MODULE DESCRIPTION Form

University Name: .Northern Technical University.....

Faculty/Institute: .Technical Engineering College Mosul.....

Scientific Department: Power Mechanics Engineering Technology

Academic or Professional Program Name: Bachelor of Power Mechanics Engineering Technology

Final Certificate Name: Bachelor of Power Mechanics Engineering Technology

Academic System: Bologna Process.....

Description Preparation Date: 2/9/2025

File Completion Date: 2/9/2025

Signature:

Head of Department Name:

Dr. Ammar Hasan Suhail

Date: 2/9/2025

Signature:

Scientific Associate Name:

Prof. Dr. Mohammed Sabah Jarjees

Date: 25/9/2025

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance

Department: Assist. Lect. Warqaa Hashim Mahmood

Date:

Signature:

Approval of the Dean

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mechanical Engineering /Static**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 100**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	**PM**		**College**	TEMO	
Module Leader	Mothana M. Mohamed Salih		**e-mail**	muthanam.m1981@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	MASTER	
Module Tutor	Mothana M. Mohamed Salih		**e-mail**	muthanam.m1981@ntu.edu.iq	
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	Module Objectives for Engineering Mechanics/Statics: 1. Understand the fundamental concepts and principles of Statics, including motion, forces, and acceleration. 2. Apply kinematic equations to analyze the motion of particles and rigid bodies in various scenarios. 3. Determine the relationship between forces, mass, and acceleration using Newton's laws of motion.

	4. Apply the principles of work and energy to analyze and solve dynamic problems. 5. Analyze and calculate linear and angular momentum, and apply the principle of impulse and momentum to dynamic systems. 6. Understand and apply the principles of vibrations and oscillations in mechanical systems. 7. Apply principles of balancing rotating masses and vibrations to ensure smooth operation of machinery. 8. Analyze multi-degree of freedom systems and determine their natural frequencies and mode shapes. 9. Apply dynamic principles to real-world engineering problems and systems. 10. Develop critical thinking and problem-solving skills in the context of engineering Statics. 11. Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of dynamic problems. By achieving these module objectives, students will gain a comprehensive understanding of the principles and applications of engineering Statics. They will be able to analyze and solve problems related to motion, forces, and vibrations in mechanical systems, and apply their knowledge to real-world engineering scenarios. They will also develop skills in critical thinking, problem-solving, and effective communication, which are valuable in the field of engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Apply fundamental concepts of engineering mechanics/statics to analyze and solve problems related to the equilibrium of rigid bodies. 2. Demonstrate a deep understanding of vector mathematics and its application in statics, including vector addition, subtraction, dot product, and cross product. 3. Apply the principles of static equilibrium to solve problems involving forces and moments acting on rigid bodies in two and three dimensions. 4. Analyze and calculate the internal forces, such as axial forces, shear forces, and bending moments, in statically determinate structures using methods such as the method of sections and the method of joints. 5. Utilize free-body diagrams to model and analyze the forces acting on a structure or a rigid body, and determine the resultant forces and moments at specific points. 6. Analyze and calculate the centroid and moment of inertia of various two-dimensional shapes, including rectangles, triangles, and circles, and apply these concepts to determine the stability and strength of structures. 7. Apply the concepts of friction and its effects on the equilibrium of bodies in statics, including calculating static and kinetic friction forces and determining the angle of friction. 8. Analyze and calculate the forces in trusses and frames, including the method of joints and the method of sections, and determine the stability and structural integrity of these systems. 9. Apply the principles of equilibrium to solve real-world engineering problems,

	such as determining the stability of structures, calculating the forces on supports and connections, and analyzing the behavior of mechanical systems. 10. Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of engineering mechanics/statics problems. By achieving these module learning outcomes, students will develop a strong foundation in engineering mechanics/statics and be equipped with the necessary knowledge and skills to analyze and solve a wide range of engineering problems involving static equilibrium and structural stability.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to Statics • Definition and scope of statics • Fundamental concepts and principles • Importance of statics in engineering 2. Vectors and Vector Analysis • Vector representation and operations • Vector components and coordinate systems • Vector addition, subtraction, and scalar multiplication 3. Forces and Moments • Forces and their characteristics • Resultant and equilibrium of forces • Moment of a force and its properties • Couples and their effects 4. Equilibrium of Rigid Bodies • Free body diagrams and force analysis • Equations of equilibrium in two and three dimensions • Solving equilibrium problems using scalar and vector approaches • Applications to simple systems and structures 5. Truss Structures • Introduction to truss analysis • Method of joints and method of sections • Determination of member forces and support reactions 6. Friction • Laws of friction and frictional forces • Types of friction and their characteristics • Calculation of frictional forces and moments • Applications to inclined planes, wedges, and screws 7. Center of Gravity and Centroids • Definitions and properties of center of gravity and centroids • Determination of center of gravity and centroids of simple shapes • Composite bodies and distributed loads

	8. Moments of Inertia • Moment of inertia and its physical significance • Calculating moments of inertia for simple shapes • Parallel-axis and perpendicular-axis theorems • Application of moments of inertia in engineering analysis

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module employs a blended approach combining structured lectures with interactive tutorials to reinforce core concepts. Problem-solving sessions are conducted weekly, where students apply vector analysis and equilibrium equations to real-world scenarios. Collaborative learning is encouraged through group assignments and case studies, fostering critical thinking and peer discussion. Additionally, formative assessments (quizzes and report writing) are integrated to provide regular feedback and support self-directed learning. Practical examples and free-body diagram exercises are used throughout to bridge theory with engineering applications.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	122	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
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	15% (15)	5,7,9 and 13	LO #2 , #3 , #5 and #8
	Assignments	5	15% (15)	2,6,8,10 and 14	LO #1 ,#4 ,#6 ,#7 and #9
	Projects / Lab.				
	Report	1	10% (10)	13	LO #5, #8 and #10

Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction, Fundamental Concepts, Units Conversion, Scalar and Vector Quantities.
Week 2-4	Resultant force Resolution & Composition of Forces. Triangle & parallelogram law
Week 5	Addition of a System of Coplanar Forces: Scalar Notation, Cartesian Vector Notation
Week 6-7	Equilibrium of a Particle
Week 8	Moment of a Force, Varignons Theorem.
Week 9	Moment of a Couple
Week 10-11	Equilibrium of a Rigid Body
Week 12	Distributed loads.
Week 13	Friction
Week 14	Centroid
Week 15	Centroid of area, First moment of area.
Week 16	Area moment of inertia, Second moment of area.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Engineering Mechanics/ Statics, Fourteen Edition, R.C. Hibbeler	yes
Recommended Texts	1- Engineering Mechanics , Ferdinand L. Singer 2- Engineering Mechanics, Meriam 3- Engineering Mechanics/ Statics, Arthur P. Boresi & Richard J. Schmidt	No
Websites		

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 100	**Mechanical Engineering /Static**	**8**	**1**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**2**	**78**	**122**

Description

Statics, is a fundamental branch of Engineering Mechanics that deals with the analysis and prediction of the behavior of objects at rest or in equilibrium. It provides the foundation for understanding the principles of forces, moments, and their effects on structures and systems. This branch of engineering mechanics is primarily concerned with the study of particles and rigid bodies under the action of forces and moments. One of the main objectives of Engineering Mechanics/Statics is to enable engineers to calculate and predict the behavior of structures and systems under different loading conditions. This includes understanding the concepts of force vectors, moments, and couples, as well as the methods for resolving and combining these forces to determine their resultant effects.
Through theoretical study, problem-solving, and practical applications, students of Engineering Mechanics/Statics develop critical skills in analyzing and solving engineering problems. They learn to apply mathematical principles, physics, and engineering concepts to determine the forces and moments in structures and systems, and to ensure their stability and safety.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics Principles**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 100**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**1**	**Semester of Delivery**		**1**
Administering Department		**PM**	**College**		**TEMO**
Module Leader	**Raid Abdulhadi Abdulqader**		**e-mail**		**raid.alabdullah@ntu.edu.iq**
Module Leader's Acad. Title		**Assistant Lecher**	**Module Leader's Qualification**		**M. Sc.**
Module Tutor			**e-mail**		
Peer Reviewer Name		**Dr. Ammar Hassan**	**e-mail**		
Scientific Committee Approval Date		**01/06/2025**	**Version Number**		**3.0**

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	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. In order to reach the aims of mathematics, students should be able to: **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.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**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.
Indicative Contents المحتويات الإرشادية	• 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.

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**	**4**	**20% (20)**	**5,8,10 and 14**	**LO #1,#2,#3 and #4**
	Assignments	**6**	**20% (20)**	**2,4,8 and 12**	**LO #1,#2,#3and#4**
	Projects / Lab.	**0**	**0% (0)**	**Continuous**	**All**
	Report	**0**	**0**		
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.oapen.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.

Code	Course/Module Title	ECTS	Semester
TEMO 100	**Mathematics Principles**	**6**	**1**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	**2**	**93**	**57**

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					
Module Title	**Electrical Technology**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☒ **Tutorial** ☒ **Lab** ☐ **Seminar**	
Module Code	**PM 101**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Deliver**	1	
Administering Department	PM		**College**		
Module Leader	Safwan Assaf Hamoodi		**e-mail**	Safwan79azb@ntu.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	**1/9/2023**		**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	Introduce students to the basic concepts of electrical engineering, including voltage, current, resistance, power, and energy. Teach students how to analyze simple electrical circuits using fundamental laws such as Ohm's Law and Kirchhoff's Laws, and apply circuit analysis tech. Provide a comprehensive understanding of both alternating current (AC) and direct current (DC) systems, including their characteristics, behaviors, and application. Familiarize students with common electrical components such as resistors, capacitors, inductors, diodes, and transistors, including their functions and applications in circuits. Enhance students' mathematical skills necessary for solving electrical engineering problems, including algebra, calculus, and complex number analysis.
Module Learning Outcomes	**1 . Fundamental Knowledge**: Demonstrate an understanding of basic electrical engineering concepts, including voltage, current, resistance, power, and energy**.** **2 .Circuit Analysis**:

	Apply Ohm's Law and Kirchhoff's Laws to analyze and solve simple electrical circuits, both in DC and AC contexts**.** **3 .Component Identification**: Identify and describe the function of common electrical components such as resistors, capacitors, inductors, diodes, and transistors in circuit applications**.** **4 .Mathematical Proficiency**: Utilize mathematical techniques, including algebra and complex numbers, to solve electrical engineering problems effectively**.** **5 .Practical Skills**: Conduct laboratory experiments to build and analyze electrical circuits, demonstrating the ability to apply theoretical knowledge in a practical setting**.** **6 .Problem-Solving Ability**: Develop systematic approaches to solve engineering problems, including the ability to model and simulate electrical systems**.** **7 .Safety Practices**: Recognize and apply safety practices relevant to working with electrical systems and components in both laboratory and real-world environments.
Indicative Contents	**Part A: Symbols and Units:** Define the meaning of units and its importance in engineering science, the Greek Alphabet, the symbols, suffix, acronyms and scientific numbers. The basic units, the derived units, and the available different systems of units. How to write units in official documents. The physical meaning of units. Revision problem classes. [20 hours] **Part B: The Basic Concepts of Electricity Parameters:** The physical meaning of Energy, Work, Displacement, Distance, Force, Acceleration, Torque, and Power. The Potential, Voltage, and Current. The electric circuit 3 parameters, the conventional current and the electronic current, the electric power, the drift velocity, the atomic structure of insulators and conductors. Revision problem classes. [20 hours] Revision Session and Quiz. [1.5 hours] **Part: Analogue DC Circuit Theories:** Resistive networks, voltage and current sources, internal resistance concept, maximum power transfer theory, current and voltage division, Thevenin and Norton equivalent circuits, and other circuit theories. Revision problem classes. [20 hours] Control Systems, Troubleshooting, and Maintenance. [10 hours] Revision Session and Quiz [1.5 hours]

Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in delivering this module is to declare the physical comprehension of the units like (Newton Unit) for example, the distinguishing between vector and scalar quantities, 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 practical examples before teaching each new subject to increase the student interest. The student must know the reason of learning each subject and its impact on his future as an engineer.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation					
As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	5 and 10	LO #1and #2
	Assignments	3	5% (5)	2 and 12	LO #2 and #3
	Projects / Lab.	6	15% (15)	Continuous	LO #1 and #3
	Report	2	10% (10)	13	LO #3
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	Introduction - Basic concepts and units: The international system of units, quantities derived from SI units. Units of force, energy, torque, and power. Abbreviation for multiples & sub-multiples.
Week 2	Electricity & atomic structure of the substance.
Week 3	Current and current density. Coulomb's Law.
Week 4	potential, electromotive force (emf) and potential difference.
Week 5	The relation between energy and heat. Efficiency and percentage efficiency.
Week 6	Analysis of DC circuits: Ohm's law, resistivity & conductivity, temperature effect.
Week 7	Midterm exam +The internal resistance of a source. Equivalent resistance: Series, parallel, (Series- parallel).
Week 8	delta, and star connections. Equivalent voltage source: Series, parallel.
Week 9	Power calculation in DC circuit. Introduction to network theorems, types of sources: independent and dependent voltage sources and their transformation.
Week 10	Kirchhoff’s laws, KVL, KCL, Maxwell’s circulating current (mesh analysis). Nodal analysis, Superposition theorem.

Week 11	Thevenin's theorem, Norton's theorem, Maximum power transfer theorem. The Photovoltaic panel internal resistance, Millman's theorem, Substitution theorem, Reciprocity theorem.
Week 12	Magnetic field. Magnetic fields due to the electric current, magnetic field in a coil. Magnitude and direction of the force on a moving charge in the magnetic field (Motor and Generator principles).
Week 13	Ferromagnetic materials. The magnetization curve (B-H Curve). Permeability, Relative permeability. Magnetic constants: reluctance, magnetic leakage, and fringing. Magnetic circuit: Series, parallel, and (series-parallel). Kirchhoff's laws for the magnetic circuit.
Week 14	Condition for the minimum volume of a permanent magnet, load line of a permanent magnet.
Week 15	The force between two magnetic poles, the magnetic pull between two iron surfaces and (series parallel). Kirchhoff's laws for the magnetic circuit.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
Week	**Material Covered**
Week 1	**Lab 1:** Resistor color code
Week 2	**Lab 2:** Ohm's law
Week 3	**Lab 3:** Resistors in series parallel
Week 4	**Lab 4:** Divider Rules
Week 5	**Lab 5:** Kirchhoff's laws
Week 6	**Lab 6:** Delta & star.
Week 7	**Lab 7:** Mesh Method
Week 8	**Lab 8:** Nodal theorem
Week 9	**Lab 9:** Superposition theorem
Week 11	**Lab 10:** Thevenin's theorem
Week 12	**Lab 11:** Norton theorem
Week 13	**Lab 12:** Max. power theorem
Week 14	**Lab 13:** fundamental of Ac
Week 15	**Lab 14:** Oscilloscope

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education.	Yes
Recommended Texts	Digital Fundamentals, T. L. Floyd, Pearson Education Ltd.	Yes
Websites	https://logic.ly/demo/	

Grading Scheme **مخطط الدرجات**				
Group	Grade	التقدير	Marks %	Definition
	A - Excellent	امتياز	90 - 100	Outstanding Performance

Success Group (50 - 100)	B - Very Good	جيد جدا	80 - 89	Above average with some errors
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	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 303	**Electrical and Electronic Engineering**	**6**	**6**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	**78**	**72**

Description

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.

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.

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.

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.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Workshop**			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 102**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Deliver**	1	
Administering Department	PM		**College**	TEMO	
Module Leader	Dr. Ammar Hassan Suhail		**e-mail**	ammarsuhail@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D	
Module Tutor	Abdullah Adel Badr		**e-mail**	abdulladel06@ntu.edu.iq	
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/6/2025		**Version Number**	3.0	

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	1. Teach students the basic principles of the compression refrigeration cycle. 2. Identify the tools used in the field of refrigeration and air-conditioning in general. 3. Training students on the operations carried out on pipes used in the field of refrigeration and air-conditioning. 4. Teaching students the basic operations of refrigeration and air-conditioning equipment. 5. Introducing students to the main parts that make up refrigeration and air-conditioning equipment of all kinds. 6. Teaching students about the electrical and mechanical parts of household refrigeration and air-conditioning devices. 7. Learn about the types of furnaces for melting metals, and how to pour molten metal into sand molds.

	8. Identify the types of filings and their shapes. 9. Learn about all types of lathes and how to use them. 10. Learn how to deal with sheet metal. 11. Learn about the most important methods of welding and the machines and tools needed for that. 12. Learn about the most important tools and machines for dealing with wood, in addition to identifying the most popular and common types of wood.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. The student learned the processes of cutting, flaring and expanding pipes. 2. The student learned the processes of welding pipes of all kinds. 3. The student learned about the processes that take place on refrigeration and air-conditioning equipment, such as checking for leaks, vacuum and charging. 4. Students' ability to know the refrigerant fluids used in refrigeration and air-conditioning devices. 5. The student learned to connect electrical circuits for refrigeration and air-conditioning equipment. 6. The student's ability to distinguish the pressures used in the field of refrigeration and air conditioning from leakage checks, discharge and charging of all devices. 7. The student's ability to melt metals, how to pour the molten metal into sand molds, how to deal with the mold and fix it with sand, and how to get it out of the sand. 8. The student's ability to work with each type of file and how to choose it according to the type of material being worked on. 9. The ability of the student to scrape and perforate the parts to be formed by each of the turning machines, milling machines, scrapers, as well as all kinds of gutters. 10. The student's ability to deal with metal sheets in terms of cutting, hammering, perforating, bending and humping, and the most important tools needed for that and how to work with them. 11. The student's ability to perform welding operations in all ways and for various types of metals. 12. The student's ability to deal with wood in addition to identifying the most popular and common types of wood.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Compression cycles and their applications by using visual devices. [15 hrs] Types of environmentally friendly and harmful gasses and the ozone layer and how to deal with them. [15 hrs] Awareness and important instructions for occupational safety. [10 hrs] Awareness of the dangers of industrial machines and caution against them. [10 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The primary strategy for delivering this unit is to encourage students to participate in the operations conducted in all laboratory departments using the college's equipment and machinery, honing their critical thinking skills and expanding them to include advanced systems. This is achieved through classroom instruction, interactive lessons, and visits to construction sites as scientific visits. The course also includes the study of various refrigeration and air conditioning systems, which include practical activities of interest to students.

