on a pressure-volume chart. Students will learn about the behavior of steam during various processes and how to interpret and analyze such processes graphically. [10 hrs]

Types of Pressure Gauges in Refrigeration: This section covers the different types of pressure gauges commonly used in refrigeration systems. Students will become familiar with these gauges, their working principles, and their specific applications in refrigeration processes. [6 hrs]

Types of Air Velocity Gauges and Their Uses: This topic explores the various types of air velocity gauges and their respective uses. Students will learn about the different instruments used to measure air velocity and how these measurements are relevant in various contexts, such as HVAC systems or airflow analysis. [6 hrs]

Learning and Teaching Strategies

Strategies	The primary methodology employed in delivering this module aims to actively involve students in exercises that will enhance their critical thinking skills and promote engagement. This will be achieved through a combination of lectures, interactive tutorials, and the inclusion of various types of simple experiments. These experiments will be designed to captivate students' interest and provide hands-on experience in the subject matter. The overall objective is to encourage active learning, foster critical thinking, and create an engaging learning environment for the students.
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Student Workload (SWL)

Structured SWL (h/sem)	123	Structured SWL (h/w)	8
Unstructured SWL (h/sem)	77	Unstructured SWL (h/w)	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	Continuous	LO #1, #2, #4, #5 and #6
	Assignments	4	5% (10)	Continuous	LO #1, #4, #5 and #6
	Projects / Lab.	5	15% (10)	Continuous	LO #2, #3, #5, #7, #9 and #11
	Report	5	10% (10)	Continuous	LO #2, #3, #5, #7, #9 and #11
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Thermodynamics; Overview, system, surroundings, boundary, properties
Week 2	First Law of Thermodynamics; Energy transfer and work, Heat transfer and thermal energy, Conservation of energy principle
Week 3	Second Law of Thermodynamics; Heat engines and refrigerators, Carnot cycle and efficiency, Entropy and its significance
Week 4	Entropy and its Applications; Calculation of entropy changes, Entropy generation and irreversibility, Entropy balance in thermodynamic processes
Week 5	Properties of Pure Substances; Equations of state, Phase diagrams and phase equilibrium, Ideal gas behavior
Week 6	Vapor and Gas Power Cycles; Rankine cycle, Brayton cycle, Combined cycles
Week 7	Refrigeration and Heat Pump Systems; Vapor compression refrigeration, Absorption refrigeration, Coefficient of Performance (COP)
Week 8	Thermodynamic Property Relations; Maxwell's equations, Departure functions, Compressibility factor
Week 9	Mixtures and Psychometrics; Properties of mixtures, Psychrometric properties and processes, Air conditioning and humidity control
Week 10	Chemical Reactions and Thermodynamics; Enthalpy of reactions, Gibbs free energy and chemical equilibrium, Chemical equilibrium constant
Week 11	Exergy and Second Law Analysis; Exergy analysis and applications, Availability and irreversibility, Second law efficiency
Week 12	Power and Refrigeration Cycles; Gas power cycles (Otto, Diesel, and more), Refrigeration cycles (Cascade, Multi-stage, etc.)
Week 13	Introduction to Heat Transfer; Modes of heat transfer (conduction, convection, radiation), Fourier's law, Newton's law of cooling, Stefan-Boltzmann law
Week 14	Heat Exchangers; Types of heat exchangers, Effectiveness-NTU method, Heat exchanger design and analysis
Week 15	Review and Applications; Review of key concepts and principles, Applications of thermodynamics in various industries, Final exam preparation
Week 16	Preparatory week before the final Exam



Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to Laboratory Safety and Equipment
Week 2	Lab 2: Measurement of Temperature and Heat Transfer; Calibration, Determination of heat transfer coefficients, Analysis of heat conduction experiments
Week 3	Lab 3: Measurement of Pressure and Flow; Calibration, Measurement of pressure drops in flow systems, Flow rate measurements using different devices (venturi meter, orifice plate, et
Week 4	Lab 4: Measurement of Thermodynamic Properties; Determination of specific heat capacity of substances, Measurement of enthalpy changes in chemical reactions, Calculation of thermodynamic properties using steam tables or software
Week 5	Lab 5: Performance Analysis of Heat Engines and Refrigeration Systems
Week 6	Lab 6: Experimental Analysis of Energy Conversion Systems
Week 7	Lab 7: Data Analysis and Report Writing