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	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 11	LO #1-4 and LO#8-11
	Assignments	No	No	No	No
	Projects / Lab.	14	20% (10)	Continuous	All
	Report	14	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري والعملي

	Material Covered
Week 1	Introduction - Difference the basic principles of the compression refrigeration cycle.
Week 2	Learn about the types of furnaces for melting metals, and how to pour molten metal into sand molds.
Week 3	Identify the tools used in the field of refrigeration and air-conditioning in general.
Week 4	Identify the types of filings and their shapes
Week 5	Training students on the operations carried out on pipes used in the field of refrigeration and air-conditioning.
Week 6	Learn about all types of lathes and how to use them.
Week 7	Mid-term Exam
Week 8	Learn how to deal with sheet metal.
Week 9	Introducing students to the main parts that make up refrigeration and air-conditioning equipment of all kinds.
Week 10	Learn about the most important methods of welding and the machines and tools needed for that.
Week 11	Teaching students the basic operations of refrigeration and air-conditioning equipment.
Week 12	Learn about the most important tools and machines for dealing with wood, in addition to identifying the most popular and common types of wood.
Week 13	Teaching students about the electrical and mechanical parts of household refrigeration and air-conditioning devices.
Week 14	Carrying out operations to find and repair leakages and charge gas for air-conditioning devices.
Week 15	Conducting a practical exercise chosen by the course Lecturer as a test before the final exam
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	No

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Modern Refrigeration and Air-conditioning.	Yes
Recommended Texts	Hand Book Of Air Condition and Refrigeration.	Yes
Websites	https://drive.google.com/file/d/1Azp71sEHa6rlw72PabzXwUiEfWbe_6IJ/view	

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 102	**WORKSHOP**	**6**	**1**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
0	**6**	**93**	**57**

The workshop in an engineering college provides students with a valuable opportunity to acquire knowledge and practical skills in specific engineering fields. The workshop aims to enhance the application of theoretical concepts learned in classrooms and provides an interactive learning environment. It includes instructional sessions, hands-on exercises, problem-solving, and practical application projects. Students collaborate in teams to achieve specific goals and develop effective projects. The workshop promotes communication and collaboration among students, encourages critical thinking, and problem-solving in an engineering simulation environment. The workshop is a valuable chance for students to develop their technical and practical skills and enhance their engineering capabilities for the future.

نموذج وصف المادة الدراسية

معلومات المادة الدراسية			
عنوان المقرر	الديمقراطية وحقوق الانسان	طريقة تقديم المقرر	
نوع المقرر	مادة مساعدة	☒ نظري ☒ محاضرة ☐ مختبر ☒ تمارين ☐ عملي ☒ حلقة دراسية	
رمز المقرر	NTU100		
عدد الساعات المعتمدة بنظامECTS	2		
SWL (hr/sem)	50		
مستوى المقرر	1	فصل تقديم المقرر	1
القسم الإداري المسؤول	PM	الكلية	TEMO
مسؤول المقرر	أ.م. د. محمد عبد الموجود حسن	ايميل	dr.mohmmed67@ntu.edu.iq
اللقب الأكاديمي لمسؤول المقرر	أستاذ مساعد	الشهادات العلمية لمسؤول المقرر	دكتوراه
مدرس المقرر	أ.م. د. محمد عبد الموجود حسن	ايميل	dr.mohmmed67@ntu.edu.iq
اسم المراجع النظير	د. عمار حسن سهيل	ايميل	
تاريخ اعتماد اللجنة العلمية	2025/06/01	رقم الاصدار	3.0

العلاقة مع المواد الدراسية الأخرى			
المقرر السابق المطلوب	لا يوجد	الفصل الدراسي	
المقررات المتزامنة	لا يوجد	الفصل الدراسي	

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
أهداف المادة الدراسية	تهدف مادة حقوق الإنسان والديمقراطية إلى: 1. **فهم المفاهيم الأساسية** :تعريف الطالب بمفهوم حقوق الإنسان والديمقراطية، وأصولهما التاريخية ونشأتهما. 2. **تحليل القوانين والمواثيق الدولية** :التعرف على الإعلان العالمي لحقوق الإنسان، الاتفاقيات الدولية، والقوانين الوطنية المرتبطة بحقوق الإنسان. 3. **تنمية الوعي الحقوقي والسياسي** :تعزيز فهم الطالب للعلاقة بين الديمقراطية وحماية الحريات العامة، ووعي المسؤولية الفردية والاجتماعية. 4. **تطوير المهارات التطبيقية** :تمكين الطالب من تحليل الحالات العملية، كتابة تقارير، وحل مسائل تطبيقية تتعلق بحقوق الإنسان والديمقراطية. 5. **تعزيز التفكير النقدي** :قدرة الطالب على تقييم الانتهاكات الحقوقية، والممارسات الديمقراطية، ومناقشة التحديات المعاصرة في المجتمعات المختلفة.
	بنهاية دراسة المادة، يُتوقع أن يكون الطالب قادرًا على: 1. **تفسير المفاهيم الأساسية** :تمييز مفاهيم حقوق الإنسان والديمقراطية وشرح خصائصها ومصادرها.

مخرجات التعلم للمادة الدراسية	2. **تتبع التطور التاريخي** :تحليل تطور حقوق الإنسان عبر الحضارات (بلاد الرافدين، وادي النيل، الإغريق، الرومان، العصور الوسطى، والعصر الحديث). 3. **فهم النظريات الحقوقية :تفسير نظريات حقوق الإنسان مثل القانون الطبيعي، والعقد الاجتماعي، والاقتصاد الحر.** 4. **تحليل النصوص القانونية :قراءة وتحليل الإعلان العالمي لحقوق الإنسان والاتفاقيات الدولية ذات الصلة.** 5. **تقييم الواقع الحقوقي :تشخيص واقع حقوق الإنسان في العراق وربطه بالمعايير الدولية.** 6. **تمييز أنواع الحقوق :تصنيف حقوق الإنسان إلى مدنية، سياسية، اقتصادية، اجتماعية، وثقافية، وفهم تكاملها.** 7. **تعزيز الثقافة الديمقراطية** :الربط بين الديمقراطية واحترام حقوق الإنسان في بناء الدولة الحديثة. 8. **استخدام التفكير النقدي** :مناقشة القضايا الحقوقية بموضوعية واقتراح حلول واقعية. 9. **فهم الآليات الوطنية** :توضيح دور الدستور، القضاء، والفصل بين السلطات في حماية الحقوق. 10. **تنمية مهارات التواصل** :عرض وتحليل القضايا الحقوقية بأسلوب علمي واضح شفهيًا وكتابيًا.
المحتويات الإرشادية	1. **مدخل إلى حقوق الإنسان والديمقراطية:** تعريف حقوق الإنسان وخصائصها، مفهوم الديمقراطية، العلاقة بينهما، وأهمية كل منهما في بناء المجتمع . 2. **حقوق الإنسان عبر التاريخ:** تطور حقوق الإنسان في الحضارات القديمة (بلاد الرافدين، وادي النيل، الإغريق، الرومان)، وواقعها في العصور الوسطى، ثم تطورها في العصر الحديث. 3. **الأطر الفكرية والقانونية لحقوق الإنسان:** تشمل حقوق الإنسان في الإسلام، والنظريات المفسرة لها، والإعلان العالمي لحقوق الإنسان من حيث نشأته وخصائصه وأنواع الحقوق التي تضمنها. 4. **حماية حقوق الإنسان وآلياتها:** **تتضمن دراسة الحقوق الفئوية (المرأة، الطفل، ذوو الإعاقة، الأقليات)، والانتهاكات الجسيمة وخصائصها، وخطاب الكراهية وسبل معالجته، فضلًا عن الآليات الوطنية والمؤسسات الرقابية والتوعوية ودور الإعلام الحر والرأي العام في حماية الحقوق.** 5. **لتطبيقات المعاصرة لحقوق الإنسان:** تشمل واقع حقوق الإنسان في العراق، والحقوق الرقمية، وآليات مكافحة التمييز، وحماية الأقليات، مع تحليل الحالات العملية وتعزيز دور المواطن في صون الحقوق والحريات.

استراتيجيات التعلم والتعليم	
استراتيجيات	1. **المحاضرات النظرية** :تقديم المفاهيم الأساسية لحقوق الإنسان والديمقراطية، مدعومة بالمناقشات الصفية وتحليل الأمثلة الواقعية. 2. **المناقشات الصفية** :تنفيذ تمارين تطبيقية، إعداد تقارير، تحليل وثائق ومواثيق، والعمل ضمن مجموعات لمناقشة القضايا الحقوقية المعاصرة.. 3. **التطبيق العملي والتمارين** :حل مسائل تطبيقية، كتابة تقارير قصيرة، وممارسة تحليل الوثائق الدولية. 4. **التمارين والواجبات** :إعداد تقارير عن موضوعات محددة، البحث في المواثيق الدولية، ومراجعة القوانين الوطنية المتعلقة بحقوق الإنسان. 5. **التعلم التعاوني** :العمل ضمن مجموعات لمناقشة القضايا المعاصرة في الحقوق والديمقراطية، وتقديم حلول واقعية. 6. **العصف الذهني والتحليل النقدي** :استخدام العصف الذهني لتحليل التحديات، مع اعتماد اختبارات قصيرة وعروض وتقارير لمتابعة تطور الطلبة. 7. **التقييم المستمر** :اختبارات قصيرة، عروض تقديمية، تقارير عملية، لمتابعة تقدم الطلبة وفهمهم للمادة.

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
الحمل الدراسي المنتظم للطالب خلال الفصل	33	الحمل الدراسي المنتظم للطالب أسبوعيا	2
الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

تقييم المادة الدراسية					
مخرجات التعلم ذات الصلة		الوقت / العدد	وزن التقييم	أسبوع التسليم	مخرج التعلم المناسب
تقييم تكويني	اختبارات قصيرة	4	15% (15)	5,7,9 and 13	LO #2 , #3 , #5 and #8
	واجبات	5	15% (15)	2,6,8,10 and 14	LO #1 ,#4 ,#6 ,#7 and #9
	مشاريع/ مختبر				
	تقرير	4	10% (10)		
تقييم ختامي	امتحان فصلي	2hr	10% (10)	7	LO #1 - #5
	امتحان نهائي	3hr	50% (50)	16	All
اجمالي التقييم			100% (100 درجات)		

المنهاج الاسبوعي النظري	
الاسبوع	المحتوى الدراسي
الأسبوع 1	مدخل إلى حقوق الإنسان: التعريف، الأهداف، الخصائص.
الأسبوع 2	حقوق الإنسان في الحضارات القديمة (الرافدين، وادي النيل، الإغريق، الرومان).
الأسبوع 3	حقوق الإنسان في العصور الوسطى والعصر الحديث وتطورها.
الأسبوع 4	نظريات حقوق الإنسان (القانون الطبيعي، العقد الاجتماعي، الاقتصاد الحر)
الأسبوع 5	حقوق الإنسان في الإسلام ومبادئها الأساسية
الأسبوع 6	الاعلان العالمي لحقوق الإنسان :النشأة، الخصائصأنواع الحقوق ،
الأسبوع 7	الحقوق الفئوية: المرأة، الطفل، ذوو الإعاقة، الأقليات
الأسبوع 8	الانتهاكات الجسيمة لحقوق الإنسان وأنواعها
الأسبوع 9	خطاب الكراهية: المفهوم، الأسباب، وآليات المعالجة
الأسبوع 10	الآليات الوطنية لحماية حقوق الإنسان والمؤسسات الرقابية
الأسبوع 11	.المؤسسات التوعوية، الإعلام الحر، والرأي العام
الأسبوع 12	حقوق الإنسان في العراق والحقوق الرقمية ومكافحة التمييز
الأسبوع 13	مدخل إلى الديمقراطية: المفهوم، النشأة، العلاقة بحقوق الإنسان
الأسبوع 14	التحديات المعاصرة للديمقراطية وحقوق الإنسان (خاصة في العالم العربي)

الأسبوع 15	مراجعة عامة / الامتحان النهائي

مصادر التعلم والتدريس		
	المراجع	متوفر في المكتبة ؟
الكتب المطلوبة	حقوق الانسان والديمقراطية – المفاهيم والمرتكزات للدكتور سماح مهدي العلياوي والدكتور سلمان كاظم البهادلي	نعم
الكتب المقررة / الكتب الموصى بها	الديمقراطية وحقوق الانسان في الاسلام للدكتور راشد الغنوشي	لا
Websites	https://www.kutubypdf.com/book50469/ https://www.kutubypdf.com/book52099/	

مخطط الدرجات				
مجموعة	درجة	التقدير	% درجات	تعريف
مجموعة النجاح (50 - 100)	ممتاز - A	امتياز	90 - 100	أداء متميز
	جيد جدا – B	جيد جدا	80 - 89	اعلى من المتوسط مع وجود بعض الاخطاء
	جيد - C	جيد	70 - 79	عمل جيد مع أخطاء ملحوظة
	مقنع - D	متوسط	60 - 69	مقبول لكنه يعاني من نواقص كبيرة
	ضعيف - E	مقبول	50 - 59	العمل يفي بالحد الأدنى من المتطلبات
مجموعة الفشل (0 – 49)	فشل – FX	راسب (قيد المعالجة)	(45-49)	مطلوب عمل اضافي
	فشل – F	راسب	(0-44)	مطلوب كمية كبيرة من العمل

ملاحظة:

سيتم تقريب العلامات التي تحتوي على كسور عشرية أعلى أو أقل من 0.5 إلى العلامة الكاملة الأعلى أو الأدنى. على سبيل المثال، سيتم تقريب العلامة 54.5 إلى 55، بينما سيتم تقريب العلامة 54.4 إلى 54. تتبنى الجامعة سياسة عدم قبول حالات الرسوب "بالقرب من النجاح"، لذلك فإن التعديل الوحيد على العلامات الممنوحة من قبل المصحح(ين) الأصلي(ين) سيكون التقريب التلقائي الموضح أعلاه فقط.

الرمز	عنوان المقرر	ECTS	الفصل الدراسي
NTU100	الديمقراطية وحقوق الانسان	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
1	2	33	17

الوصف

تُعنى هذه المادة بدراسة المفاهيم الأساسية لحقوق الإنسان والديمقراطية، من حيث التعريف والنشأة والتطور التاريخي، مع التركيز على المبادئ والقيم التي تقوم عليها الأنظمة الديمقراطية، وعلاقتها بحماية الحقوق والحريات العامة. كما تتناول المادة الإطار القانوني الدولي والوطني لحقوق الإنسان، وآليات حمايتها وتطبيقها في الواقع.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**English Language**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**NTU101**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	PM		**College**	TEMO	
Module Leader	Safa AKRAM YOUNIS		**e-mail**	Safa.altutunji@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Lecturer		**Module Leader's Qualification**	MASTER	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	The module objectives of learning English are the goals or outcomes that a course/module wants students to achieve. These objectives usually focus on improving the main language skills and overall communication ability. Here are the most common objectives: 1. Improve Communication Skills • Help students speak clearly and confidently in English • Understand conversations in real-life situations (school, work, travel) 2. Develop the Four Main Skills

	• Listening: Understand spoken English (lectures, conversations, media) • Speaking: Express ideas, opinions, and feelings correctly • Reading: Understand texts like stories, articles, and instructions • Writing: Write sentences, paragraphs, and essays with correct structure 3. Build Vocabulary and Grammar • Learn new words and phrases • Use correct grammar in speaking and writing 4. Enhance Pronunciation • Improve how words are pronounced • Speak in a way that others can easily understand 5. Encourage Critical Thinking • Understand and analyze texts • Express opinions and support them with reasons 6. Use English in Real-Life Contexts • Practice English in daily situations (shopping, emails, presentations) • Prepare for academic or professional environments 7. Increase Confidence • Reduce fear of making mistakes
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students will be able to: 1. Identify main ideas in short reading passages 2. Use basic grammar correctly in sentences 3. Communicate simple ideas in spoken English 4. Write a short paragraph with correct structure 5. Understand everyday conversations.
Indicative Contents المحتويات الإرشادية	The module will cover the following topics: • Basic grammar (tenses, sentence structure) • Vocabulary development (common words and expressions) • Reading comprehension (short texts and passages) • Writing skills (sentences and paragraphs) • Listening practice (conversations and audio materials) • Speaking practice (dialogues, discussions, pronunciation)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module adopts a communicative and student-centered approach, emphasizing active participation in real-life language use. Interactive seminars and pair/group activities are used to develop speaking, listening, reading, and writing skills in an integrated manner. Role-plays, discussions, and listening exercises simulate authentic contexts such as travel, work, and daily conversations. Formative assessments (quizzes, assignments, and a seminar presentation) provide regular feedback to reinforce grammar, vocabulary, and pronunciation. The strategy encourages students to practice English confidently inside and outside the classroom, fostering continuous improvement.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	4 and 11	LO #1, #2, #3, #4
	Assignments	6	10% (10)	3,5,7,8,10 and 15	LO #1, #2, #3, #4
	Seminar	1	10% (10)	7	LO #1, #2, #3, #4
	Report	1	10% (10)	12	LO #1, #2, #3, #4
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1, #2, #3, #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Unit 2: Grammar: Present, past, present perfect • Topic: Different lifestyles and cultures • Skills: Reading about families, speaking comparisons
Week 2	Unit 2: Relationships • Grammar: Present perfect vs past simple • Vocabulary: Family and relationships • Skills: Listening and discussing personal experiences
Week 3	Unit 3: Work and Jobs • Grammar: Present tenses and questions • Vocabulary: Jobs and workplaces • Skills: Talking about work and daily routines
Week 4	Unit 4: Time and Money • Grammar: Countable/uncountable nouns, quantities

	• Vocabulary: Money and shopping • Skills: Real-life conversations
Week 5	Unit 5: Travel and Adventure • Grammar: Past simple and continuous • Vocabulary: Travel and holidays • Skills: Reading travel stories, speaking
Week 6	Unit 6: Education and Learning • Grammar: Modal verbs (can, must, should) • Skills: Talking about school and learning
Week 7	Unit 7: Technology and Communication • Grammar: Future forms (will, going to) • Vocabulary: Technology • Skills: Discussions and listening
Week 8	Unit 8: (More Units) • Topics like: • Culture • Health • Environment • Society
Week 9	Unit 9: Culture and Media • Grammar: Passive voice • Vocabulary: TV, films, media • Skills: Expressing opinions, discussions
Week 10	Unit 10: Society and Environment • Grammar: Conditionals (if clauses) • Vocabulary: Environment, social issues • Skills: Problem-solving discussions
Week 11	Unit 11: Experiences • Grammar: Past perfect • Vocabulary: Life experiences • Skills: Storytelling, speaking
Week 12	Unit 12: Student-Centered Learning • The syllabus focuses on student participation • Encourages learners to speak, interact, and practice actively
Week 13	Unit 13: Communicative Approach • Emphasis on using English in real communication • Not only learning rules, but using language in real situations
Week 14	Unit 14: . Integration of Skills • Listening, speaking, reading, and writing are taught together, not separately • Activities combine more than one skill
Week 15	Unit 15: Review & Consolidation • Revision of all grammar and vocabulary • Integrated skills practice • Final assessment

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Head way students' books	No
Recommended Texts		No
Websites		

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
NTU101	**ENGILISH LANGUAGE**	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**0**	33	17

The module adopts a communicative and student-centered approach, focusing on active participation in real-life language scenarios. Interactive seminars, pair work, and group discussions are used to integrate listening, speaking, reading, and writing skills. Role-plays, dialogues, and audio materials simulate authentic contexts such as travel, work, and daily conversations. Formative assessments including quizzes, assignments, and a seminar presentation provide ongoing feedback to reinforce grammar, vocabulary, and pronunciation. This strategy encourages students to practice English confidently both inside and outside the classroom, promoting continuous improvement.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Thermodynamics principle**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**PM 103**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		1	**Semester of Deliver**		2
Administering Department		**PM**	**College**	TEMO	
Module Leader	Mothana M. Mohamed Salih		**e-mail**	muthanam.m1981@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Professor	**Module Leader's Qualification**		master
Module Tutor	Mothana M. Mohamed Salih		**e-mail**	muthanam.m1981@ntu.edu.iq	
Peer Reviewer Name		Dr. Ammar Hassan	**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date		01/6/2025	**Version Number**		3.0

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	1. To develop problem solving skills and understanding of thermodynamics theory through the application of techniques. 2. To understand thermodynamics and energy law. 3. This course deals with the basic concept of heat, work and energy.

	4. This is the basic subject for all cases of systems used in thermodynamics. 5. To understand the laws of energy conversion between thermodynamics systems. 6. Introducing students to thermodynamics by studying thermal systems in terms of energy interactions with its immediate surroundings.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Recognize how temperature gauges work in laboratory equipment. 2. List the different thermodynamics terms. 3. Summarize what is meant by thermodynamics. 4. Discuss the reaction and participation of atoms in chemical reactions. 5. Describe thermal energy, work and energy. 6. Define Boyle's law. 7. Identify open and closed systems and their applications. 8. Discuss the heat transfer processes between thermal systems. 9. Discuss the different characteristics of the measuring devices used in the laboratory. 10. Explanation of Joule's law. 11. Identify the mathematical relationships in solving problems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A</u> ● Introduction - Textbooks - Units. Important definitions - force - pressure - system. Pressure and its types [15 hrs] ● Vapor - Forms of matter when changing its phase - Drawing the phase change of matter on the pressure-volume chart. [15 hrs] ● Specific heat at constant pressure - specific heat at constant volume. Closed system procedures - constant volume - constant pressure. [10 hrs] ● Energy Equation for Systems: Open and Closed - Applications [15 hrs] ● Revision problem classes [6 hrs] <u>Part B</u> ● Fundamentals ● Temperature: Units - Conversions - Measuring Methods - Zero Law. Definition of energy - forms of energy: potential, kinetic, thermal - work - capacity - flow work - pressure diagram. internal energy - enthalpy [15 hrs] ● Steam procedures and their projection on the pressure-volume chart [7 hrs] ● Identify the types of pressure gauges used in refrigeration - types of air velocity gauges and their uses. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	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.

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**	6	10% (10)	3,5,7,9,11 and 15	LO #2, #3,#5,#7,#9 and #11
	Assignments	4	10% (10)	2,6,8 and 12	LO #1, #4, #6and #10
	Projects / Lab.	4	20% (20)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introductions, references, units , General notations , about pressure, force, work etc.

Week 2	Temperature, unit of temperature and conversion, temperature measurements. Zeroth law of Thermodynamics. Energy, types of energy, positional, kinetic, internal and flow energy energies. Heat and work, power, enthalpy.
Week 3	First law of thermodynamics
Week 4	Steady flow energy equation for open system, non-flow energy equation for closed system, Ideal gas and equation of state
Week 5	Ideal gas, Boyle's law and Charles law and equation of state
Week 6	Specific heat at constant pressure and constant volume, closed system Processes using ideal gas. Isometric and isobaric processes.
Week 7	Isothermal and adiabatic processes
Week 8	Polytropic processes
Week 9	open system processes
Week 10	Vapor, phase of substance, Phase change curve on P-V diagram.
Week 11	Dryness fraction, liquid and vapor lines, wet vapor
Week 12	Steam tables and Examples on steam tables
Week 13	Superheated vapor, tables of superheated tables.
Week 14	Processes using two phase system, processes on P-V diagram, Irreversible processes Closed system
Week 15	Second law of thermodynamics, heat engine, heat pump
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Identify the types of pressure gauges used in refrigeration and their uses.
Week 2	Lab 2: Identify the types of air velocity gauges and their uses.
Week 3	Lab 3: Identify the types of temperature measurements used in refrigeration and their uses.
Week 4	Lab 4: Types of heat pumps with a study of the efficiency of the heat pump.
Week 5	Lab 5: compression cycle performance
Week 6	Lab 6: The real refrigeration cycle
Week 7	Lab 7: Filters

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Thermal engineering (eighth edition) R. K. RAJPUT	No
Recommended Texts	Fundamentals of heat and mass transfer (M. Thirumaleshwar)	No
Recommended Texts	Heat and mass transfer (SI UNITS) (Er. R. K. RAJPUT) (S. CHAND)	No
Websites		

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 103	Thermodynamics principles	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**(SSWL (hr/sem**	**(USWL (hr/sem**
3	5	93	107
Description			
In this thermodynamics module, students will explore the foundational concepts that form the basis of this field of study. They will examine energy interactions in thermal systems and measure relevant properties. Key concepts covered include force, energy, work, thermal equilibrium, and temperature. The workshop aims to develop a clear understanding of thermodynamics and its application in engineering. Students will also learn about the practical implications of thermodynamics, such as the laws of heat transfer and their applications in engine cycles. Additionally, they will explore the functioning of refrigerators and heat pumps based on the reversed Carnot cycle, which requires external work to transfer heat from a lower temperature body to a higher temperature body.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**NTU 102**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	1		**Semester of Deliver**	2	
Administering Department	PM		**College**	TEMO	
Module Leader	Safa Akram Younis		**e-mail**	safa.altutunji@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/6/2025		**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	To learn about computers and their characteristics and features, compare different types of computers. 1. To learn about the computer's Hardware, Identify the factors that affect the computer's performance, Learn about the numerical systems and data representation. 2. Learn about the computer's Hardware (2), CPU, Memory 3. Learn about operating system software 4. Learn about the utility software programming languages, application software.

	5. Learn the Microsoft office2020(Word, Excel, PowerPoint)
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrates knowledge of the Introduction to computer, computer component (hardware, software) 2. Demonstrates knowledge of the Operating system (windows), 3. Able to install windows (formatting) 4. Able to use the following items: Start menu, desktop, taskbar, mouse applications, My computer, My documents, drivers, folders, files, cut, copy, paste, shortcut, right click menu, Setting menu, control panel 5. Able to use Microsoft word 2020, Microsoft excel 2020, Microsoft PowerPoint 2020 6. Able to use Internet, Internet explorer, starting, menus of internet explorer, E-Mail: Yahoo, Hotmail, google, yahoo, search information
Indicative Contents المحتويات الإرشادية	After studying this chapter, the student is expected to master the following knowledge and skills: 1. To know what is the computer, distinguish different computer properties, list the computers features and capabilities, compare between the different types of computers [11 hrs] 2. Classifies the computer's hardware components to internal and external [11 hrs] 3. To knows the CPU, types of memory modules, learn about input and output units, Learn about storage media, learn the components of the motherboard [11 hrs] 4. Distinguish between different types of software, differentiate between types of system software, distinguish between types of operating systems, count the basic functions of the operating system. [12 hrs] 5. Learn about different types of utility software, learn about the most important utility software and its functions, distinguish between different types of programming languages, differentiate between the types of different programming languages Compilers, classifies different programming languages, classifies application software, learn about the most important application software [12 hrs] 6. Learn to use the Microsoft office2020 [15hrs] ● Word [5 hrs] ● Excel [5 hrs] ● Powerpoint [5 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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.

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	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	3,8 and 12	LO #1, #2,#4,#5 and #6
	Assignments	4	10% (10)	2,5,10 and 14	LO #1, #4,#5 and #6
	Projects / Lab.	3	20% (20)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #3
	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 Computer: Concepts of Hardware and Software with their components; Concept of Computing, Data and Information; Applications of Information Electronics and Communication Technology (IECT); Connecting input/output devices, and peripherals to CPU
Week 2	Computer Components: Computer Portions, Hardware Parts, I/O Units, Memory Types, Basic CPU Components, Computer Ports, Personal Computer, Personal Computer (Features and Types)
Week 3 &4	Operating System and Graphical User Interface GUI: Operating System; Basics of

	Common Operating Systems; The User Interface, Using Mouse Techniques; Use of Common Icons, Status Bar, Using Menu and Menu-selection, Concept of Folders and Directories, Opening and closing of different Windows: Creating Short cuts
Week 5&6	Word Processing: Word Processing Basics: Opening and Closing of documents, Text creation and Manipulation; Formatting of text; Table handling: Spell check, language setting and thesaurus; Printing of word document.
Week 7& 8& 9	Spread Sheet: Basics of Spreadsheet, Manipulation of cells; Formulas and Functions, Editing of Spread, printing of spread sheet.
Week 10&11	Presentation Software: Basics of presentation software; Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation / handouts
Week 12	Introduction to Internet and Web Browsers: Computer networks Basic; LAN, WAN; Concept of Internet and its Applications; connecting to intemet; World Wide Web; Web Browsing software's, Search Engines: Understanding URL: Domain name; IP Address
Week 13	Communications and Emails: Basics of electronic mail; Getting an email account; Sending and receiving emails; Accessing sent emails; Using Emails; Document collaboration
Week 14	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 5&6	Able to use Microsoft word 2020
Week 7& 8& 9	Able to use Microsoft excel 2020
Week 10&11	Able to use Microsoft powerpoint 2020

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Introduction to Computer Skills **For first year students, Bisha University** Computer Science Principles: The Foundational Concepts of Computer Science - For AP® Computer Science Principles 2020th Edition , Mr. Kevin P Hare (Author), Pindar Van Arman (Foreword) 1. Graham Brown, David Watson, "Cambridge IGCSE Information and Communication Technology", 3rd Edition	Yes

Recommended Texts	MICROSOFT ACCESS, EXCEL & POWER BI FOR BEGINNERS & POWER USERS, Tech Demystified	No
Websites	https://www.just.edu.jo/~mqais/CIS99/PDF/Ch.01_Introduction_%20to_computers.pdf	

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
NTU 101	**COMPUTER PRINCIPLES**	**3**	**2**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**2**	**63**	**12**

Description

Computer Principles is an introductory course that provides a comprehensive understanding of the fundamental concepts and principles of computer science. The course covers topics such as computer architecture, data representation, algorithms, programming languages, operating systems, and computer networks. Students will learn about the basic components of a computer system, how data is stored and processed, and the principles behind efficient and reliable computer operations. The course also explores the role of computers in society, ethical considerations in computing, and emerging trends in the field. Through this course, students will develop a solid foundation in computer principles and gain the necessary skills to pursue further studies or careers in computer science

نموذج وصف المادة الدراسية

معلومات المادة الدراسية			
عنوان المقرر	اللغة العربية	طريقة تقديم المقرر	
نوع المقرر	مادة مساعدة Support or related learning activity	نظري ☒ محاضرة ☒ مختبر ☐ تمارين ☒ عملي ☐ حلقة دراسية ☒	
رمز المقرر	NTU 103		
عدد الساعات المعتمدة بنظامECTS	2		
SWL (hr/sem)	50		
مستوى المقرر	1	فصل تقديم المقرر	2
القسم الإداري المسؤول	PM	الكلية	TEMO
مسؤول المقرر	أ.م. د. محمد عبد الموجود حسن	ايميل	dr.mohmmed67@ntu.edu.iq
اللقب الأكاديمي لمسؤول المقرر	أستاذ مساعد	الشهادات العلمية لمسؤول المقرر	دكتوراه
مدرس المقرر	أ.م. د. محمد عبد الموجود حسن	ايميل	dr.mohmmed67@ntu.edu.iq
اسم المراجع النظير	د. عمار حسن سهيل	ايميل	ammarsuhail@ntu.edu.iq
تاريخ اعتماد اللجنة العلمية	2025/06/01	رقم الاصدار	3.0

العلاقة مع المواد الدراسية الأخرى			
المقرر السابق المطلوب	لا يوجد	الفصل الدراسي	
المقررات المتزامنة	لا يوجد	الفصل الدراسي	

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
أهداف المادة الدراسية	تهدف المادة إلى: • تمكين الطلبة من الكتابة الصحيحة الخالية من الأخطاء الإملائية والنحوية • تعريف الطلبة بالقواعد الأساسية في اللغة العربية • تنمية القدرة على التمييز بين التراكيب اللغوية المختلفة • معالجة الأخطاء اللغوية الشائعة في الاستعمال اليومي • تطوير مهارات الكتابة الرسمية والإدارية.
مخرجات التعلم للمادة الدراسية	بنهاية المادة يكون الطالب قادراً على: • كتابة نصوص سليمة لغوياً • تطبيق قواعد الإملاء والنحو الأساسية • تصحيح الأخطاء اللغوية • استخدام اللغة العربية في الكتابات الرسمية والإدارية • التعبير عن الأفكار بشكل واضح ومنظم
المحتويات الإرشادية	- تتناول المادة أساسيات اللغة العربية من حيث قواعد الإملاء الصحيحة، ومعالجة الأخطاء اللغوية الشائعة، بما يسهم في تحسين سلامة الكتابة لدى الطلبة.

	- كما تشمل دراسة مبادئ النحو الأساسية مثل أقسام الكلام وبعض التراكيب اللغوية، إلى جانب استعمال علامات الترقيم ودلالات العدد وحروف الجر في السياق اللغوي. - وتركّز المادة على التطبيقات العملية من خلال تحليل النصوص وتصحيح الأخطاء، بما يعزز مهارات الفهم والاستخدام الصحيح للغة. - وتتضمن كذلك التعريف بأسس الكتابة الوظيفية والخطاب الإداري، من حيث الشكل والمضمون، وصولاً إلى تمكين الطلبة من كتابة نصوص رسمية سليمة.

استراتيجيات التعلم والتعليم	
استراتيجيات	1. **المحاضرات النظرية** :تقديم المفاهيم والقواعد الأساسية للغة العربية مع أمثلة تطبيقية 2. **المناقشات الصفية** :تشجيع الطلاب على المشاركة وتحليل النصوص اللغوية ومناقشة الأخطاء الشائعة. 3. **التطبيق العملي** :تدريبات كتابة وتحرير نصوص، وتصحيح الأخطاء اللغوية والنحوية. 4. **التمارين والواجبات** :حل تدريبات على الإملاء، علامات الترقيم، المفاعيل، والكتابة الرسمية. 5. **التعلم التعاوني** :العمل ضمن مجموعات لمراجعة النصوص وتحليلها وتقديم حلول تصحيحية. 6. **العصف الذهني** :مناقشة الأساليب الصحيحة في الخطاب الإداري وتحليل نماذج كتابية. 7. **التقييم المستمر** :اختبارات قصيرة، تقارير، وعروض تطبيقية لمتابعة تقدم الطلاب.

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
الحمل الدراسي المنتظم للطالب خلال الفصل	33	الحمل الدراسي المنتظم للطالب أسبوعيا	2
الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

تقييم المادة الدراسية					
مخرجات التعلم ذات الصلة		الوقت / العدد	وزن التقييم	أسبوع التسليم	مخرج التعلم المناسب
تقييم تكويني	اختبارات قصيرة	4	15% (15)	5,7,9 and 13	LO #2 , #3 , #5 and #8
	واجبات	5	15% (15)	2,6,8,10 and 14	LO #1 ,#4 ,#6 ,#7 and #9
	مشاريع/ مختبر				
	تقرير	4	10% (10)		
تقييم ختامي	امتحان فصلي	2hr	10% (10)	7	LO #1 - #5
	امتحان نهائي	3hr	50% (50)	16	All
اجمالي التقييم			100% (100 درجات)		

المنهاج الاسبوعي النظري	
الاسبوع	المحتوى الدراسي
الأسبوع 1	القرآن الكريم: من سورة الحج (1–5) + الحديث الشريف وشرحه
الأسبوع 2	الأدب: بائية ابن الرومي (شرح الأبيات وتحليلها)
الأسبوع 3	الأدب: القيم الإنسانية في الشعر الجاهلي + الإسلام والشعر
الأسبوع 4	النحو: أقسام الكلام وعلامات الإعراب
الأسبوع 5	النحو: المعرب والمبني + المعرفة والنكرة
الأسبوع 6	النحو: المبتدأ والخبر
الأسبوع 7	النحو: النواسخ
الأسبوع 8	النحو: الفاعل ونائب الفاعل
الأسبوع 9	البلاغة: مقدمة عامة + تعريف البلاغة وعلومها
الأسبوع 10	البلاغة: علم البيان + التشبيه
الأسبوع 11	البلاغة: الحقيقة والمجاز + المجاز اللغوي
الأسبوع 12	البلاغة: الاستعارة + المجاز العقلي + الكناية
الأسبوع 13	المعاجم: المدارس المعجمية + مفردات القرآن + منهج (العين والأساس)
الأسبوع 14	مراجعة عامة + الأخطاء اللغوية الشائعة + التهيئة للامتحان
الأسبوع 15	الامتحان النهائي

مصادر التعلم والتدريس		
	المراجع	متوفر في المكتبة ؟
الكتب المطلوبة	قواعد اللغة العربية للعلامة حفني ناصف وآخرون	نعم
الكتب المقررة / الكتب الموصى بها	قواعد النحو وتعلم العربية (أ.د. محمد حماسة عبد اللطيف - رحمه الله)	لا
Websites	https://shamela.ws/ **المكتبة الشاملة**	

مخطط الدرجات				
مجموعة	درجة	التقدير	% درجات	تعريف
مجموعة النجاح **(50 - 100)**	ممتاز - **A**	امتياز	90 - 100	أداء متميز
	جيد جدا – **B**	جيد جدا	80 - 89	اعلى من المتوسط مع وجود بعض الاخطاء
	جيد - **C**	جيد	70 - 79	عمل جيد مع أخطاء ملحوظة
	مقنع - **D**	متوسط	60 - 69	مقبول لكنه يعاني من نواقص كبيرة
	ضعيف - **E**	مقبول	50 - 59	العمل يفي بالحد الأدنى من المتطلبات
مجموعة الفشل **(0 – 49)**	فشل – **FX**	راسب (قيد المعالجة)	(45-49)	مطلوب عمل اضافي
	فشل – **F**	راسب	(0-44)	مطلوب كمية كبيرة من العمل

ملاحظة:

سيتم تقريب العلامات التي تحتوي على كسور عشرية أعلى أو أقل من 0.5 إلى العلامة الكاملة الأعلى أو الأدنى. على سبيل المثال، سيتم تقريب العلامة 54.5 إلى 55، بينما سيتم تقريب العلامة 54.4 إلى 54. تتبنى الجامعة سياسة عدم قبول حالات الرسوب "بالقرب من النجاح"، لذلك فإن التعديل الوحيد على العلامات الممنوحة من قبل المصحح(ين) الأصلي(ين) سيكون التقريب التلقائي الموضح أعلاه فقط.