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ol style="list-style-type: none"> 1. "Thermodynamics: An Engineering Approach" by Yunus A. Çengel and Michael A. Boles 2. "Fundamentals of Engineering Thermodynamics" by Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey 3. "Introduction to Chemical Engineering Thermodynamics" by J.M. Smith, Hendrick C. Van Ness, Michael M. Abbott, and Mark T. Swihart 	No
Recommended Texts	<ol style="list-style-type: none"> 1. "Thermodynamics: An Engineering Approach" by Yunus A. Çengel and Michael A. Boles 2. "Fundamentals of Engineering Thermodynamics" by Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey 3. "Introduction to Chemical Engineering Thermodynamics" by J.M. Smith, Hendrick C. Van Ness, Michael M. Abbott, and Mark T. Swihart 	No
Recommended Texts	Heat and mass transfer (SI UNITS) (Er. R. K. RAJPUT) (S. CHAND)	No
Websites	<p>(https://www.khanacademy.org/science/physics/thermodynamics)</p> <p>(https://ocw.mit.edu/courses/chemistry/5-60-thermodynamics-kinetics-spring-2008/)</p> <p>(https://www.engineeringtoolbox.com/thermodynamics-d_28.html)</p>	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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Code	Course/Module Title	ECTS	Semester
PM 201	Thermodynamics	8	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/sem)
4	2/2	123	77
Description			
<p>Thermodynamics is a branch of physics that deals with the study of energy and its transformations in various systems. It focuses on understanding the behavior of heat, work, and energy flow. Thermodynamics encompasses fundamental principles such as the laws of thermodynamics, which describe the relationships between energy, heat, and work. It explores concepts like temperature, pressure, entropy, and equilibrium. Thermodynamic principles find applications in various fields, including engineering, chemistry, and environmental science. By analyzing thermodynamic processes and systems, scientists and engineers can optimize energy utilization, design efficient engines and power plants, and understand the behavior of substances under different conditions.</p>			



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
Module Title	Professional Ethics	Module Delivery	
Module Type	Support	<input checked="" type="checkbox"/> Theory	
Module Code	NTU 201	<input type="checkbox"/> Lecture	
ECTS Credits	2	<input type="checkbox"/> Tutorial	
SWL (hr/sem)	50	<input type="checkbox"/> Practical	
Module Level	2	Semester of Deliver	4
Module Leader	Banan Najim Abdullah	e-mail	Banan.najim@ntu.edu.iq
Administering Department	PM	College	TEMO
Module Leader's Acad. Title	Assist. Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	01/09/2024	Version Number	1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	<ol style="list-style-type: none"> 1. To develop an understanding of the ethical principles and values that are relevant to professional practice. 2. To explore the role of ethics in decision-making processes within professional contexts. 3. To cultivate critical thinking skills and the ability to analyze ethical dilemmas in professional settings. 4. To promote ethical awareness and sensitivity towards ethical issues that may arise in the chosen profession. 5. To equip students with the knowledge and skills to apply ethical theories and frameworks in professional decision-making and problem-solving.
Module Learning Outcomes	<ol style="list-style-type: none"> 1. Understand the fundamental ethical theories and principles relevant to professional practice. 2. Identify and analyze ethical issues and dilemmas that commonly occur in their chosen profession. 3. Apply ethical reasoning and critical thinking skills to evaluate and resolve ethical problems in professional contexts. 4. Demonstrate an awareness of the legal and regulatory frameworks that govern professional ethics. 5. Communicate and discuss ethical principles and considerations effectively with colleagues, clients, and stakeholders. 6. Develop a personal code of ethics and a commitment to ethical behavior in their professional roles. 7. Recognize and navigate conflicts of interest and maintain professional integrity. 8. Reflect on personal and professional growth in ethical decision-making and ethical leadership.
9. Indicative Contents	<p>Indicative content includes the following.</p> <p><u>Part A - Theory</u></p> <ol style="list-style-type: none"> 1. Introduction to Professional Ethics; Overview of professional ethics and its importance in various fields, Ethical principles and values in professional practice. Ethical Theories and Frameworks; Exploration of major ethical theories and frameworks, Application of ethical theories to real-world ethical dilemmas. Ethical Decision-Making; Understanding the process of ethical decision-making, Analysis of ethical decision-making models and strategies. 4. Professional Codes of Ethics and Standards; Examination of professional codes of ethics and standards in different professions, Discussion on the role of codes of ethics in guiding professional behavior. 5. Ethical Issues in the Workplace;

Identification and analysis of common ethical issues and challenges in professional settings, Case studies and discussions on ethical dilemmas specific to various professions [10 hrs]

Ethical Leadership and Responsibility; Exploration of ethical leadership principles and practices, Understanding the responsibility of professionals towards stakeholders. Ethical Communication and Professional Relationships; Effective communication of ethical considerations to colleagues, clients, and stakeholders, Development of professional relationships based on ethical principles. 8. Ethical Decision-Making in Complex Situations; Analysis of ethical challenges in complex and ambiguous situations, Strategies for making ethical decisions in challenging contexts. Professional Integrity and Conflicts of Interest; Understanding conflicts of interest and their impact on professional integrity, Techniques for managing conflicts of interest ethically. Ethical Issues in Technology and Innovation; Examination of ethical challenges arising from technological advancements, Ethical considerations in research, development, and implementation of new technologies. [10 hrs]

Revision problem classes [2 hrs]

Part B – Practice

Social and Environmental Responsibility; Discussion on ethical responsibilities towards society and the environment, Exploration of sustainable and socially responsible practices. Ethics in Professional Relationships; Ethical considerations in working with colleagues, supervisors, and subordinates, Navigating ethical challenges in team dynamics and collaborations. Ethics in Decision-Making and Problem-Solving; Ethical considerations in making effective and ethical decisions, Techniques for resolving ethical dilemmas and managing ethical risks. [10 hrs]