الرمز	عنوان المقرر	ECTS	الفصل الدراسي
NTU103	اللغة العربية	**2**	**1**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
1	**2**	**33**	**17**
الوصف			
تهدف هذه المادة إلى تنمية قدرات الطلبة في فهم اللغة العربية واستعمالها استعمالًا صحيحًا من خلال دراسة النصوص القرآنية والأدبية، والتعرّف على القواعد النحوية والبلاغية الأساسية، والتدريب على تحليل النصوص واستيعاب معانيها. كما تسعى إلى تعزيز مهارات الطلبة في التعبير اللغوي السليم، وتنمية ذائقتهم الأدبية، وتمكينهم من توظيف اللغة في السياقات الأكاديمية بصورة دقيقة ومنظمة، مع معالجة الأخطاء اللغوية الشائعة وتطوير القدرة على الفهم والتحليل.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mechanics/ Dynamics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**PM 104**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	PM		**College**	TEMO	
Module Leader	Mohammed Taha Mohammed		**e-mail**	mohammed.taha@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Lecturer		**Module Leader's Qualification**	MASTER	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	Module Objectives for Engineering Mechanics/Dynamics: 1. Understand the fundamental concepts and principles of dynamics, including motion, forces, and acceleration. 2. Apply kinematic equations to analyze the motion of particles and rigid bodies in various scenarios. 3. Determine the relationship between forces, mass, and acceleration using Newton's laws of motion.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	4. Apply the principles of work and energy to analyze and solve dynamic problems. 5. Analyze and calculate linear and angular momentum, and apply the principle of impulse and momentum to dynamic systems. 6. Understand and apply the principles of vibrations and oscillations in mechanical systems. 7. Apply principles of balancing rotating masses and vibrations to ensure smooth operation of machinery. 8. Analyze multi-degree of freedom systems and determine their natural frequencies and mode shapes. 9. Apply dynamic principles to real-world engineering problems and systems. 10. Develop critical thinking and problem-solving skills in the context of engineering dynamics. 11. Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of dynamic problems. By achieving these module objectives, students will gain a comprehensive understanding of the principles and applications of engineering dynamics. They will be able to analyze and solve problems related to motion, forces, and vibrations in mechanical systems, and apply their knowledge to real-world engineering scenarios. They will also develop skills in critical thinking, problem-solving, and effective communication, which are valuable in the field of engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Module Learning Outcomes for Engineering Mechanics/Dynamics: 1. Demonstrate a thorough understanding of the fundamental concepts and principles of dynamics, including motion, forces, and acceleration. 2. Apply kinematic equations to analyze the motion of particles and rigid bodies in different scenarios and determine their velocities and accelerations. 3. Analyze and calculate the forces and moments acting on particles and rigid bodies in dynamic situations, considering the principles of equilibrium. 4. Apply Newton's laws of motion to determine the relationship between forces, mass, and acceleration, and solve dynamic problems using these principles. 5. Utilize the principles of work and energy to analyze and solve dynamic problems, calculating mechanical work, kinetic energy, and potential energy. 6. Apply the principles of impulse and momentum to analyze the motion and collision of particles and rigid bodies, and solve related problems. 7. Understand the principles of vibrations and oscillations in mechanical systems, and analyze their behavior, natural frequencies, and damping effects. 8. Analyze three-dimensional motion of rigid bodies, applying Euler's equations of motion to determine their rotational and translational behavior. 9. Understand gyroscopic motion and its applications in stability and control systems, including precession and gyroscope stabilization.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	10. Apply the principles of balancing rotating masses to minimize vibrations and ensure smooth operation of rotating machinery. 11. Analyze multi-degree of freedom systems, determine their natural frequencies and mode shapes, and understand their response to dynamic loading. 12. Apply the principles and techniques learned in dynamics to solve real-world engineering problems, such as analyzing the motion and forces in mechanical systems. 13. Demonstrate critical thinking and problem-solving skills by effectively applying dynamic principles to analyze and solve complex engineering problems. 14. Communicate effectively, both orally and in writing, to present and explain the analysis, results, and solutions of dynamics problems. By achieving these module learning outcomes, students will have a solid foundation in engineering dynamics, enabling them to analyze and solve problems related to motion, forces, vibrations, and stability in mechanical systems. They will develop critical thinking skills, problem-solving abilities, and effective communication skills, which are essential for success in the field of engineering dynamics.
Indicative Contents المحتويات الإرشادية	Indicative Contents for Engineering Mechanics/Dynamics: 1. Kinematics of Particles • Position, velocity, and acceleration • Rectilinear and curvilinear motion • Projectile motion • Tangential and normal components of acceleration 2. Kinetics of Particles • Newton's laws of motion • Force, mass, and acceleration • Application of Newton's laws to particles • Frictional forces • Applications of particle kinetics 3. Kinematics of Rigid Bodies • Rotation and angular displacement • Angular velocity and acceleration • Fixed axis rotation • General plane motion 4. Kinetics of Rigid Bodies • Moment of inertia • Parallel-axis theorem • Angular momentum and torque • Equations of motion for rigid bodies • Applications of rigid body kinetics

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	5. Work and Energy • Work done by a force • Kinetic energy and potential energy • Principle of work and energy • Power and efficiency • Conservative and non-conservative forces 6. Impulse and Momentum • Linear momentum and impulse • Conservation of linear momentum • Impulse-momentum principle • Impact and collision • Applications of momentum 7. Vibrations and Oscillations • Free and forced vibrations • Single degree of freedom systems • Damping and damping ratios • Natural frequency and resonance • Vibration isolation and control

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	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	122	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
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)	4 and 11	LO #1, #2, #3, #9, #10 and #11
	Assignments	6	10% (10)	3,5,7,8,10 and 15	LO #2, #4, #5, #7, #9 and #11
	Seminar	1	10% (10)	7	LO #1-7
	Report	1	10% (10)	12	LO #9-12
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 Engineering Mechanics/Dynamics • Overview of Engineering Mechanics/Dynamics • Fundamental concepts and principles • Unit conversions
Week 2	• Kinematics of Particles • Position, velocity, and acceleration
Week 3	Rectilinear motion
Week 4	Curvilinear motion
Week 5	Tangential and normal components of acceleration
Week 6	Projectile motion
Week 7	• Kinetics of Particles • Newton's laws of motion • Force, mass, and acceleration
Week 8	Application of Newton's laws to particles
Week 9	• Frictional forces • Applications of particle kinetics
Week 10	• Kinetics of Rigid Bodies • Moment of inertia
Week 11	• Work and Energy • Work done by a force

Week 12	• Kinetic energy and potential energy • Principle of work and energy
Week 13	• Impulse and Momentum • Linear momentum and impulse • Conservation of linear momentum • Impulse-momentum principle • Impact and collision • Applications of momentum
Week 14	Vibrations • Free and forced vibrations • Single degree of freedom systems
Week 15	• Damping and damping ratios • Natural frequency and resonance • Vibration isolation and control

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	• **Engineering Mechanics: Dynamics,** By R. C. Hibbeler 14th edition.	No
Recommended Texts	• Engineering Mechanics: Dynamics, by J. L. Meriam and L. D. Kraige 9th edition • Theory and Problems of Engineering Mechanics: Statics and Dynamics, Fifth Edition, Shaum's Outline Series. • Engineering Mechanics: Dynamics, by Andrew Pytel and Jaan Kiusalaas, 3rd edition.	No
Websites		

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
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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 104	**Engineering Mechanics/ Dynamics**	**8**	**2**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**2**	**78**	**122**

Dynamics is a branch of Engineering Mechanics that focuses on the study of objects in motion and the forces that cause that motion. It builds upon the principles of statics and expands them to analyze the behavior of objects subjected to acceleration, velocity, and displacement. This field is concerned with understanding and predicting the motion of particles and rigid bodies, as well as the forces and energy associated with their motion.

The primary goal of Engineering Mechanics/Dynamics is to provide engineers with a comprehensive understanding of how objects move and interact under the influence of forces and moments. By studying dynamics, engineers can design and analyze systems such as machines, vehicles, and structures to ensure their optimal performance, efficiency, and safety.

In this subject, students explore various topics, including the kinematics and kinetics of particles and rigid bodies. Kinematics deals with the description of motion, focusing on concepts such as displacement, velocity, and acceleration. Kinetics, on the other hand, focuses on the forces and torques acting on objects, leading to their motion.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering drawing**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 105**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	1		**Semester of Deliver**	2	
Administering Department	PM		**College**	TEMO	
Module Leader	Asmaa Taha Hussein		**e-mail**	Asmaa.taha@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	01/6/2025		**Version Number**	3.0	

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	1. Introduction students to the Autocad software. 2. Introduction to the students of engineering drawings. 3. Teaching students to draw geometrically according to accurate measurements. 4. To understand the basic principle for descriptive geometry. 5. to train students: to read the engineering drawings through the application of computers and techniques. 6. To understand standard specifications, draw simple and complex assembly drawings.
Module Learning Outcomes	1. Enables the students to use AutoCAD for 2-D representations. 2. Enables the students to Introduce the students to engineering drawings. 3. Enables the students to learn the techniques and standard practices of technical graphics.

مخرجات التعلم للمادة الدراسية	4. To develop the student's abilities of engineering imagination. 5. To develop the student's engineering sense by dealing with dimensions and measurements. 6. To teach the student to identify the characteristics of geometric shapes and the various ways to draw them. 7. To teach the student diversity in the way of thinking and finding solutions for drawing each form.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Introduction to (CAD), components of computer aided drawing (CAD), Exercises. [8 hrs.] Introducing the most important geometric shapes and their components, and how to draw each shape using the program [4hrs.] Introducing the most important commands that contribute to making modifications to the geometric shapes drawn using the program [8 hrs.] Demonstrate the method of drawing advanced geometric shapes using the program. [4 hrs.] Training students to draw advanced geometric shapes using the program [8 hrs.] Revision and quiz [8hrs] Part B - Training students at this stage to draw triangular projections of geometric shapes for any geometric shape in general. [8 hrs.] Complex geometrical shape. [12 hrs.] Training the students at this stage to draw the triangular projections of the geometric shapes of the mechanical engineering shapes in particular. [15 hrs.] Training the students at this stage to draw the Perspective. [15 hrs.] Revision and quiz [8hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	**63**	**Structured SWL (h/w)**	4

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
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)	2 , 7 and 13	LO #1, #5 and #6
	Assignments	5	10% (10)	3 , 5, 8,10 and 14	LO #2,#3, #4 and #7
	Projects / Lab.	10	20% (20)	Continuous	All
	Report				
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	Demonstrates knowledge about: · Introduction to engineering drawing. · Introduction about AutoCAD 2D software in engineering drawing. · Limits, grid, object snap, view menu (zoom, pan).
Week 2&3	Correctly draw menu (line, poly line, polygon, rectangle, arc, circle, point, text).
Week 4&5	Correctly modify menu (erase, copy, mirror, offset, move, rotate, trim, extend, explode).
Week 6&7&8	Complex geometrical shape.
Week 9	Mid Semester exam

Week 10&11&12	Perspective
Week 13	Correctly implement and identify orthographic projection. Correctly implement and execute first and third angle projection method
Week 14	Correctly draw the projection with the first angle projection method Correctly draw the projection with the third angle projection method Demonstrates knowledge and implementation about drawing the three projections with the first and third angle projection method
Week 15	Semester exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	No

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals and principles of engineering drawing Fundamentals of AutoCAD 2010	Yes
Recommended Texts	Fundamentals of AutoCAD2020	Yes
Websites	https://tr.pinterest.com/pin/343540277818420973/	

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 105	Engineering Drawing	7	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	2	63	112

DESCRIPTION

Engineering drawing is a universal language used exclusively by engineers, technicians, and all those working in engineering fields to convey and translate scientific and technical ideas. It is also used in communication between design professionals and product developers, regardless of the language they speak. Due to the urgent need for a means of assisting those interested in computer-aided engineering drawing, AutoCAD was chosen. It is considered one of the most advanced programs for the drafting process and one of the most popular CAD systems in the world due to its ease of use and speed of implementation.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information					
Module Title	**Occupational Safety**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Laboratory** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 107**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	**1**		**Semester of Deliver**		**2**
Administering Department	**PM and AM**		**College**	**TEMO**	
Module Leader	**Banan Najim Al-deen 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	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	**01/06/2025**		**Version Number**	**3.0**	

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	Understanding the Importance of Occupational Safety: This unit aims to provide students with a comprehensive understanding of the importance of occupational safety in the workplace. Students will identify potential hazards associated with various industries and their impact on employee safety. They will understand the importance of following safety guidelines to create a safe work environment .They will learn how to identify potential hazards, assess their severity and likelihood of occurrence, and develop appropriate control measures to mitigate or eliminate those hazards.
Module Learning Outcomes	1. Identify and assess workplace hazards: Engineering students will be able to identify and assess potential workplace hazards specific to their field of engineering. They will understand the importance of hazard identification and risk assessment in order to prevent accidents, injuries, and occupational illnesses. 2. Apply engineering principles to develop safety solutions: Students will

	be able to apply their engineering knowledge and skills to develop innovative and effective safety solutions. They will understand how engineering principles can be utilized to design and implement engineering controls, safety devices, and protective measures to minimize or eliminate workplace hazards. 3. Implement safety standards and regulations: Engineering students will be knowledgeable about relevant safety standards and regulations applicable to their specific engineering discipline. They will understand the importance of compliance with safety standards and be able to apply them in the design, construction, operation, and maintenance of engineering systems and processes. They will also be aware of the legal and ethical responsibilities associated with ensuring occupational safety in their professional practice.
1. Indicative Contents	Indicative content includes the following. Introduction to Occupational Safety, Identifying and Assessing Risks, Engineering Controls and Safety Systems, Personal Protective Equipment and Safety, Equipment Occupational Health and Industrial Health [10 hrs] Fire Safety and Emergency Preparedness, Electrical Safety in Engineering Machine and Equipment, Safety Construction, Safety in Engineering Projects, Hazardous Materials Management [10 hrs] Revision classes [2 hrs] Incident Investigation and Reporting in Engineering Safety Management Systems in Engineering Application in Occupational Safety 1 Application in Occupational Safety 2. [10 hrs]

2. Learning and Teaching Strategies	
3. Strategies	1. Familiarize yourself with the subject 2. Collaborate and discuss: Engage in discussions and group activities with fellow engineering students. Share experiences, exchange ideas, and learn from each other's perspectives. This collaborative learning environment can broaden your understanding and provide different insights into safety practices. 3. Stay updated with industry standards: Keep yourself informed about the latest safety regulations, codes, and standards relevant to the engineering field. Regularly refer to authoritative sources such as government agencies, professional organizations, and reputable publications to stay up-to-date with best practices.
Student Workload (SWL)	

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**(32/15)= 2**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**(18/15)= 1**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**		**15% (10)**	**5 and 10**	**LO #2**
	Assignments		**15% (10)**	**2 and 12**	**LO #3**
	Projects / Lab.				
	Report		**10% (20)**	**8 and 13**	**LO #1 and LO #2**
Summative assessment	**Midterm Exam**	**1hr.**	**10% (10)**	**7**	**LO #1 - #2**
	Final Exam	**2hr.**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Occupational Safety
Week 2	Hazard Identification and Risk Assessment
Week 3	Engineering Controls and Safety Systems
Week 4	Personal Protective Equipment (PPE) and Safety Equipment
Week 5	Occupational Health and Industrial Hygiene
Week 6	Fire Safety and Emergency Preparedness
Week 7	Electrical Safety in Engineering
Week 8	Machine and Equipment Safety
Week 9	Construction Safety in Engineering Projects
Week 10	Hazardous Materials Management
Week 11	Training and Communication in Engineering Safety
Week 12	Accident Investigation and Reporting in Engineering
Week 13	Safety Management Systems in Engineering
Week 14	Application in Occupational Safety 1
Week 15	Application in Occupational Safety 2
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. "السلامة والصحة المهنية" بواسطة علي عبد العزيز المرزوقي.	**Yes**
Recommended Texts		
Websites	*"Machine Safety". NIOSH Workplace Safety and Health Topics. National Institute of Occupational Safety and* Health.	

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 106	**Occupational Safety**	**4**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	**0**	**32**	**18**
Description			
Occupational safety is a field of study focused on achieving a safe and healthy working environment for			

employees across all industries and sectors. Scientists and researchers in this field aim to analyze and assess potential workplace hazards and develop and implement strategies and systems for preventing and controlling these risks. Areas of study in occupational safety include hazard identification, risk assessment, designing and implementing safety and prevention procedures, training and education, accident and emergency management, and safety legislation and standards. Scientists and professionals in this field aim to promote a culture of safety and raise awareness of the importance of occupational safety among employees and the business community as a whole. Occupational safety is a fundamental component of effective risk management and contributes to improved overall performance, quality, and employee well-being in the workplace.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information					
Module Title	**Refrigeration & Air Conditioning Principles**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Laboratory** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 200**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	**2**	**Semester of Deliver**	**3**		
Administering Department	**PM**	**College**	**TEMO**		
Module Leader	**Banan Najim Al-deen 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	Dr. Ammar Hassan	e-mail	ammarsuhail@ntu.edu.iq		
Scientific Committee Approval Date	01/06/2025		**3.0**		

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	The main objective of studying Refrigeration and Air Conditioning principles is to understand the fundamental concepts and working mechanisms used to control temperature, humidity, and air quality in different environments. This field teaches students how heat is transferred and how refrigeration cycles operate in systems such as air conditioners, refrigerators, and industrial cooling units. It also aims to develop the ability to analyze, design, operate, and maintain refrigeration and air-conditioning systems efficiently. By studying these principles, students gain the knowledge needed to improve energy efficiency, ensure thermal comfort in buildings, and support various applications in homes, hospitals, industries, and transportation systems
Module Learning Outcomes	1. Understand the basic principles of refrigeration and air-conditioning systems. 2. Identify and explain the main components of refrigeration systems such as compressors, condensers, evaporators, and expansion devices.

	3. Analyze refrigeration cycles and thermodynamic processes used in cooling systems. 4. Calculate cooling load requirements for buildings and different applications. 5. Evaluate the performance and efficiency of refrigeration and air-conditioning systems. 6. Apply engineering knowledge to design simple refrigeration and HVAC systems. 7. Diagnose common operational problems and maintenance issues in cooling systems. 8. Understand the environmental and energy impacts of refrigeration and air-conditioning technologies. 9. Develop practical skills for installation, operation, and maintenance of refrigeration equipment.
1. Indicative Contents	Introduction to refrigeration and air-conditioning systems Properties of refrigerants and their environmental impact The vapor compression refrigeration cycle and its components Types and working principles of compressors, condensers, evaporators, and expansion devices Performance analysis of refrigeration systems and coefficient of performance (COP) Psychrometric properties of air and air-conditioning processes Cooling load estimation for buildings and indoor spaces Types of air-conditioning systems used in residential and commercial buildings Energy efficiency and methods for improving system performance Basic installation, operation, and maintenance of refrigeration and air-conditioning equipment Safety considerations and environmental regulations in refrigeration systems

2. Learning and Teaching Strategies	
3. Strategies	1. Lectures: Presenting theoretical concepts and fundamental principles of refrigeration and air-conditioning systems. 2. Class Discussions: Encouraging students to discuss concepts, ask questions, and analyze practical problems. 3. Problem-Solving Sessions: Solving numerical and engineering problems related to refrigeration cycles and system performance. 4. Laboratory Experiments: Conducting practical experiments to understand the operation of refrigeration and air-conditioning equipment. 5. Case Studies: Studying real-life applications of HVAC systems in buildings and industry. 6. Group Work: Assigning collaborative tasks to improve teamwork and technical understanding. 7. Practical Demonstrations: Demonstrating the working principles of system components such as compressors, condensers, and evaporators.

	8. Assignments and Projects: Giving students tasks to apply theoretical knowledge to practical design or analysis problems. 9. Use of Multimedia and Simulation Tools: Using software, videos, and visual aids to illustrate system operation and performance.

Student Workload (SWL)			
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

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**		**10% (10)**	**5 and 10**	**LO #2**
	Assignments		**10% (10)**	**2 and 12**	**LO #3**
	Projects / Lab.		**10% (10)**		
	Report		**10% (10)**	**8 and 13**	**LO #1 and LO #2**
Summative assessment	**Midterm Exam**	**1hr.**	**10% (10)**	**7**	**LO #1 - #2**
	Final Exam	**2hr.**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	introduction
Week 2	SI Units
Week 3	Fundamental properties of air and water vapour mixture
Week 4	Psychrometric Chart
Week 5	The Psychrometry of Air and Conditioning Process
Week 6	Winter Cycle)
Week 7	Summer Cycle
Week 8	REFRIGERATION
Week 9	Refrigerators And Heat Pumps
Week 10	Reversed Carnot Cycle
Week 11	VAPOUR COMPRESSION CYCLE
Week 12	Multipressure systems Performance of the standard vapour compression cycle

Week 13	Multipressure systems Performance of the standard vapour compression cycle
Week 14	Multipressure systems Performance of the standard vapour compression cycle
Week 15	Refrigerants
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. Refrigeration & Air Conditioning Technology 2. Introduction to Refrigeration and Air Conditioning Systems	**No**
Recommended Texts		
Websites	**Introduction to Refrigeration and Air Conditioning Systems (2023).**	

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 106	**Refrigeration & Air Conditioning Principles**	**8**	**3**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**

4	**4**	**123**	**77**

Description

This course introduces students to the fundamental principles and applications of refrigeration and air-conditioning systems. It covers the basic concepts of thermodynamics and heat transfer as applied to cooling processes, including the study of refrigeration cycles such as the vapor compression cycle. The course also explores the main components of refrigeration systems, including compressors, condensers, evaporators, and expansion devices, and explains their functions and operation.

In addition, the course addresses psychrometric processes and air-conditioning principles used to control temperature, humidity, and air quality in indoor environments. Students will learn how to estimate cooling loads, evaluate system performance, and understand energy efficiency considerations. Practical aspects such as system operation, maintenance, and common troubleshooting techniques are also introduced to prepare students for real-world applications in residential, commercial, and industrial settings

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 200**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Deliver**	3	
Administering Department	PM		**College**	TEMO	
Module Leader	Ahmed Mustaffa Saleem		**e-mail**	ahmedmustafa@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	1.To enable the student to solve the mathematical problems. 2. To provide a suitable type of discipline in the mind of the learners. 3. To prepare the student for various technical profession. 4. To prepare the student for economic purposeful, productive, creative, and constructive living. 5. To prepare the student for undergraduate as well as postgraduate education. 6. To develop in the power of thinking and reasoning. 7. To develop in the student the habit of concentration, self-reliance and discovery.
Module Learning Outcomes	1. Solve problems at various levels and in various contexts. 2. Learn how to read, understand, and formulate the definitions of mathematical concepts. 3. Cultivate how to read and analyze mathematical statements.

مخرجات التعلم للمادة الدراسية	4. Apply logical deduction and acquire mathematical reasoning through writing formal mathematical proofs. 5. Work with ideas and approaches representing the breadth of mathematical sciences, ranging from continuous to discrete and theoretical to applied.
Indicative Contents المحتويات الإرشادية	1. Evidence an understanding of general fundamental mathematical topics. 2. Evidence an understanding of mathematics topics related to engineering and technology. 3. Demonstrate ability to analyses and present information and data through the use of graphs and tables, or other similar data presentation methods.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Effective mathematics instruction involves a combination of pedagogical strategies that address conceptual understanding, procedural fluency, and problem-solving abilities. Key strategies include explicit instruction, cooperative learning, hands-on activities, visual aids, and strategic questioning. These strategies can be integrated to create engaging and effective math lessons, ultimately leading to a deeper understanding of mathematical concepts.

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	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20%(20)	5,8,10,and 14	No
	Assignments	4	20% (20)	2,4,8, and 12	No
	Projects / Lab.	0	0	Continuous	All
	Report	0	0	Continuous	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #6

	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري والعملي	
	Material Covered
Week 1	Introduction of Derivatives and Integration
Week 2	Vector, vector components, vector in space
Week 3	Complex number, Argand diagram, De Moivre's Theorem
Week 4	Partial derivatives, Chain rule, gradient derivatives, directional derivatives
Week 5	Double integral, volume by double integral
Week 6	physical application of double integral
Week 7	Triple integral
Week 8	Polar coordinates
Week 9	Matrices, matrix by matrix product
Week 10	Solve equation by inverse matrix method
Week 11	Green's theorem
Week 12	Line integration
Week 13	MacLaurin series
Week 14	Taylor series
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	George B. Thomas, Jr et al., 2014. Thomas Calculus. Thirteen Edition	Yes
Recommended Texts	H.S. Gangwar and Prabhakar Gupta, 2009. A Textbook of Engineering Mathematics. Second Edition	Yes
Websites	https://rodrigopacios.github.io/mrpacios/download/Thomas_Calculus.pdf	

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 200	**Mathematics**	**6**	**3**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	**2**	**93**	**57**

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	Fluid Mechanics			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	PM 201				
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level	2		**Semester of Deliver**	3	
Administering Department	PM		**College**	TEMO	
Module Leader	Firas Aziz Ali		**e-mail**	firasaziz@ntu.edu.iq	
Module Leader's Acad. Title	Assist prof.		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Firas Aziz Ali		**e-mail**	firasaziz@ntu.edu.iq	
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	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.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	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.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **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. **Part B-** Analyze characteristics of a particular flow. Formulate the governing equations and boundary conditions. Solve these equations analytically in simple cases. Revision problem classes and quiz [6 hrs]

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	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**	3	10% (10)	3, 5, and 10	LO #1, #2 and #5
	Assignments	5	10% (10)	2, 4, 6, 9, and 12	LO #3, #4, #6 and #7
	Projects / Lab.	10	20% (20)	Continuous	All
	Report				

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.

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
	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 201	Fluid Mechanics	8	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	4	123	77

Description

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.

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.

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.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mechanical Drawing**			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	PM202				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	PM		**College**	TEMO	
Module Leader	Wijdan Ahmed Jalal		**e-mail**	Mti.lec227.wajdan@ntu.edu.iq	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**	M.Sc	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	1. Understand the fundamental principles of technical drawing. 2. Interpret and create 2D mechanical drawings using standard projection methods (e.g., orthographic and isometric projections). 3. Apply proper dimensioning, tolerancing, and annotation techniques in mechanical drawings. 4. Identify and use common drawing symbols, conventions, and standards (e.g., ISO, ANSI). 5. Develop basic skills in using Computer-Aided Design (CAD) software for mechanical drafting.

	6. Analyze and visualize mechanical components and assemblies through detailed technical drawings.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Recognize the fundamentals and principles of mechanical engineering drawing. 2. List the technical terms associated with mechanical drawing. 3. Summarize different projection methods such as orthographic and isometric projections. 4. Discuss the importance and role of dimensions and tolerances in mechanical drawings. 5. Describe the use of symbols and standard conventions in technical drawing. 6. Define accurate measurement and annotation techniques in drawings. 7. Discuss the basic operations of using Computer-Aided Design (CAD) software. 8. Analyze and assemble detailed drawings of mechanical components. 9. Explain how to read and interpret complex engineering drawings. 10. Recognize the applications of mechanical drawing in various engineering industries.
Indicative Contents المحتويات الإرشادية	1. **Introduction to Engineering Drawing:** o Importance and applications of mechanical drawing in engineering industries. o Fundamentals and principles of technical drawing. o Technical terminology used in mechanical drawings. 2. **Projection Methods:** o Orthographic projections: front, top, and side views. o Isometric and pictorial projections. o Converting 3D objects into 2D representations. 3. **Dimensioning and Tolerancing:** o Types of dimensions and dimensioning techniques. o Tolerances and their importance in mechanical design. o Standard annotation practices in drawings. 4. **Drawing Conventions and Symbols:** o Line types, title blocks, and borders. o Common mechanical drawing symbols (e.g., threads, holes, surface finishes). o Standards in mechanical drawing (ISO, ANSI, BS). 5. **Computer-Aided Design (CAD) Basics:** o Introduction to CAD software for mechanical drafting. o Basic operations: creating, editing, and saving 2D drawings. o Generating views and applying dimensions in CAD. 6. **Assembly and Visualization of Mechanical Components:** o Understanding exploded views and assembly drawings. o Reading and interpreting complex drawings of components and assemblies. o Visualization of mechanical systems from detailed drawings.

	7. **Practical Applications and Exercises:** o Hands-on practice in creating mechanical drawings. o Exercises in orthographic and isometric projection. o CAD-based drawing assignments and mini-projects.

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	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)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2hr	20% (20)	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, Simplifications, Conventions and Symbols

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	Exercises.
Week 5	Keys, types of keys, spline shaft and hub.
Week 6	Rivets and riveted joints, types of riveted joints, Conventional rivet symbo
Week 7	Welding, type of weld joints, welding symbols standard,location and dimension of weld.
Week 8	Pulleys, types of pulleys.
Week 9	Gears classification of gears, spur gear, definitions, formulas and calculations.
Week 10	Gear tooth profile, working drawing
Week 11	Bevel gear, calculations, working drawing.
Week 12	Helical gear, worms and worm gear, rack and pinion.
Week 13	Gear boxes.
Week 14	Assembly and details of common mechanical unit, (Vice).

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		Yes
Recommended Texts		No
Websites		

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 100	Engineering Drawing	4	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
0	4	63	37

Description

The Mechanical Drawing module covers fundamental technical drawing principles, orthographic and isometric projections, dimensioning and tolerancing, standard symbols and conventions (ISO, ANSI), and basic Computer-Aided Design (CAD) operations. Its indicative content includes screw threads, fasteners, keys, riveted joints, welding symbols, pulleys, gear classifications (spur, bevel, helical, worm), gearboxes, and assembly drawings of mechanical units such as a vice. The main advantages are that students gain the ability to interpret and create accurate 2D mechanical drawings, apply proper dimensioning and annotation techniques, visualize complex mechanical components and assemblies, and develop essential CAD skills—all of which are critical for success in various engineering industries like manufacturing, automotive, and machine design.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

معلومات المادة الدراسية				
اسم المادة الدراسية	**جرائم نظام حزب البعث في العراق**			كيفية تدريس المقرر
نوع المقرر	**اساسي**			☒ نظري ☒ محاضرات ☐ مختبر ☐ تمارين ☐ عملي ☒ حلقات دراسية
رمز المقرر	**NTU 200**			
عدد الوحدات الاوربية **ECTS**	**2**			
الحمل الدراسي للفصل (بالساعات)	**50**			
مستوى المقرر	**الثاني**	الفصل الدراسي	**الثالث**	
القسم المسؤول	**PM**	الكلية	**TEMO**	
اسم مدرس المقرر	**سجى مؤيد احمد**	الايميل	saja.moaeed@ntu.edu.iq	
اللقب العلمي لمدرس المقرر	**مدرس مساعد**	المؤهل العلمي لمدرس المقرر	**ماجستير**	
اسم المدرس المساعد		الايميل		
اسم المقيم العلمي	د. عمار حسن	الايميل	ammarsuhail@ntu.edu.iq	
تاريخ موافقة اللجنة العلمية	**2025/06/01**	رقم الاصدار	3.0	

العلاقة مع المواد الدراسية الأخرى			
مقررات متطلبة سابقة	لا توجد	الفصل الدراسي	
مقررات مرافقة	لا توجد	الفصل الدراسي	

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
أهداف المادة الدراسية	1. التعرف على طبيعة الأنظمة السياسية في العراق عبر المراحل التاريخية المختلفة. 2. فهم مفهوم حقوق الإنسان والحريات العامة في الأنظمة الديمقراطية والاستبدادية. 3. تحليل انتهاكات حقوق الإنسان في ظل نظام حزب البعث. 4. دراسة الأبعاد السياسية والاجتماعية والنفسية لتلك الانتهاكات. 5. تقييم أثر القمع السياسي على المجتمع العراقي. 6. التعرف على دور الإعلام والثقافة في تكريس الفكر الشمولي. 7. تحليل تأثير الحروب والسياسات البيئية على السكان.

	8. فهم مفهوم العدالة الانتقالية وأهميتها. 9. تنمية القدرة على التفكير النقدي تجاه الأنظمة الاستبدادية. 10. تعزيز الوعي بحقوق الإنسان وأهميتها في بناء الدولة الحديثة.
مخرجات التعلم للمادة الدراسية	عند الانتهاء من المقرر، سيكون الطالب قادرًا على: 1. يعرّف الطالب مفاهيم حقوق الإنسان والحريات العامة. 2. يميز بين الأنظمة الديمقراطية والاستبدادية. 3. يشرح مراحل تطور النظام السياسي في العراق. 4. يحلل أشكال انتهاكات حقوق الإنسان في عهد البعث. 5. يقيّم أثر السياسات القمعية على المجتمع. 6. يفسر دور الإعلام في تشكيل الرأي العام. 7. يناقش آثار الحروب على البيئة والسكان. 8. يوضح مفهوم العدالة الانتقالية وتطبيقاتها. 9. يربط بين الأحداث التاريخية والواقع الحالي. 10. يطوّر مهارات البحث والتحليل الأكاديمي.
المحتويات الإرشادية	1. مدخل إلى حقوق الإنسان والحريات العامة . 2. الأنظمة السياسية في العراق .(1921–2003) 3. نشأة نظام حزب البعث وتطوره . 4. انتهاكات الحقوق الفكرية والسياسية . 5. انتهاكات الحريات العامة (الإعلام، التعبير، التنظيم) . 6. القمع السياسي وأثره على المجتمع . 7. الميدان النفسي والاجتماعي في ظل النظام . 8. الدين والدولة في الفكر البعثي . 9. الثقافة والإعلام وعسكرة المجتمع . 10. أثر الحروب والسياسات البيئية (التلوث، التهجير، المقابر الجماعية) .

استراتيجيات التعلم والتعليم	
الاستراتيجيات	تعتمد استراتيجيات التدريس في هذا المقرر على مزيج من المحاضرات النظرية، والمناقشات الصفية، والعروض التقديمية، وتحليل النصوص التاريخية، بهدف تعزيز الفهم العميق لدى الطلبة. كما يتم توظيف التعلم النشط من خلال طرح الأسئلة التحليلية ودراسة الحالات الواقعية، إضافة إلى تكليف الطلبة بإعداد بحوث قصيرة وعروض جماعية لتنمية مهارات التفكير النقدي والعمل الجماعي. ويتم استخدام الوسائل السمعية والبصرية لدعم العملية التعليمية وربط المفاهيم النظرية بالواقع العملي، مع تشجيع الطلبة على المشاركة الفاعلة وتحليل الأحداث من منظور أكاديمي موضوعي.