Ethical Professionalism and Career Development; Integration of ethical principles in career development and advancement, Ethical considerations in professional networking and job search. Ethical Reflection and Personal Development; Reflecting on personal values, ethical growth, and ongoing professional development, Developing an ethical action plan for future professional practice. [2 hrs]

10. Strategies	<ol style="list-style-type: none"> 1. Active Engagement: Actively participate in discussions, debates, and case studies to enhance understanding of ethical concepts and apply them to real-world scenarios. Engage in critical thinking and reflective practices to analyze ethical dilemmas and formulate well-reasoned arguments. 2. Ethical Reflection: Regularly reflect on personal values, beliefs, and biases to develop self-awareness and cultivate ethical decision-making skills. Consider how ethical principles align with professional goals and responsibilities. 3. Case Studies and Role-Playing: Engage in case studies and role-playing exercises to simulate ethical dilemmas and practice ethical decision-making. Analyze and discuss different perspectives, ethical implications, and potential consequences. 4. Collaborative Learning: Foster a collaborative learning environment by engaging in group discussions, peer review, and collaborative projects. Exchange ideas, share experiences, and learn from diverse perspectives to enhance ethical reasoning and decision-making skills.
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Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	33	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	(32/15)= 2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	17	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	(18/15)= 1
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	50		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	15% (15)	Continuous	LO #1,#2, #3,#4,#6,#7 and #8
	Assignments	2	10% (10)	Continuous	LO #1, #3 and #9
	Seminar	1	5% (5)	Continuous	LO #1, #5 and #7
	Report	2	10% (10)	Continuous	LO #5, #7 and #9
Summative assessment	Midterm Exam	1hr.	10% (10)	7	LO #1 - #4
	Final Exam	2hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	١. مقدمة في الأخلاق المهنية: نظرة عامة على الأخلاق المهنية وأهميتها في مجالات مختلفة، المبادئ الأخلاقية والقيم في الممارسة المهنية.
Week 2	٢. النظريات الأخلاقية والإطارات: استكشاف النظريات الأخلاقية الرئيسية والإطارات، تطبيق النظريات الأخلاقية على الصعوبات الأخلاقية في الحياة العملية الواقعية
Week 3	٣. اتخاذ القرارات الأخلاقية: فهم عملية اتخاذ القرارات الأخلاقية، تحليل نماذج واستراتيجيات اتخاذ القرارات الأخلاقية.
Week 4	٤. قوانين ومعايير الأخلاق المهنية: دراسة قوانين ومعايير الأخلاق المهنية في مجالات مختلفة، مناقشة دور قوانين الأخلاق في توجيه السلوك المهني.
Week 5	٥. القضايا الأخلاقية في مكان العمل: تحديد وتحليل القضايا الأخلاقية الشائعة والتحديات في البيئات المهنية، دراسة حالات ومناقشة الصراعات الأخلاقية المحددة لمهن مختلفة.
Week 6	٦. القيادة الأخلاقية والمسؤولية: استكشاف مبادئ وممارسات القيادة الأخلاقية، فهم مسؤولية المهنيين تجاه أصحاب المصلحة.
Week 7	٧. التواصل الأخلاقي والعلاقات المهنية: التواصل الفعال للاعتبارات الأخلاقية مع الزملاء والعملاء وأصحاب المصلحة، تطوير العلاقات المهنية بناءً على المبادئ الأخلاقية.
Week 8	٨. اتخاذ القرارات الأخلاقية في الحالات المعقدة: تحليل التحديات الأخلاقية في الحالات المعقدة والغامضة، استراتيجيات اتخاذ القرارات الأخلاقية في سياقات تحدي.