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
الحمل الدراسي المنتظم للطالب خلال الفصل	33	الحمل الدراسي المنتظم للطالب أسبوعيا	2
الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
الحمل الدراسي الكلي للطالب خلال الفصل	50		

تقييم المادة الدراسية					
		الوقت/العدد	الوزن (الدرجات)	الأسبوع المحدد	نواتج التعلم ذات الصلة
التقييم التكويني	الاختبارات	2	10% (2)	4 و 11	LO1، LO2، LO3
	المختبر	-	-	-	
	الحلقات الدراسية	2	15% (2)	5 و 13	LO4، LO5، LO9
	التقرير	2	15% (2)	مستمر	LO8، LO9، LO10
التقييم الختامي	امتحان منتصف الفصل	ساعتان	10% (10)	7	LO1، LO3، LO4، LO5
	الامتحان النهائي	ثلاث ساعات	50% (50)	16	LO1 إلى LO10 (شامل)
التقييم الاجمالي			100% (100 Marks)		

خطة تدريس المقرر

المنهاج الاسبوعي النظري

الاسبوع	المواد
الاسبوع الاول	مقدمة عن المقرر وأهمية حقوق الإنسان
الاسبوع الثاني	مفهوم الحقوق والحريات العامة
الاسبوع الثالث	الأنظمة السياسية في العراق (1921–1958)
الاسبوع الرابع	الأنظمة السياسية (1958–1968)
الاسبوع الخامس	نظام حزب البعث (1968–2003)
الاسبوع السادس	انتهاكات الحقوق السياسية
الاسبوع السابع	انتهاكات الحريات الفكرية والإعلام
الاسبوع الثامن	القمع السياسي وأدواته
الاسبوع التاسع	امتحان نصف الفصل
الاسبوع العاشر	الميدان النفسي والاجتماعي
الاسبوع الحادي عشر	الدين والدولة في النظام البعثي
الاسبوع الثاني عشر	الثقافة والإعلام وعسكرة المجتمع
الاسبوع الثالث عشر	الحروب وتأثيرها على البيئة والسكان
الاسبوع الرابع عشر	العدالة الانتقالية ومعالجة الانتهاكات
الاسبوع الخامس عشر	مراجعة عامة + عرض مشاريع الطلبة

مصادر التعلم والتدريس		
	المصدر	هل المصدر متوفر في المكتبة
الكتب المطلوبة:	جرائم نظام حزب البعث في العراق	كلا
الكتب الموصى بها:		كلا
المواقع الالكترونية		

مخطط الدرجات				
المجموعة	التقدير	التقدير	الدرجة %	التعريف
مجموعة النجاح - **(50 - 100)**	**A** - Excellent	امتياز	90 - 100	أداء متميز
	B - Very Good	جيد جدا	80 - 89	فوق المتوسط مع بعض الأخطاء
	C - Good	جيد	70 - 79	عمل جيد مع أخطاء ملحوظة
	D - Satisfactory	متوسط	60 - 69	أداء متوسط لكن مع قصور كبير
	E - Sufficient	مقبول	50 - 59	اداء يحقق الحد الأدنى من معايير النجاح
مجموعة الرسوب **(0 – 49)**	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	يتطلب منه المزيد من العمل لكن يمكن منحه درجة النجاح الصغرى
	F – Fail	راسب	(0-44)	يتطلب منه الكثير من العمل الإضافي

ملاحظة: يتم تقريب الأرقام العشرية للأعلى أو الأسفل وفقاً للسياسة الجامعية (مثلاً 54.5 تُقرب إلى 55 و54.4 تُقرب إلى 54)، ولا يتم التساهل مع العلامات القريبة من النجاح.

رمز المقرر	اسم المقرر	عدد الوحدات الاوربية **ECTS**	الفصل الدراسي
NTU 200	**جرائم نظام حزب البعث في العراق**	2	1
عدد ساعات الصف (ساعة/أسبوع)	محاضرات / مختبر / عملي / تمارين	الحمل الدراسي المنتظم للطالب خلال الفصل (ساعة/فصل)	الحمل الدراسي غير المنتظم للطالب خلال الفصل (ساعة/فصل)
2	0	33	17

يهدف هذا المقرر إلى دراسة طبيعة الأنظمة السياسية في العراق وتحليل انتهاكات حقوق الإنسان والحريات العامة في ظل نظام حزب البعث. يتناول المقرر الجوانب السياسية والاجتماعية والنفسية والثقافية لتلك الانتهاكات، مع التركيز على أثر القمع والحروب على المجتمع والبيئة. كما يسلط الضوء على دور الإعلام والثقافة في ترسيخ الفكر الشمولي، ويعرّف الطلبة بمفهوم العدالة الانتقالية وأهميتها في معالجة آثار الماضي. يسعى المقرر إلى تنمية التفكير النقدي وتعزيز الوعي بحقوق الإنسان لدى الطلبة.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**English Language**	**Module Delivery**	
Module Type	**Basic**	☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**NTU201**		
ECTS Credits	**2**		
SWL (hr/sem)	**50**		
Module Level	2	**Semester of Delivery**	3
Administering Department	PM	**College**	**TEMO**
Module Leader	Wijdan Ahmed Jalal	**e-mail**	Mti.lec227.wajdan@ntu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	M.Sc
Module Tutor		**e-mail**	
Peer Reviewer Name	Dr. Ammar Hassan	e-mail	ammarsuhail@ntu.edu.iq
Scientific Committee Approval Date	01/06/2025	**Version Number**	3.0

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	1. **Develop Core Language Skills** o Improve **listening** skills to understand real-life conversations and everyday dialogues. o Enhance **speaking** skills through practice and interaction in various communicative situations. o Strengthen **reading** skills to comprehend and analyze intermediate-level texts. o Build **writing** skills to produce clear and accurate short paragraphs, letters, and essays. 2. **Expand Vocabulary:**

	o Learn and use new words and expressions related to topics such as work, travel, relationships, technology, and health. 3. **Master Grammar:** o Review and apply key grammar structures including verb tenses (past, present, future), auxiliary verbs, conditionals, and modal verbs. 4. **Improve Pronunciation:** o Practice accurate pronunciation, stress, and intonation to enhance spoken communication. 5. **Develop Communication Skills and Confidence:** o Encourage students to use English confidently in real-life contexts through interactive tasks and group discussions. 6. **Enhance Cultural Awareness:** o Explore aspects of English-speaking cultures and global perspectives through reading and listening materials.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this course, students will be able to: 1. **Listening:** a. Understand the main ideas and specific details in conversations, interviews, and short talks on familiar topics. 2. **Speaking:** a. Communicate effectively in everyday situations using appropriate vocabulary, grammar, and pronunciation. b. Participate confidently in discussions, role-plays, and short presentations. 3. **Reading:** a. Read and comprehend intermediate-level texts on a variety of topics. b. Identify the main ideas, supporting details, and the writer's purpose or opinion. 4. **Writing:** a. Write coherent and grammatically correct short texts such as emails, letters, and descriptive or narrative paragraphs. b. Use appropriate vocabulary and linking words to organize ideas clearly. 5. **Grammar and Vocabulary:** a. Use key grammar structures accurately, including verb tenses, modals, conditionals, and reported speech. b. Apply a wide range of vocabulary related to everyday and academic topics. 6. **Pronunciation and Fluency:** a. Demonstrate improved pronunciation, stress, and intonation patterns for clearer communication. b. Speak with greater fluency and confidence in spontaneous conversations. 7. **Cultural Awareness:** a. Show awareness of cultural differences and similarities in English-speaking countries through course materials and discussions.

	8. Recognize the applications of mechanical drawing in various engineering industries.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. **Grammar:** o Review of present, past, and future tenses o Present perfect simple and continuous o Passive voice o Modals and semi-modals o Reported speech o Conditionals (zero, first, second, and third) o Relative clauses and question forms 2. **Vocabulary:** o Words and expressions related to everyday life, work, travel, technology, relationships, and health o Collocations, phrasal verbs, and idiomatic expressions o Word formation and parts of speech 3. **Listening:** o Listening to real-life dialogues, interviews, and short talks o Understanding gist, detail, and implied meaning o Developing note-taking and comprehension strategies 4. **Speaking:** o Pair and group discussions o Role-plays and simulations of real-life situations o Short oral presentations and debates o Pronunciation and intonation practice 5. **Reading:** o Reading texts from different genres (articles, stories, letters, etc.) o Skimming and scanning techniques o Identifying main ideas and supporting details o Interpreting opinions and attitudes 6. **Writing:** o Paragraph writing (descriptive, narrative, and opinion) o Writing emails, letters, and short essays o Organizing ideas using linking words and cohesive devices o Editing and revising written work 7. **Cultural and Communicative Awareness:** o Exposure to English-speaking cultures through readings and listening activities o Understanding cultural norms and communication styles o Comparing cultural aspects with the students' own context

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Task-based & cyclical:** Each week, complete one real-world project (e.g., plan a trip, write a work email, give a health talk). For that project, cycle through all skills: read a

	related text (skim/scan), listen to a dialogue (note implied meaning), practice grammar (tenses, passives, conditionals) and vocabulary (phrasal verbs, word formation) as needed, speak via role-play, then write and revise. End with a cultural comparison. Repeat weekly with a new theme.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Classwork	2	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 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	Present Simple, Present Continuous, Past Simple, Past Continuous.
Week 2	Present Perfect Word formation, Phrasal verbs Social expressions.
Week 3	Past Simple, Present Perfect Sport and leisure, play football, work in a bank .
Week 4	Numbers and dates, Money, fractions
Week 5	Past Simple and Past Perfect, Past Perfect Continuous Art and literature Giving opinions
Week 6	Modal verbs (obligation, permission, prohibition, necessity)
Week 7	Nationality words Requests and queries

Week 8	Future forms (going to, will), Future Continuous The weather Travelling around using public transport
Week 9	Questions with like Describing food, towns, places Signs and sounds, Saying sorry, thanks
Week 10	Present Perfect versus Past Simple, Present Perfect Continuous Literal information, Phrasal verbs Taking a telephone message, Talking about a loan
Week 11	First Conditional, Second Conditional Adverbs and adjectives, Words good and well Making suggestions, Shopping
Week 12	Modal verbs (probability), Modal verbs in the past Character adjectives Agreeing and disagreeing
Week 13	Present Perfect Simple versus Continuous (focus on duration using for/since) Gerunds and Infinitives Emphasizing what you say
Week 14	Indirect questions Verbs and nouns that go with sounds Informal/Formal English.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	New Headway Intermediate	Yes
Recommended Texts		
Websites		

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
NTU201	English Language	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	0	32	18
Description			
The English Language module covers essential content including grammar (tenses, modals, conditionals, reported speech, passive voice), vocabulary (collocations, phrasal verbs, everyday topics like work, travel, technology, and health), listening (dialogues and interviews), speaking (discussions, role-plays, and presentations), reading (skimming, scanning, and identifying main ideas), writing (paragraphs, emails, and letters), and cultural awareness. Its main advantages are that students develop strong core language skills for real-life and academic contexts, gain confidence in spoken communication with improved pronunciation and fluency, expand practical vocabulary, and enhance their understanding of English-speaking cultures—all of which prepare them for effective interaction in diverse personal and professional settings.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Strength of Materials**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 203**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		2	**Semester of Delivery**		4
Administering Department		PM	**College**	TEMO	
Module Leader	Mohammed Taha Mohammed		**e-mail**	mohammed.taha@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Lecturer	**Module Leader's Qualification**		MASTER
Module Tutor			**e-mail**		
Peer Reviewer Name		Dr. Ammar Hassan	**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**		3.0

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	**By the end of this module, students should be able to:** 1. To understand the behavior of solid bodies subjected to different types of loads. 2. To know different types of stresses acting on mechanical elements and their effects (strain). 3. To study shear force and bending moment diagrams with associated stresses. 4. To analyze strength, stiffness, and failure of engineering materials and structures.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**After completing this module, students will be able to:** 1. Identify and calculate different types of stress and strain. 2. Interpret stress–strain relationships and material properties (E, yield strength, etc.). 3. Analyze elastic behavior using Hooke's law and modulus of elasticity. 4. Evaluate shear stress, bearing stress, and temperature stress. 5. Analyze thin-walled cylinders and pressure vessels. 6. Determine stresses in compound sections. 7. Construct and interpret shear force and bending moment diagrams. 8. Analyze torsion and combined stresses in mechanical components.
Indicative Contents المحتويات الإرشادية	**Indicative Contents for Strength of Materials** • Introduction to Strength of Materials • Simple stress and strain • Stress–strain diagram • Shearing stress • Bearing stress • Thermal (temperature) stress • Thin-walled cylinders • Stress in compound sections • Shear force and bending moment in beams • Bending stress • Slope and deflection of beams • Torsion • Combined stresses

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Learning and Teaching Strategies** • Lectures explaining theoretical concepts • Worked examples and problem-solving sessions • Homework assignments and class exercises • Quizzes and mid-term assessments • Technical reports • Use of diagrams and graphical analysis (S.F. & B.M.) • Final examination for comprehensive evaluation

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	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	2,5,11 and 13	LO1, LO2, LO3, LO4
	Assignments	6	10% (10)	3,5,7,8,10 and 14	LO1, LO2, LO3, LO4, LO5, LO6
	Seminar	2	10% (10)	6 and 12	LO5, LO7, LO8
	Report	4	10% (10)	3,6,10,13	LO2, LO4, LO5, LO6
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO1, LO2, LO3, LO4, LO6, LO7
	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 Strength of Materials
Week 2	Simple stress and strain
Week 3	Stress-strain diagram
Week 4	Bearing stress
Week 5	Thermal stress
Week 6	Thin wall cylinders
Week 7	Shear force and bending moment in beam
Week 8	Shear force and bending moment in beam
Week 9	Bending stress
Week 10	Slope and Deflection of Beams
Week 11	Slope and Deflection of Beams
Week 12	Bending stress
Week 13	Torsion
Week 14	Combined stresses
Week 15	Combined stresses
Week 16	Final Examination

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Mechanical Tests
Week 2	Lab 2: Tensile Test
Week 3	Lab 3: Compression Test
Week 4	Lab 4: Brinell Hardness Test
Week 5	Lab 5: Vickers Hardness Test
Week 6	Lab 6: Rockwell Hardness Test
Week 7	Lab 7: Impact Test
Week 8	Lab 8: Torsion Test
Week 9	Lab 9: Bending Test
Week 10	Lab 10: Fatigue Test

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• **Strength of Materials**, By Andrew Pytel and Ferdinand L. Singer 4th edition.	No
Recommended Texts	• **A Textbook of Strength of Materials,** by R. K. Rajput, 7th edition • **Mechanics of Materials**, by Ferdinand P. Beer, 8th edition. • **Mechanics of Materials I**, by E. J. Hearn, 3rd edition.	No
Websites	https://seia.org/	

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 203	**Strength of Materials**	**6**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	**63**	**87**

Strength of Materials is a core engineering course that studies how solid bodies behave under various types of loads and forces. It introduces fundamental concepts of stress, strain, and deformation, enabling students to understand how materials respond to tension, compression, shear, torsion, and bending. The course examines stress–strain relationships, Hooke's law, and material properties such as elasticity and yield strength. It also covers practical topics including thermal stresses, thin-walled pressure vessels, compound sections, and structural elements like beams. Students learn to construct and interpret shear force and bending moment diagrams, analyze bending stresses, and evaluate deflection and torsional effects. Emphasis is placed on both theoretical understanding and problem-solving skills for real engineering applications. By the end of the course, students can assess the strength, stability, and safety of mechanical and structural components, forming an essential foundation for design courses and professional engineering practice.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Materials**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**PM 204**				
ECTS Credits	**8**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	PM		**College**	TEMO	
Module Leader	Zina Saad Abdul Jabbar		**e-mail**	Zena.saad@ntu.edu.iq	
Module Leader's Acad. Title	**Assistant Lecturer**		**Module Leader's Qualification**	**M.Sc.**	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	**01/06/2025**		**Version Number**	**3.0**	

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	**Understand the Internal Structure of Materials:** Learn about the atomic and molecular composition of materials, including atomic arrangements, crystal structures, and how these affect material properties and behavior. **Study Physical and Mechanical Properties:** Explore key properties such as strength, hardness, elasticity, conductivity, thermal expansion, and corrosion resistance, and understand their impact on material performance in various applications. **Gain Knowledge of Material Processing Techniques:** Familiarize yourself with manufacturing and processing methods used to alter the structure and properties of materials, including casting, forging, welding, heat treatment, and surface modification.

	Comprehend Material Selection Principles: Understand the criteria for selecting appropriate materials for engineering applications, considering mechanical needs, environmental conditions, cost, and sustainability. **Analyze Causes of Material Failure:** Investigate failure mechanisms like fracture, fatigue, creep, and wear, and learn strategies to prevent such failures through material science principles. **Learn Material Testing and Characterization Methods:** Study experimental techniques used to evaluate material properties and performance, such as tensile testing, hardness tests, microscopy, spectroscopy, and non-destructive testing. **Understand Material Behavior under Various Conditions:** Examine how materials respond to external factors such as temperature, pressure, and loading, including concepts like elasticity, plasticity, viscoelasticity, and behavior at extreme temperatures. **Explore Sustainability in Materials:** Understand the importance of sustainable materials, recycling, and environmental impact assessment, considering the material lifecycle and ecological footprint. **Develop Material Design Skills:** Apply knowledge of material properties and processing to design components and systems that meet specific engineering requirements, optimizing the relationship between design, materials, and manufacturing. **Enhance Problem-Solving and Analytical Abilities:** Build critical thinking skills related to material selection, performance evaluation, and failure analysis, applying theoretical knowledge to practical engineering challenges.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	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 properties, corrosion resistance, and other relevant characteristics. 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. 1. 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.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Metals: • Ferrous Metals: Iron, Carbon, Manganese, Chromium, Nickel, Molybdenum, etc. • Non-Ferrous Metals: Aluminum, Copper, Zinc, Lead, Tin, Titanium, etc. 2. Polymers (Plastics): • Polyethylene: Ethylene monomer units • Polypropylene: Propylene monomer units • Polyvinyl Chloride (PVC): Vinyl Chloride monomer units • Polystyrene: Styrene monomer units • Polyethylene Terephthalate (PET): Ethylene Glycol, Terephthalic Acid 3. Ceramics: • Traditional Ceramics: Clay, Feldspar, Silica, Alumina • Advanced Ceramics: Zirconia, Silicon Carbide, Aluminum Nitride, Boron Nitride 4. Composites: • Fiber Reinforced Composites: Glass fibers, Carbon fibers, Aramid fibers • Matrix Materials: Epoxy resins, Polyester resins, Thermoplastics 5. Semiconductors: • Silicon: Pure silicon with small amounts of impurities (dopants) like Boron or Phosphorus 6. Concrete: • Cement: Portland cement (mainly composed of Calcium, Silicon, Aluminum, Iron) • Aggregates: Crushed stone, Sand, Gravel 7. Wood: • Cellulose: Main constituent of wood • Lignin: Provides rigidity and strength to wood 8. Glass: • Silica: Main component of glass

	• Various additives: Sodium carbonate, Calcium oxide, Aluminum oxide, etc.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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. 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	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	2, 6, 12 and 14	LO #1, #3, and #6
	Assignments	2	10% (10)	1, 3, 5, and 9, 15	LO #2, #4 and #5, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10		
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #3
	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: • 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: • 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: • Stress and strain. • Elasticity and plasticity. • Tensile, compressive, and shear behavior. • Hardness, toughness, and impact resistance.
Week 6	Metals and Alloys: • 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	Advanced Topics: • Nanomaterials and nanotechnology. • Biomaterials and medical applications.
Week 13	Ceramics: • Structure and properties of ceramics. • Types of ceramics: oxides, non-oxides, composites. • Ceramic processing techniques. • Applications and limitations of ceramics.
Week 14	Polymers and Composite Materials: • Polymer structure and properties. • Polymerization techniques. • Thermoplastics and thermosetting polymers. • Composite materials: types, properties, and applications.
Week 15	Material Selection and Design: • 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.	

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 204	**Engineering Materials**	**6**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	**63**	**87**

Description

The Engineering Materials module covers the internal structure of materials (atomic arrangements, crystal structures like FCC, BCC, and CPH, atomic bonds, and crystalline defects), phase diagrams and transformations, mechanical properties (stress-strain, elasticity, plasticity, hardness, toughness, creep, fatigue), metals and alloys (ferrous and non-ferrous, strengthening mechanisms, corrosion), iron-making and steel-making, iron-iron carbide diagram, types of steels, ceramics, polymers, composites, nanomaterials, biomaterials, and material selection criteria. Practical lab work includes impact testing, fatigue testing, microscopic examination, heat treatments, surface hardening, and microstructure analysis of stainless steel and cast iron. The main advantages are that students gain a comprehensive understanding of material properties and behavior, learn to select appropriate materials for engineering applications, understand processing and manufacturing techniques, develop failure analysis skills, gain hands-on testing experience, and consider sustainability and environmental impact—essential for careers in mechanical, civil, aerospace, and manufacturing engineering.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Thermodynamics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 205**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	**2**		**Semester of Deliver**	**4**	
Administering Department	**PM**		**College**	**TEMO**	
Module Leader	**Anwar Ahmed Yousif**		**e-mail**	**anawarayousif@ntu.edu.iq**	
Module Leader's Acad. Title	**lecturer**		**Module Leader's Qualification**	**MSc.**	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	**01/06/2023**		**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	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	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	**<u>Part A</u>** 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] 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] Pressure and its Types: This module explores the concept of pressure in detail, examining its various types and their respective characteristics and 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] **<u>Part B</u>** 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.

Student Workload (SWL)			
Structured SWL (h/sem)	**123**	**Structured SWL (h/w)**	**8**
Unstructured SWL (h/sem)	**52**	**Unstructured SWL (h/w)**	**3**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10% (10)	3, 5, 8 and 11	LO #1, #2, #5, and #8
	Assignments	3	10% (10)	4, 9 and 12	LO #3, #4, #6, #9
	Projects / Lab.	10	20% (20)	Continuous	All
	Report				
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 and Basic Concepts
Week 2	Properties of Pure Substances
Week 3	Steam Power Plant
Week 4	Rankin reheat cycle
Week 5	Isentropic efficiencies of steady flow devices
Week 6	Regenerative cycle
Week 7	Gas mixtures
Week 8	Real Gases
Week 9	Thermodynamics of combustion
Week 10-11	Positive Displacement Machine
Week 12-13	Gas Turbine
Week 14-15	Steam Turbine

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	1. "Thermodynamics: An Engineering Approach" by Yunus A. Çengel and Michael A. Boles	No
Recommended Texts	1. "Fundamentals of Engineering Thermodynamics" by Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey 2. "Introduction to Chemical Engineering Thermodynamics" by J.M. Smith, Hendrick C. Van Ness, Michael M. Abbott, and Mark T. Swihart	No
Websites	(https://www.khanacademy.org/science/physics/thermodynamics) (https://ocw.mit.edu/courses/chemistry/5-60-thermodynamics-kinetics-spring-2008/) (https://www.engineeringtoolbox.com/thermodynamics-d_28.html)	

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 205	**Thermodynamics**	**7**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	**4**	**123**	**52**

Description

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Electrical Machines**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☒ **Tutorial** ☒ **Lab** ☐ **Seminar**	
Module Code	**PM 206**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**2**	**Semester of Deliver**		**4**
Administering Department		**PM**	**College**		
Module Leader	**Safwan Assaf Hamoodi**		**e-mail**	**Safwan79azb@ntu.edu.iq**	
Module Leader's Acad. Title		**Assistant Professor**	**Module Leader's Qualification**		**M.Sc.**
Module Tutor			**e-mail**		
Peer Reviewer Name		Dr. Ammar Hassan	**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date		**1/6/2025**	**Version Number**	**3.0**	

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	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. Applying the acquired knowledge to the operation and maintenance of electrical machines, including motors and generators. Students will also explore the fundamentals of power systems, including power generation, transmission, and distribution.
Module Learning Outcomes	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. 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.
Indicative Contents	Part A: Fundamentals of Electrical Principles, Measurements, and Instruments [20 hours] Introduction to Electrical Machines, Power Systems, Safety, and Direct Current Circuits [20 hours] Revision Session and Quiz [1.5 hours] Part B: 4. Alternating Current Circuits, Circuit Theory, and Analogue Electronics [20 hours] Control Systems, Troubleshooting, and Maintenance [10 hours] Revision Session and Quiz [1.5 hours] 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.
Learning and Teaching Strategies	
Strategies	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.

Student Workload (SWL)			
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	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1and #2
	Assignments	2	5% (5)	2 and 12	LO #2 and #3
	Projects / Lab.	6	15% (15)	Continuous	LO #1 and #3
	Report	1	10% (10)	13	LO #3
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	DC generator construction and types.
Week 8	Single phase induction motor, split-phase, capacitor-start, shaded-pole type
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	3-phase induction motor, construction, synch. Speed, slip. line current, line voltage, phase current
Week 12	Contactors, relays, timers
Week 13	Thermal overload, starter (contactor +timer)
Week 14	Transformer
Week 15	Types of transformers and application
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	1. "Electric Machinery and Power System Fundamentals" by Stephen J. Chapman 2. "Principles of Electric Machines and Power Electronics" by P.C. Sen	
Recommended Texts	1. "Electrical Wiring Residential" by Ray C. Mullin and Phil Simmons 2. "Electrical Safety Handbook" by John Cadick, Mary Capelli - Schellpfeffer, and Dennis Neitzel	
Websites	(www.allaboutcircuits.com) (www.electrical4u.com)	

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 206	**Electrical Machines**	**6**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	**63**	**87**

Description

The Electrical Machines module covers DC motors (construction, types, back EMF, speed control, torque characteristics, starting methods), DC generators, single-phase induction motors (split-phase, capacitor-start, shaded-pole), three-phase induction motors (construction, synchronous speed, slip, starting methods like star-delta, and frequency control), transformers, and control components such as contactors, relays, timers, and thermal overloads. Practical lab work includes wiring diagrams, relay testing, compressor start-up, rotor voltage control, frequency control, slip power control, dismantling motors, and fault analysis. The main advantages are that students gain a comprehensive understanding of electrical circuit theory (voltage, current, resistance, power), learn to analyze and maintain electrical machines, develop hands-on troubleshooting skills, and build a foundation in power generation, transmission, and distribution—essential for careers in electrical engineering, industrial automation, and power systems.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**NTU 202**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	2		**Semester of Deliver**	4	
Administering Department	PM		**College**	TEMO	
Module Leader	Safa Akram Younis		**e-mail**	safa.altutunji@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/6/2025		**Version Number**	3.0	

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	The goal of teaching the subject of communications is to provide students with a fundamental understanding of how information is transmitted and received over various media. It aims to: 1. Introduce basic concepts such as signals, modulation, bandwidth, and noise. 2. Explain communication systems, including analog and digital transmission. 3. Develop problem-solving skills in analyzing and designing communication circuits and systems.

	4. Prepare students for advanced topics like wireless communication, data networks, and information theory. 5. Enhance practical skills through lab work and simulations involving real-world communication technologies. Overall, the course equips students with the theoretical and practical knowledge needed for careers in telecommunications, electronics, and networking.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the Fundamentals of Communication: Describe the basic principles, types, and models of communication. Explain the components and processes of effective communication. 2. Apply Verbal and Non-verbal Communication Skills: Demonstrate effective speaking, listening, and presentation techniques. Interpret and use body language, tone, and other non-verbal cues appropriately. 3. Communicate Effectively in Various Contexts: Adapt communication styles to suit academic, professional, and intercultural settings. Collaborate and communicate efficiently within teams and group environments 4. Utilize Modern Communication Technologies: Use digital tools (e.g., email, social media, video conferencing) for clear and professional communication. Analyze the impact of technology on modern communication practices. 5. Develop Critical Thinking and Message Analysis Skills: Evaluate the credibility and effectiveness of messages in media and interpersonal contexts. Construct coherent, persuasive, and ethically sound messages 6. Resolve Communication Barriers and Conflicts: Identify common communication barriers and propose solutions. Practice conflict resolution strategies through communication techniques.
Indicative Contents المحتويات الإرشادية	Learning Internet Communications requires understanding various technical concepts that form the foundation of how the Internet works. Here are practical guidelines to help you study this subject effectively: ✅ 1. Understand Networking Basics Start with studying the fundamentals of Computer Networks: What is a protocol? Types of networks (LAN, WAN, MAN) Network components (modem, router, switch) Learn about the OSI Model and TCP/IP Model and their layers. ✅ 2. Focus on Key Internet Protocols Make sure you understand the following protocols: IP (Internet Protocol) – for addressing TCP / UDP – reliable vs. unreliable transmissi… Learning Internet Communications requires understanding various technical concepts that form the foundation of how the Internet works. Here are practical guidelines to help you study this subject effectively:

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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.

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	12	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	3,8 and 12	LO #1, #2,#4,#5 and #6
	Assignments	4	10% (10)	2,5,10 and 14	LO #1, #4,#5 and #6
	Projects / Lab.	3	20% (20)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #3
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Security and Networking: What is a network? Types of networks. Basic network components. Network Security Basics. Understanding network threats. Network Troubleshooting
Week 2	E-Commerce: Concepts of Electronic banking services this include online banking: ATM and debit card services, Phone banking. SMS banking, electronic alert, Mobile banking
Week 3 &4	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 5&6	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations
Week 7& 8& 9	Al in Our Daily Lives: Al in smartphones and virtual assistants like Siri or Google Assistant.)
Week 10&11	Applications of Al: Education, Healthcare, Finance, Transportation, Marketing and Advertising.
Week 12	Al and Society: (How Al affects social, Al and international relations, Al and the future of humanity.
Week 13	surveillance, the impact of Al on the job market
Week 14	The Future of Al (Future trends in Al, recent research and emerging technologies.)
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Introduction to Computer Skills **For first year students, Bisha University** Computer Science Principles: The Foundational Concepts of Computer Science - For AP® Computer Science Principles 2020th Edition , Mr. Kevin P Hare (Author), Pindar Van Arman (Foreword) 1. Graham Brown, David Watson, "Cambridge IGCSE Information and Communication Technology", 3rd Edition (2020) 2. Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology In Action Complete", 16th Edition (2020). 3. Ahmed Banafa, "Introduction to Artificial Intelligence (AI)", 1st Edition (2024).	Yes

Recommended Texts	MICROSOFT ACCESS, EXCEL & POWER BI FOR BEGINNERS & POWER USERS, Tech Demystified	No
Websites	https://www.just.edu.jo/~mqais/CIS99/PDF/Ch.01_Introduction_%20to_computers.pdf	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	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
NTU 101	**COMPUTER PRINCIPLES**	**3**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**2**	**63**	**12**

Description

This course provides a comprehensive introduction to computer networking. Students will learn the fundamental concepts, protocols, and technologies that form the basis of modern communication networks, including the Internet. Topics include network models (such as the OSI and TCP/IP models), IP addressing and subnetting, data transmission, routing and switching, network devices, wireless networking, and network security basics. The course combines theoretical knowledge with hands-on practice through labs and simulations, preparing students to design, configure, and troubleshoot basic network systems.

نموذج وصف المادة الدراسية

معلومات المادة الدراسية			
عنوان المقرر	اللغة العربية	طريقة تقديم المقرر	
نوع المقرر	مادة مساعدة	نظري ☒ محاضرة ☒ مختبر ☐ تمارين ☒ عملي ☐ حلقة دراسية ☒	
رمز المقرر	NTU203		
عدد الساعات المعتمدة بنظامECTS	2		
SWL (hr/sem)	50		
مستوى المقرر	2	فصل تقديم المقرر	4
القسم الإداري المسؤول	PM	الكلية	TEMO
مسؤول المقرر	أ.م. د. محمد عبد الموجود حسن	ايميل	dr.mohmmed67@ntu.edu.iq
اللقب الأكاديمي لمسؤول المقرر	أستاذ مساعد	الشهادات العلمية لمسؤول المقرر	دكتوراه
مدرس المقرر	أ.م. د. محمد عبد الموجود حسن	ايميل	dr.mohmmed67@ntu.edu.iq
اسم المراجع النظير	د. عمار حسن سهيل	ايميل	ammarsuhail@ntu.edu.iq
تاريخ اعتماد اللجنة العلمية	2025/06/01	رقم الاصدار	3.0

العلاقة مع المواد الدراسية الأخرى			
المقرر السابق المطلوب	لا يوجد	الفصل الدراسي	
المقررات المتزامنة	لا يوجد	الفصل الدراسي	

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
أهداف المادة الدراسية	تهدف مادة اللغة العربية للمرحلة الثانية إلى: 1. تعميق فهم القواعد اللغوية: تطوير مهارات الطالب في النحو والصرف والإملاء على مستوى متقدم. 2. تطوير مهارات الكتابة الأكاديمية: تمكين الطالب من صياغة المقالات، التقارير، والأبحاث بأسلوب لغوي سليم ودقيق. 3. تحليل النصوص الأدبية والإدارية: تعزيز قدرة الطالب على فهم النصوص المعقدة، واستنتاج القواعد والأساليب البلاغية. 4. معالجة الأخطاء اللغوية المتقدمة: تدريب الطالب على التعرف على الأخطاء الشائعة وتصحيحها في مختلف السياقات. 5. تنمية التفكير النقدي والتحليلي: القدرة على تحليل النصوص، والمقارنة بين الأساليب اللغوية، وتقديم حلول تحريرية دقيقة. 6. إتقان أساليب الخطاب الرسمي والإداري: تعزيز مهارات الطالب في كتابة الوثائق الرسمية والخطابات الأكاديمية والإدارية بطريقة صحيحة ومنظمة.

مخرجات التعلم للمادة الدراسية	بنهاية دراسة المادة، يُتوقع أن يكون الطالب قادرًا على: • **تطبيق القواعد اللغوية المتقدمة** :استخدام النحو والصرف والإملاء بشكل صحيح في الجمل المعقدة والمركبة. • **تحليل النصوص** :تفسير النصوص الأدبية والإدارية، وتحديد الأساليب البلاغية واللغوية فيها. • **كتابة نصوص أكاديمية وإدارية سليمة** :صياغة المقالات، التقارير، والأبحاث، والوثائق الرسمية بدقة ووضوح. • **معالجة وتصحيح الأخطاء اللغوية** :التعرف على الأخطاء الشائعة وتصحيحها في مختلف السياقات الكتابية. • **التفكير النقدي والتحليلي** :تقييم النصوص والمقارنة بين الأساليب اللغوية المختلفة، واقتراح الحلول التحريرية المناسبة. • **التواصل الفعال كتابيًا وشفهيًا** :التعبير عن الأفكار بطريقة منظمة ودقيقة باستخدام اللغة العربية المتقدمة.
المحتويات الإرشادية	- مراجعة قواعد الإملاء وعلامات الترقيم، مع التركيز على القواعد المتقدمة. - النحو المتقدم: أقسام الكلام، الجملة المركبة، الأساليب النحوية المعقدة. - المفاعيل والعدد وحروف الجر المركبة، وتطبيقاتها العملية. - البلاغة العربية: التشبيه، الاستعارة، المجاز، وأساليب الإقناع. - الكتابة الأكاديمية والإدارية: صياغة المقالات، الأبحاث، والوثائق الرسمية. - تحليل النصوص الأدبية والإدارية، وتصحيح الأخطاء اللغوية المتقدمة. - مشروع عملي نهائي: كتابة نص أكاديمي أو تحليلي متكامل مع مراجعة عامة للمادة.

استراتيجيات التعلم والتعليم	
استراتيجيات	1. **المحاضرات النظرية** :تقديم القواعد المتقدمة في النحو والصرف والإملاء، وشرح أساليب البلاغة والتحليل الأدبي. 2. **المناقشات الصفية** :تحليل النصوص الأدبية والإدارية، ومناقشة الأساليب البلاغية والأسلوبية المختلفة. 3. **التطبيق العملي والتمارين**: كتابة المقالات، التقارير، والوثائق الرسمية مع التركيز على تصحيح الأخطاء اللغوية. 4. **التمارين والواجبات** :حل تدريبات نحوية وإملائية متقدمة، وتحليل نصوص أدبية وإدارية مختارة. 5. **التعلم التعاوني** :العمل ضمن مجموعات لمناقشة النصوص، تبادل الملاحظات، وتحليل التطبيقات العملية. 6. **العصف الذهني** :مناقشة الأساليب اللغوية المختلفة، تقييم النصوص، واقتراح الحلول التحريرية الصحيحة. 7. **التقييم المستمر** :اختبارات قصيرة، عروض تقديمية، تقارير تطبيقية، لمتابعة تقدم الطلاب في جميع جوانب المادة.