Week 9	٩. النزاهة المهنية وتعارض المصالح؛ فهم تعارض المصالح وتأثيره على النزاهة المهنية، تقنيات إدارة تعارض المصالح بشكل أخلاقي.
Week 10	١٠. القضايا الأخلاقية في التكنولوجيا والابتكار؛ دراسة التحديات الأخلاقية الناشئة من التقدم التكنولوجي، الاعتبارات الأخلاقية في البحث والتطوير وتنفيذ التقنيات الجديدة.
Week 11	١١. المسؤولية الاجتماعية والبيئية؛ مناقشة المسؤوليات الأخلاقية تجاه المجتمع والبيئة، استكشاف الممارسات المستدامة والمسؤولية اجتماعياً.
Week 12	١٢. الأخلاق في العلاقات المهنية؛ الاعتبارات الأخلاقية في التعامل مع الزملاء والمشرفين والمرؤوسين، التعامل مع التحديات الأخلاقية في ديناميكيات الفريق والتعاون.
Week 13	١٣. الأخلاق في اتخاذ القرارات وحل المشكلات؛ الاعتبارات الأخلاقية في اتخاذ قرارات فعالة وأخلاقية، تقنيات لحل الصعوبات الأخلاقية وإدارة المخاطر الأخلاقية.
Week 14	١٤. الاحترافية الأخلاقية وتطوير الحياة المهنية؛ دمج المبادئ الأخلاقية في تطوير وتقديم الحياة المهنية، الاعتبارات الأخلاقية في شبكات العمل المهنية والبحث عن وظيفة
Week 15	١٥. الانعكاس الأخلاقي والتطوير الشخصي؛ التفكير في القيم الشخصية والنمو الأخلاقي والتطور المهني المستمر، وضع خطة عمل أخلاقية لممارسة المهنة في المستقبل
Week 16	١٦. Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	١. أخلاقيات المهنة: نحو تطوير الأخلاقيات المهنية للمؤلفة إليزابيث رينولدز ويلفل. ٢. أخلاقيات في مكان العمل: أدوات واستراتيجيات للتحويل التنظيمي للمؤلف كريغ إي. جونسون. ٣. أخلاقيات المهن: نظرية وتطبيق للمؤلف جون ر. روان ٤. "أخلاقيات المهن والأخلاق المدنية للمؤلف إيميل دوركهايم.	Yes
Recommended Texts	1. "Ethics for the Professions: A Roadmap for Decision-Making" by John R. Boatright. 2. "Professional Ethics and Civic Morals" by Emile Durkheim. 3. "Ethics in the Workplace: Tools and Strategies for Organizational Transformation" by Craig E. Johnson. 4. "Professional Ethics: Theories and Applications" by D. Chris Rieger. 5. "Professional Ethics and Human Values" by R. Subramanian.	No
Websites	No	

Grading Scheme مخطط الدرجات



Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module 1

Code	Course/Module Title	ECTS	Semester
NTU 200	Professional Ethics	2	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/sem)
2	0	33	17
Description			
<p>مادة أخلاقيات المهنة تعنى بدراسة المفاهيم والمبادئ الأخلاقية التي ترتبط بممارسة المهن المختلفة. يتم توجيه الطلاب لفهم الأخلاقيات والقيم الأساسية في بيئة العمل وتطبيقها في مواقف واقعية. يشمل المنهج تحليل القضايا الأخلاقية والتعرف على الأطر الأخلاقية المختلفة التي يمكن أن تستخدم لاتخاذ قرارات أخلاقية صائبة. كما يتم استكشاف القوانين والقوانين المهنية ذات الصلة ودورها في توجيه سلوك المهنيين. تُعزز المهارات اللازمة للتواصل الأخلاقي وبناء العلاقات المهنية الصحيحة. يتم تسليط الضوء أيضًا على المسؤولية الاجتماعية والبيئية وتحديات التكنولوجيا وابتكاراتها في سياق المهن المختلفة. تهدف المادة إلى تطوير الوعي الأخلاقي والقدرة على اتخاذ قرارات أخلاقية صائبة في مجال المهنة.</p>			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mathematics		Module Delivery
Module Type	Base		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	TEMO 200		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	2	Semester of Delivery	
Administering Department	PM	College	TEMO
Module Leader	Ahmed Mustafa Saleem	e-mail	ahmedmustafa@ntu.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	M. Sc.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/09/2024	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Objectives أهداف المادة الدراسية</p>	<p>Mathematics provides a powerful and universal language. Students are expected to use appropriate mathematical language and different forms of representation when communicating mathematical ideas, reasoning and findings, both orally and in writing.</p> <p>In order to reach the aims of mathematics, students should be able to:</p> <ol style="list-style-type: none"> 1. use appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations. 2. use appropriate forms of mathematical representation to present information. 3. move between different forms of mathematical representation. 4. communicate complete, coherent and concise mathematical lines of reasoning. 5. organizes information using a logical structure.
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> 1. Students are able to appreciate the importance of understanding the structure of algebra to a higher-level concept. 2. Students can create awareness, especially symbolic thinking within the framework of the theory of modules. 3. Students have the capability to use its understanding and analyzing models of mathematics, science and technology and other disciplines related fields. 4. Students are able to develop an understanding framework that supports science and technology, and mathematics as well as communicate the results of the development of oral and written comprehension.
<p>Indicative Contents المحتويات الإرشادية</p>	<ul style="list-style-type: none"> • Demonstrate an understanding of basic concepts in each of the module core topics (complex numbers, matrices, limits, differential equations, integration, hyperbolic functions, vectors, series, proof) • Demonstrate an understanding of basic skills and techniques in dealing with concrete examples in each of the core topics • Apply these skills and techniques to solve a wide range of familiar and unfamiliar problems in the core topics • Demonstrate an understanding of how to communicate mathematical ideas clearly and coherently

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Teaching and learning strategies can include a range of whole class, group and individual activities to accommodate different abilities, skills, learning rates and styles that allow every student to participate and to achieve some degree of success.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20% (10)	Continuous	LO #1,#5,#6 and #8
	Assignments	2	10% (10)	Continuous	LO #1,#5 and #6
	Seminar	1	5 % (5)	Continuous	LO #2,#3,#5,#7 ,#9 and #11
	Online Assignments	1	5 % (10)	Continuous	LO #9 and #11
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #2
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Review in differential and integration
Week 2	Vectors: general introduction to vectors in space – equation of straight line and an equation for a plane in space – plane, tangent and perpendicular line – vector function
Week 3	Complex numbers – polar form – Euler equation – exponential and roots of complex numbers – composite functions – Cauchy-Riemann equation
Week 4	Tow and more variable equations – partial derivative
Week 5	Chain rule for partial derivative – gradient and directional derivative – maximum and minimum values for tow variable functions
Week 6	Double integral, areas and volumes – physical applications
Week7	Triple integral
Week 8	Polar coordinates – cylindrical and spherical coordinates – curve drawing in polar coordinates
Week 9	Green's theorem - divergence theorem
Week 10	The linear integration
Week 11	The Series: sequences of numbers – limits – infinite series – limit by definition - alternating series test - power series - converges interval
Week 12	Taylor/Maclaurin series for a function – general applications
Week 13	Matrices: introduction and Basic Operations
Week 14	Inverse of a Matrix (system of linear equations) – solution of equations by matrices
Week 15	Solution of Differential Equations
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	" Calculus " , Ford , S.R. and Ford , J.R. , (1963) McGraw-Hill	Yes
Recommended Texts	“Advanced Engineering Mathematics”, Erwin Kreyszig et al., (2006)	No
Websites	https://library.oopen.org/bitstream/handle/20.500.12657/31235/633792.pdf?sequence=1&isAllowed=y	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module 1

Code	Course/Module Title	ECTS	Semester
TEMO 200	Mathematics	8	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/sem)
4	2	93	107

Description

The proficiencies of Understanding, Fluency, Problem Solving and Reasoning are fundamental to learning mathematics and working mathematically and are applied across all three strands Number and Algebra, Measurement and Geometry, and Statistics and Probability.

Understanding refers to students building a robust knowledge of adaptable and transferable mathematical concepts and structures. Students make connections between related concepts and progressively apply the familiar to develop new ideas. They develop an understanding of the relationship between the 'why' and the 'how' of mathematics. Students build understanding when they:

- connect related ideas
- represent concepts in different ways
- identify commonalities and differences between aspects of content
- describe their thinking mathematically
- interpret mathematical information



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Refrigeration & Air Conditioning Principles		Module Delivery	
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	PM 205			
ECTS Credits	8			
SWL (hr/sem)	200			
Module Level	2	Semester of Deliver		3
Administering Department	PM	College	TEMO	
Module Leader	Banan Najim Abdullah		e-mail	banan.najim@ntu.edu.iq
Module Leader's Acad. Title	Lecturer		Module Leader's Qualification	Msc
Module Tutor			e-mail	
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date	01/9/2024	Version Number	1.0	

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	None		Semester	
Co-requisites module	None		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	<ol style="list-style-type: none"> 1. Understand the basic principles of refrigeration and air conditioning systems. 2. To understand the fundamental properties of Air and Water vapor mixture. 3. This course deals with the basic concept of air-conditioning processes. 4. Identify and describe the components of a typical refrigeration and air conditioning system. 5. To explain the thermodynamic principles involved in refrigeration and air conditioning processes. 6. Demonstrate knowledge of refrigerants and their properties, including safety considerations and environmental impacts.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> 1. Define Refrigeration and Air conditioning and identify their applications. 2. Define and calculate moist air properties using related equations. 3. Recognize how to use a Psychrometric chart in solving various Air conditioning processes. 4. Analyze the simple vapor compression cycle. 5. Describe the factors affecting vapor compression cycle performance. 6. Identify the multi pressure Refrigeration systems. 7. Recognize the refrigerant types and their effect on Ozone and How to Number it.
Indicative Contents المحتويات الإرشادية	<p>Indicative content includes the following.</p> <p><u>Part A - Air conditioning</u></p> <p>Air conditioning definition , Air conditioning systems and applications, SI units, Fundamental properties of Air and Water vapor mixture; definition of (moist air properties), Calculation of moist air properties using related equations. [14 hrs]</p> <p>Psychrometric chart and its construction, Air-conditioning processes, Air-conditioning processes (sensible cooling, and sensible heating). [14 hrs]</p> <p>Air-conditioning processes (Dehumidification, Humidification, Mixing of air streams, Cooling and dehumidification with reheat, and Pre heating with humidification and reheat). [14 hrs]</p> <p>Summer and winter cycle. [4 hrs]</p> <p><u>Part B - Refrigeration</u></p> <p>Refrigeration definition, Refrigeration systems and applications, heat pump, reversed Carnot cycle, [7 hrs]</p>

	Simple vapor compression cycle components and analysis, Ideal and actual vapor compression cycle, factors affecting vapor compression cycle performance, Multi Pressure systems. [30 hrs] Refrigerants. [14 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The Refrigeration and Air Conditioning module employs a range of effective learning and teaching strategies. Students engage in theoretical lectures, practical demonstrations, and hands-on laboratory sessions to grasp the underlying principles and gain practical skills. Case studies and real-world scenarios enhance problem-solving abilities, while group projects foster teamwork and communication skills. Continuous assessment methods, including assignments and practical assessments, ensure students' progress and understanding of the subject matter. The module promotes equipping students with the knowledge and skills necessary for success in the field of refrigeration and air conditioning.

Student Workload (SWL) الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	123	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	77	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	Continuous	LO #1, #2, #4, #5 and #6

	Assignments	4	5% (10)	Continuous	LO #1, #4, #5 and #6
	Projects / Lab.	5	15% (10)	Continuous	LO #2, #3, #5, #7, #9 and #11
	Report	5	10% (10)	Continuous	LO #2, #3, #5, #7, #9 and #11
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Air conditioning, Air conditioning systems, SI units, Fundamental properties of Air and Water vapour mixture; definition of (moist air properties) , Dry bulb, wet bulb and Dew point temperatures, partial pressure, Relative humidity, moisture content, Specific volume and Enthalpy.
Week 2	The General Gas Law, Dalton's law of partial pressure, Calculation of moist air properties using related equations.
Week 3	Psychrometric chart, Construction of psychrometric chart, Sensible Heat and Latent Heat.
Week 4	Air-conditioning processes, Adiabatic saturation process, sensible cooling, and sensible heating.
Week 5	Dehumidification; by pass factor, contact factor, Humidification – Humidification by water injection, steam injection.
Week 6	Mixing of air streams, Cooling and dehumidification with reheat.
Week 7	Preheating with humidification and reheat. Summer and winter cycle.
Week 8	Refrigeration application, refrigeration theory, heat pump, reversed Carnot cycle.
Week 9	Simple vapour compression cycle, vapour compression cycle components, Simple vapour compression cycle analysis.
Week 10	Ideal and actual vapour compression cycle, factors affecting vapour compression cycle performance (effect of suction temperature, effect of condensing temperature, effect of subcooling, effect of superheating, effect of pressure loss).
Week 11	Multi Pressure systems: Removing of flash gas, inter-cooler.
Week 12	Single evaporator and single compressor, single compressor and two evaporators.
Week 13	Two compressors and two evaporators, multi-stage compression cycle using, water intercooler, flash intercooler, liquid refrigerants intercooler.
Week 14	Refrigerants, types of old and new refrigerant. Effect of refrigerant on Ozone, secondary refrigerants.
Week 15	Numbering of Refrigerants.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Measuring of air velocity using Pitot tube and Manometer.
Week 2	Lab 2: Air Properties.
Week 3	Lab 3: Application on air Psychrometric chart.
Week 4	Lab 4: Sensible heating.
Week 5	Lab 5: Sensible cooling.
Week 6	Lab 6: Dehumidification of air.
Week 7	Lab 7: Heating with humidification of air.
Week 8	Lab 8: Mixing of air.
Week 9	Lab 9: Refrigerator and Heat pump.
Week 10	Lab 10: Calculation of the capacity and coefficient of performance of vapor compression unit.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Refrigeration & Air Conditioning, W.F. Stoecker & J.W Jones, Second Edition, McGraw-Hill, Inc.	Yes
Recommended Texts	Air Conditioning Engineering , W.P. Jones, Fifth Edition Elsevier Butterworth-Heinemann	No
Websites	https://www.ashrae.org/technical-resources/ashrae-handbook	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
<p>Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p>				

Module 1

Code	Course/Module Title	ECTS	Semester
PM 205	Refrigeration & Air Conditioning Principles	8	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
4	2/2	123	77

Description

The Refrigeration and Air Conditioning Principles module provides students with a comprehensive understanding of the principles, components, and applications of refrigeration and air conditioning systems. This module combines theoretical knowledge with practical skills. Throughout the module, students delve into the fundamental principles of thermodynamics, heat transfer, and psychrometrics, which form the basis of refrigeration and air conditioning processes. They learn about the various components involved in these systems, including compressors, condensers, evaporators, expansion devices, and controls, and understand their functions and interactions. Hands-on activities and laboratory sessions enable students to calculate and analyze different air conditioning processes and refrigeration systems. The module encourages the students to communicate effectively and work collaboratively in teams, simulating real-world scenarios they may encounter in the field.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Mechanical drawing		Module Delivery	
Module Type	Core		<input type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	PM 202			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	2	Semester of Delivery		3
Administering Department	PM	College	TEMO	
Module Leader	Asmaa taha Hussein		e-mail	Asmaa.taha@ntu.edu.iq
Module Leader's Acad. Title	Ass. Lecturer		Module Leader's Qualification	M.Sc.
Module Tutor			e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail	
Scientific Committee Approval Date	01/09/2024	Version Number	1.0	

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	None		Semester	
Co-requisites module	None		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	<ol style="list-style-type: none"> 1. to train students: to read the technical drawings through the application of techniques. 2. Learn students to read symbols, technical terms, standard specifications. 3. To understand the basic principle for descriptive geometry.. 4. This course deals with the basic concept of the computer in mechanical drawing. 5. To be able to communicate with manufacturers of mechanical systems. 6. To understand standard specifications, draw simple and complex assembly drawings. 7. To be able to communicate with other mechanical engineering professionals regardless of their spoken language.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <ol style="list-style-type: none"> 1. Capability to use AutoCAD for 2-D representations. 2. To make the students understand all about the screw threads and their definitions also to teach the students all common types for screw threads and the common types for bolts and nuts with overview in details. 3. To make the students understand all about the Keys, types of keys, spline shaft and hub concept, and the basic definitions for Keys also the correct manner for Keys drawing. 4. Enables the students to learn the techniques and standard practices of technical graphics. 5. To make the students understand all about the riveting and types of rivets. 6. Read a working or assembly drawing (blueprint) 7. Represent mechanical components in multi view orthographic representation 8. understanding all about the welding, types of weld joints and the basic definitions for welding also the correct manner for all types of welding symbol drawing. 9. To help students understand all about the Gears classification, draw spur gear, definitions, formulas and calculations.
Indicative Contents المحتويات الإرشادية	<p>Indicative content includes the following.</p> <p><u>Part A -</u> Introduction to (CAD), components of computer aided drawing (CAD), Exercises. [4 hrs] Screw threads, forms of screw thread, international metric threads (ISO screw), Common types of fasteners. [8hrs]</p>

	<p>Method of drawing (Hexagonal & Square headed bolts and nuts) Screw threads, Nuts, Forms and types of screw threads and types of nuts, ISO. Also method of drawing (Hexagonal & Square headed bolts and nuts), with an exercise for these objects. [8 hrs]</p> <p>general introduction for Keys, types of keys, spline shaft and hub Drawing, and the basic definitions for Keys also the correct manner for Keys drawing. The common types for Keys also an explanation in detail. Also the pin and cotter joint [12hrs]</p> <p>Revision and quiz [8hrs]</p> <p><u>Part B -</u> Fundamentals of rivets and riveted joints, types of riveted joints, Conventional rivet symbol, and the basic definitions for riveting also the correct manner for all types of rivets drawing, also an explanation in details for all types. [10 hrs] general introduction for Welding, type of welding, welding symbols standard. [4 hrs]</p> <p>general introduction for Pulleys, types of pulleys. location and dimension of Pulleys, and the basic definitions for Pulleys also the correct manner for all types of Pulleys drawing, also an explanation in details for all types. [10 hrs] Gears classification of gears, Assembly and details of common mechanical unit [15 hrs] Pipes and pipe joints, piping fittings, pipe symbols standard. [10 hrs]</p>
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	<p>Type something like: The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.</p>

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	Continuous	LO #1, #2, #4, #5 and #6
	Assignments	4	10% (10)	Continuous	LO #2, #3, #5 and #7
	Projects / Lab.	4	10% (10)	Continuous	LO #5, #8, #9 and #10
	Online Assignments	4	10% (10)	Continuous	LO #4, #8, #9 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to (CAD), components of computer aided drawing (CAD), Exercises
Week 2	Screw threads, forms of screw thread, international metric threads (ISO screw), Common types of fasteners.
Week 3	Method of drawing (Hexagonal & Square headed bolts and nuts)
Week 4	Keys, types of keys.
Week 5	Pins and Cotters.



Week 6	Rivets and riveted joints.
Week 7	Types of riveted joints, Conventional rivet symbol, working drawing.
Week 8	Welding, type of weld joints, welding symbols standard, location and dimension of weld.
Week 9	Pulleys, types of pulleys.
Week 10	Gears classification of gears, spur gear, definitions, formulas and calculations.
Week 11	Gear tooth profile, working drawing.
Week 12	Assembly and details of common mechanical units. Screw Jack (Assembly and details).
Week 13	Power screw (Assemble and details)
Week 14	Coupling, Types of coupling, Bearings, types of bearings.
Week 15	Pipes and pipe joints, piping fittings, pipe symbols standard.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	k. l. Narayana p. kannaiyah k. venketa reddy mechanical engineering.	Yes
Recommended Texts	Up.and.Running.with.AutoCAD.2012.2D.and.3D.Drawing.a nd.Modeling	yes
Websites	https://learnengineering.in/mechanical-drawing-books/	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A – Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D – Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E – Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Code	Course/Module Title	ECTS	Semester
PM 202	Mechanical drawing	4	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
0	4	63	37

Description

The course on Mechanical Drafting provides comprehensive training on various aspects of drafting and design in mechanical engineering. It covers topics such as the use of AutoCAD system for mechanical drafting, screw threads, bolts, nuts, keys, pin and cotter joints, riveting joints, welding symbols, gear drawings, assembly drawings, detail drawings, and coupling, bearing, and pipe joints. The course includes practical examples and exercises that allow students to gain hands-on experience in drawing each component. By completing this course, students can enhance their knowledge and skills in mechanical engineering drafting, enabling them to create accurate and detailed drawings for various mechanical components and systems.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Fluid Mechanics		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	PM 200		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	2	Semester of Deliver	
Administering Department	PM	College	TEMO
Module Leader	Noor Moneer Basher	e-mail	noorabasher@ntu.edu.iq
Module Leader's Acad. Title	lecturer	Module Leader's Qualification	M.Sc.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/09/2024	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Objectives أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> 1. To understand the properties of fluids, dimensions and units. 2. To derive the equation of conservation of mass, momentum, energy and its application. 3. To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems. 4. To understand the various flow measuring devices. 5. To understand the classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent.
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> 1. Understand how to convert the unit system from British to SI. unit or vice versa. 2. Training the students how to solve the problems associated with fluid mechanics. 3. Measure the fluid flow of liquids by different types of flow meters. 4. Analyze the magnitude of the horizontal and vertical components of the force of the water on the gate. 5. Determine the reading on the pressure gauge by the different types of manometers. 6. Draw simple hydraulic and energy gradient lines. 7. Solve the formulas of open channel flow.
<p>Indicative Contents المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <p>Part A- Introduction: Basic concepts of fluid mechanics. Fundamental terms. Physical values. Fluids and their properties. Forces inside fluid. Measurement of pressure. Relative statistics of fluid – constant acceleration, rotation. Forces of hydrostatic pressure. Buoyancy. Streamlines. Stream surface. Stream tube. Mass/volume flow. Control volume. Fluid Dynamics: Continuity equation. Basic laws of fluid dynamics – conservation of mass, conservation of linear momentum, conservation of energy. Ideal fluid flow. Application of Bernoulli's equation. Real fluid flow. Viscosity. Determination of losses. Reynolds experiment. Laminar and turbulent flow. Boundary layer. Velocity profile. Losses in pipes. Frictional losses. Moody's diagram. Local losses. Pumps, types. Turbines and the working principle of the turbine.</p> <p>Part B- Analyze characteristics of a particular flow.</p> <p>Formulate the governing equations and boundary conditions.</p> <p>Solve these equations analytically in simple cases.</p> <p>Revision problem classes and quiz [6 hrs]</p>

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	123	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	Continuous	LO #1, #2, #4, #5 and #6
	Assignments	4	5% (10)	Continuous	LO #1, #4, #5 and #6
	Projects / Lab.	5	15% (10)	Continuous	LO #2, #3, #5, #7, #9 and #11
	Report	5	10% (10)	Continuous	LO #2, #3, #5, #7, #9 and #11
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction - Units system
Week 2	Physical properties of fluids.
Week 3	Physical properties of fluids.
Week 4	Fluid pressure at static.
Week 5	Fluid pressure instruments.
Week 6	Hydrostatic force on a plane surface.
Week 7	Hydrostatic force on an inclined surface
Week 8	Hydrostatic force on a curved surface.
Week 9	Fluid dynamics / classifications of fluids.
Week 10	Conservation of mass.
Week 11	Conservation of momentum and its application.
Week 12	Conservation of energy- Bernoulli equation.
Week 13	Bernoulli equation applications.
Week 14	Viscous flow in pipes.
Week 15	Pumps or turbines.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Density and Specific Gravity.
Week 2	Lab 2: DETERMINATION OF LIQUID VISCOSITY USING STOCK'S METHOD.
Week 3	Lab 3: Determination of Centre of Pressure and Hydro-static Force on Plane surface (Part One).
Week 4	Lab 4: Determination of Centre of Pressure and Hydro-static Force on Plane surface (Part Two).
Week 5	Lab 5: Reynolds Number Investigation.
Week 6	Lab 6: Estimation of the Volume Flow Rate Using Orifice Meter Apparatus.

Week 7	Lab 7: IMPACT OF WATER JET ON VANES.
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Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	FLUID MECHANICS	Yes
Recommended Texts	1- A TEXTBOOK OF FLUID MECHANICS AND HYDRAULIC MACHINES BY RAJPUT. 2- Fluid Mechanics by Yunus A. Cengel, John M. Cimbala. 3- fluid_mechanics_frank_m._white_4th_ed.	No
Websites		

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
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Module 1

Code	Course/Module Title	ECTS	Semester
PM 200	Fluid Mechanics	8	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/sem)
4	2/2	123	77
Description			
<p>Fluid Mechanics, the branch of science that deals with the study of fluids (liquids and gasses) in a state of rest or motion, is an important subject of Civil, Mechanical and Chemical Engineering. Its various branches are fluid statics, fluid kinematics and fluid dynamics.</p> <p>A substance that flows is called a fluid. All liquid and gaseous substances are considered to be fluids. Water, oil, and others are very important in our day-to-day life as they are used for various applications. For instance, water is used for generation of electricity in hydroelectric power plants and thermal power plants, water is also used as the coolant in nuclear power plants, oil is used for the lubrication of automobiles etc.</p> <p>Fluid Mechanics is the branch of science that studies the behavior of fluids when they are in state of motion or rest. Whether the fluid is at rest or motion, it is subjected to different forces and different climatic conditions and it behaves in these conditions as per its physical properties. Fluid mechanics deals with three aspects of the fluid: static, kinematics, and dynamics aspects.</p>			