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
الحمل الدراسي المنتظم للطالب خلال الفصل	33	الحمل الدراسي المنتظم للطالب أسبوعيا	2
الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

تقييم المادة الدراسية					
مخرجات التعلم ذات الصلة		الوقت / العدد	وزن التقييم	أسبوع التسليم	مخرج التعلم المناسب
تقييم تكويني	اختبارات قصيرة	4	15% (15)	5,7,9 and 13	LO #2 , #3 , #5 and #8
	واجبات	5	15% (15)	2,6,8,10 and 14	LO #1 ,#4 ,#6 ,#7 and #9
	مشاريع/ مختبر				
	تقرير	4	10% (10)		
تقييم ختامي	امتحان فصلي	2hr	10% (10)	7	LO #1 - #5
	امتحان نهائي	3hr	50% (50)	16	All
اجمالي التقييم			100% (100 درجات)		

المنهاج الاسبوعي النظري	
الاسبوع	المحتوى الدراسي
الأسبوع 1	مراجعة شاملة لقواعد الإملاء: التاء، الألف، الهمزة، وعلامات الترقيم
الأسبوع 2	النحو المتقدم: أقسام الكلام، الجملة الاسمية والفعلية، التراكيب المعقدة
الأسبوع 3	المفاعيل: المفعول به، المطلق، لأجله، فيه – تطبيقات عملية
الأسبوع 4	العدد وأنواعه المتقدمة، التوافق مع المعدود، تدريبات تطبيقية
الأسبوع 5	حروف الجر المركبة وحروف الاستثناء وأثرها على الجملة
الأسبوع 6	الأساليب النحوية المتقدمة: العطف، البدل، النعت، التوكيد
الأسبوع 7	الإعراب التطبيقي: تحليل الجمل الطويلة والمركبة
الأسبوع 8	الأخطاء اللغوية الشائعة في المستويات المتقدمة وطرق تصحيحها
الأسبوع 9	البلاغة العربية: التشبيه، الاستعارة، المجاز، أساليب الإقناع
الأسبوع 10	الخطاب الأكاديمي: كتابة المقالة والبحث العلمي بأسلوب سليم
الأسبوع 11	التحرير الإداري المتقدم: الصياغة الرسمية للوثائق والخطابات
الأسبوع 12	الأسلوب الأدبي: تحليل نصوص مختارة من الشعر والنثر
الأسبوع 13	تطبيقات عملية على النصوص الإدارية والأدبية: التدقيق والتصحيح
الأسبوع 14	مشروع نهائي: كتابة نص أكاديمي رسمي أو تحليلي متكامل + مراجعة عامة
الأسبوع 15	الامتحان النهائي

مصادر التعلم والتدريس		
	المراجع	متوفر في المكتبة ؟
الكتب المطلوبة	قواعد اللغة العربية للعلامة حفني ناصف وآخرون	نعم
الكتب المقررة / الكتب الموصى بها	قواعد اللغة العربية والاملاء للدكتور محمد عبد الله الشال	لا
Websites	https://shamela.ws/ **المكتبة الشاملة**	

مخطط الدرجات				
مجموعة	درجة	التقدير	% درجات	تعريف
مجموعة النجاح **(50 - 100)**	ممتاز - **A**	امتياز	90 - 100	أداء متميز
	جيد جدا – **B**	جيد جدا	80 - 89	اعلى من المتوسط مع وجود بعض الاخطاء
	جيد - **C**	جيد	70 - 79	عمل جيد مع أخطاء ملحوظة
	مقنع - **D**	متوسط	60 - 69	مقبول لكنه يعاني من نواقص كبيرة
	ضعيف - **E**	مقبول	50 - 59	العمل يفي بالحد الأدنى من المتطلبات
مجموعة الفشل **(0 – 49)**	فشل – **FX**	راسب (قيد المعالجة)	(45-49)	مطلوب عمل اضافي
	فشل – **F**	راسب	(0-44)	مطلوب كمية كبيرة من العمل

ملاحظة:

سيتم تقريب العلامات التي تحتوي على كسور عشرية أعلى أو أقل من 0.5 إلى العلامة الكاملة الأعلى أو الأدنى. على سبيل المثال، سيتم تقريب العلامة 54.5 إلى 55، بينما سيتم تقريب العلامة 54.4 إلى 54. تتبنى الجامعة سياسة عدم قبول حالات الرسوب "بالقرب من النجاح"، لذلك فإن التعديل الوحيد على العلامات الممنوحة من قبل المصحح(ين) الأصلي(ين) سيكون التقريب التلقائي الموضح أعلاه فقط.

الرمز	عنوان المقرر	ECTS	الفصل الدراسي
NTU203	اللغة العربية	**2**	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
1	**2**	**33**	**17**

الوصف

تستهدف مادة اللغة العربية للمرحلة الثانية تنمية مهارات الطلبة اللغوية على مستوى متقدم، من خلال دراسة القواعد النحوية والإملائية المعقدة، وتطوير القدرة على الكتابة الأكاديمية والإدارية بشكل سليم ودقيق. وتركز المادة على تحليل النصوص الأدبية والإدارية، واستخدام البلاغة والأساليب اللغوية المتقدمة، مع معالجة الأخطاء اللغوية الشائعة وتصحيحها في مختلف السياقات الكتابية. كما تهدف إلى تعزيز التفكير النقدي والتحليلي لدى الطلاب، وتمكينهم من التعبير عن أفكارهم بشكل واضح ومنظم، وإتقان صياغة المقالات، التقارير، والوثائق الرسمية، بما يدعم الأداء الأكاديمي والمهني في المجالات المختلفة.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Machine Design**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 300**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	**3**		**Semester of Delivery**	**5**	
Administering Department	PM		**College**	TEMO	
Module Leader	Noori Raad Noori		**e-mail**	Noori.raad@ntu.edu.iq	
Module Leader's Acad. Title	Assistant lecture		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/6/2025		**Version Number**	3.0	

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	The Machine Design course aims to develop students' ability to analyze, design, and evaluate mechanical components used in energy and refrigeration systems by applying principles of stress analysis, material selection, and safety factors. Students will learn to design essential machine elements such as shafts, bearings, fasteners, springs, belts, and gears, and assess their performance under various loading conditions. The course also enhances students' skills in using engineering software for modeling and verification, promotes understanding of failure theories and reliability, and strengthens their ability to communicate technical solutions and work collaboratively in solving practical design problems relevant to energy and cooling applications.

Module Learning Outcomes	1) Explain the fundamental concepts of mechanical design, stress analysis, and material behavior under load. 2) Analyze machine components subjected to tension, compression, torsion, bending, and combined loading conditions. 3) Design common machine elements such as shafts, fasteners, bearings, springs, belts, and gears according to engineering principles and safety criteria. 4) Select appropriate materials and mechanical components for energy and refrigeration applications based on operating and environmental conditions. 5) Construct and interpret engineering drawings and 3D models using modern design software tools. 6) Evaluate the reliability, safety, and performance of mechanical components using failure theories and design standards. 7) Communicate design solutions effectively through technical documentation and presentations.
Indicative Contents	1) Introduction to machine design: design process, design standards, and factors of safety. 2) Mechanical properties of materials: stress–strain behavior, elasticity, plasticity, hardness, fatigue, and material selection for mechanical components. 3) Analysis of stresses and strains: axial loading, torsion, bending, combined loading, stress concentrations, and Mohr's circle. 4) Design of mechanical joints: threaded fasteners, bolts, welded joints, riveted joints, and shaft–hub connections (keys, pins, and couplings). 5) Design of shafts and axles: torsional and bending analysis, critical speeds, deflection limits, and applications in compressors, fans, and pumps. 6) Design of springs: helical compression and tension springs, torsion springs, and their applications in vibration control. 7) Bearings and lubrication: rolling-contact bearings, plain bearings, load ratings, bearing life, and selection criteria.

	8) Power transmission elements: belt drives, chain drives, gear drives, speed ratios, tension analysis, and system efficiency. 9) Failure theories and fatigue analysis: static failure theories, fatigue loading, S–N curves, and design for durability. 10) Mechanical design in energy and refrigeration systems: component selection for compressors, evaporator fans, pumps, and rotating machinery. 11) Use of engineering software (SolidWorks, AutoCAD, ANSYS) for modeling, simulation, and design verification.

Learning and Teaching Strategies	
Strategies	1) **Lectures:** Delivery of core theoretical concepts using illustrated examples, problem-solving demonstrations, and real engineering applications relevant to energy and refrigeration systems. 2) **Interactive Discussions:** Guided class discussions to promote critical thinking, clarify concepts, and connect theory with practical engineering challenges. 3) **Problem-Solving Sessions:** Structured in-class exercises where students analyze and design machine elements, reinforcing analytical and mathematical skills. 4) **Laboratory and Workshop Practice:** Hands-on activities involving mechanical testing, part measurements, CAD modeling, and simulation using tools such as SolidWorks or ANSYS. 5) **Project-Based Learning:** Small design projects that require students to apply design methodologies to real or simulated mechanical components used in energy and cooling systems. 6) **Collaborative Group Work:** Team-based tasks to encourage communication, teamwork, and shared problem-solving. 7) **Case Studies:** Examination of real mechanical failures or industrial designs to enhance understanding of safety, reliability, and engineering decision-making. 8) **E-Learning Resources:** Use of digital platforms, instructional videos, and simulation tools to support independent learning and reinforce lecture material. 9) **Formative Feedback:** Continuous feedback through quizzes, assignments, lab reports, and consultations to support improvement and deeper understanding.

Student Workload (SWL)			
Structured SWL (h/sem)	63	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	87	**Unstructured SWL (h/w)**	6
Total SWL (h/sem)	**150**		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	3 and 12	LO #1, #2 and #10, #11
	Assignments	-	5% (5)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	5	10% (10)	Continuous	All
	Report				
Summative assessment	Midterm Exam	3hr	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 Machine Design, design process, role in engineering
Week 2	Material properties: stress, strain, strength, hardness, fatigue
Week 3	Failure theories and safety factors
Week 4	Shaft design: torsion, bending, combined loads
Week 5	Keys and couplings: types and design
Week 6	Bearings: journal and rolling-element bearings
Week 7	Gears: spur, helical, bevel, gear design basics
Week 8	Midterm
Week 9	Belt and chain drives
Week 10	Springs: types, design under static/dynamic load
Week 11	Fasteners and joints (bolts, screws, welded joints)
Week 12	Brakes and clutches
Week 13	Design optimization: efficiency, cost, reliability
Week 14	Standards and codes in machine design
Week 15	Course review & project presentations
Week 16	Final exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered

Week 1	Introduction to SolidWorks interface, basic sketching
Week 2	2D sketches, constraints, and simple part modeling
Week 3	Extrude, revolve, and basic 3D part modeling
Week 4	Modeling shafts and applying material properties
Week 5	Modeling keys and couplings in SolidWorks
Week 6	Bearing modeling and simple assembly
Week 7	Gear modeling (using toolbox/design library)
Week 8	Modeling disc brakes / clutches assemblies
Week 9	SolidWorks simulation: stress & displacement
Week 10	Final project submission and presentation

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1) Machine Design: An Integrated Approach – Robert L. Norton (balanced between theory, examples, and CAD use) 2) Mechanical Design of Machine Elements and Machines – Jack A. Collins, Henry R. Busby, George H. Staab (good for applied examples)	No
Recommended Texts	1) Machine Design by R.S. KHURMI J.K. GUPTA 2) Shigley's Mechanical Engineering Design – R. Budynas & J. Nisbett 3) Design of Machine Elements – V.B. Bhandari 4) Machine Design Fundamentals – J.E. Shigley	No
Websites	https://www.machinedesign.com/?utm_source=chatgpt.com	

Grading Scheme

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 300	Machine design	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	87

Description

This course introduces students to the principles and methods of mechanical design with a focus on components commonly used in energy and refrigeration systems. It covers the analysis of stresses, material behavior, and design criteria necessary for ensuring safety, reliability, and efficiency in mechanical elements. Students learn to design machine components such as shafts, fasteners, springs, bearings, and power transmission elements under various loading conditions. The course integrates theoretical understanding with practical skills through laboratory work, engineering drawings, computer-aided modeling, and simulation tools. Emphasis is placed on applying engineering judgment, selecting appropriate materials, and developing solutions to real mechanical problems encountered in compressors, fans, pumps, and other cooling and power devices. Through design projects and hands-on exercises, students gain the competencies required to analyze, model, and evaluate machine components in modern engineering applications.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Analysis**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 301**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	**3**	**Semester of Delivery**	**5**		
Administering Department	**PM**	**College**	TEMO		
Module Leader	Dr. Qais A. Yousif	**e-mail**	kaisyusuf@ntu.edu.iq		
Module Leader's Acad. Title	Assist. Professor	**Module Leader's Qualification**	Ph.D.		
Module Tutor		**e-mail**			
Peer Reviewer Name	Dr. Ammar Hassan	**e-mail**	ammarsuhail@ntu.edu.iq		
Scientific Committee Approval Date	01/06/2025	**Version Number**	3.0		

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	1. Understand the basic principles of engineering analysis and technologies. 2. Learn about the applications of Engineering Analysis. 3. Understand the current challenges in engineering Analysis.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Develop the student's ability to work on the performance of the duties and delivered on schedule. 2. How to solve the problem in Sport's statistical analysis and find the solution with various methods. 3. Acquiring knowledge about using many methods to evaluate difficult algebraic equations.
Indicative Contents المحتويات الإرشادية	1. Specific goals, such as verifying a design, improving performance, or investigating a failure. 2. Translating a physical system into a mathematical model. 3. Equations governing the system's behavior, such as Newton's laws of motion, Fourier's heat transfer laws, or Maxwell's equations. 4. Evaluation of how changes in parameters affect the overall system performance. 5. Comparison of model predictions with theoretical, empirical, or experimental results to ensure validity. 6. An evaluation of the results in relation to the design objectives and requirements. 7. Cost-benefit analysis to select the most efficient design. 8. Suggested actions, such as design modifications, material changes, or further testing to mitigate risks. 9. Clear statements of limitations, such as steady-state vs. transient, linear vs. non-linear, or assumed boundary conditions. 10. Definition of what is included and, crucially, what is excluded from the analysis.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Detailed explanation of the scientific material. 2. Students' participation in solving mathematical problems during the class lecture time. 3. Discussion and dialogue about vocabulary related to the topic.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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	5	10% (10)	3, 5, 7, 9 and 13	LO#1, LO#2 and LO#3
	Assignments	5	10% (10)	2, 4, 6, 8, and 10	LO#1, LO#2 and LO#3
	Seminars	5	10% (10)	3, 5, 7, 9 and 13	LO#1, LO#2 and LO#3
	Reports	5	10% (10)	2, 4, 6, 8, and 10	LO#1, LO#2 and LO#3
Summative assessment	Midterm Exam	2hr	10% (10)		all
	Final Exam	3hr	50% (50)		all
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	Linear and Non-Linear Equations, System of Linear Equations, Classification of linear systems
Week 2	Methods for solution linear systems (Gaussian, Gauss-Jordan Elimination)
Week 3	Quiz
	Methods for solution non-linear systems.
Week 4	Applications of Linear and Non-linear systems (Fitting polynomials, Network Analysis, Kirchhoff ’s Laws, Heat Flow).
Week 5	Quiz
	Fourier Series (Periodic Functions, Sketching a Periodic Function)
Week 6	Even and Odd Functions.
Week 7	Quiz

	Determination of Fourier Coefficients (Euler's Formulae).
Week 8	Determination of Fourier Coefficients.
Week 9	Quiz
	Laplace Transform, Properties of Laplace Transform.
Week 10	The Inverse Laplace Transform.
Week 11	Midterm exam
Week 12	Applications of Laplace Transform (Solving 1st Differential Equations using Laplace transforms).
Week 13	Quiz
	Applications of Laplace Transform (Solving 2nd Differential Equations using Laplace transforms)
Week 14	Applications of Laplace Transform (Solving 2nd Differential Equations using Laplace transforms)
Week 15	Review
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	1. **Advanced Engineering Mathematics** by C. R. Wylie 2. **Advanced Engineering Mathematics** by Peter V. O'Neil 3. **Advanced Engineering Mathematics** by Erwin Kreysizg 4. Introduction to communication systems by Ferrell G. Stemler	**No**
Websites	https://www.coursera.org / browse / physical-science-and-engineering / electrical engineering	

Grading Scheme
مخطط الدرجات

Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group	**A - E**xcellent	امتياز	90 – 100	Outstanding Performance

(50 - 100)	**B - V**ery 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 – F**ail	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**"; therefore, 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 301	**Engineering Analysis**	**4**	**5**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**0**	**48**	**52**

Description

The Engineering Analysis module covers linear and non-linear equations, systems of linear equations, solution methods (Gaussian and Gauss-Jordan elimination), applications such as polynomial fitting, network analysis, Kirchhoff's laws, and heat flow, Fourier series (periodic functions, even and odd functions, Euler's formulae for Fourier coefficients), Laplace transforms (properties and inverse transforms), and solving first- and second-order differential equations using Laplace transforms. The module is delivered through theory and tutorials. The main advantages are that students develop the ability to translate physical systems into mathematical models, solve complex algebraic and differential equations using various analytical methods, evaluate how parameter changes affect system performance, compare model predictions with theoretical results, and perform cost-benefit analysis for design optimization—essential skills for advanced engineering problem-solving, design verification, failure investigation, and performance improvement across all engineering disciplines.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Heat Transfer**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**PM 302**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	PM		**College**	TEMO	
Module Leader	Omar Mohammed Yousif		**e-mail**	omar.m.yousif@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	Module Objectives for Heat Transfer: 1.Introduce the student to the groups used in heat transfer and to know their composition and how they work. 2. Introduce the student Basic Concepts of Heat Transfer, Heat Transfer Mechanisms, Thermal conductivity and convection heat transfer. 3. Introducing the student the main scientific principle in the field of heat transfer and its application in the Refrigeration, Cooling, and air conditioning fields, power plants.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	4. Introduce the student Basic Concepts heat transfer ,physical mechanism 5. Introduce the student by convection heat transfer. 7. Introduce the student Basic Concepts of Heat exchanger, mass transfer and heat transfer by radiation. 8. Introducing the student the main scientific principle in the field of heat transfer and its application in the Refrigeration, Cooling, and air conditioning fields. 9. Introduce the student Basic Concepts mass transfer, physical. 10. mechanism 11. Introduce the student by Radiation heat transfer.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Module Learning Outcomes for heat transfer. 1. The ability to calculation Overall Heat Transfer Coefficient 2. The ability to understand study the heat conduction through a large plane wall , cylinder and sphere as one-dimension steady state case and a multilayer plane walls, cylinders, and spheres medium under steady conditions and unsteady conditions.. 3. Ability to calculating the heat transfer from finned surfaces. 4. Ability to calculating critical radius of insulation 5. The ability to understand to Basic Concepts convection heat transfer, viscous flow, inviscid flow, laminar boundary layer on flat plate. 6. The ability to understand the Empirical relations of Forced convection – for pipe and flow over flat plate and across tube banks, Empirical relation for free convection on a vertical and horizontal flat plate , vertical and horizontal cylinders . 7. The ability to understand study the heat Radiation and the equation of black body Radiation , Diffuse and Gray surfaces. 8. Ability to understand the difference between the absorptivity, reflectivity and transmissivity heat transfer from the surfaces. 9. Ability to understand the difference between type of heat exchanger. 10. The ability to calculation to Basic Concepts heat transfer in heat exchanger and calculate the overall heat transfer coefficient. 11. The ability to understand the Empirical relations the log mean temperature difference method and the effectiveness –NTU Method
Indicative Contents المحتويات الإرشادية	Indicative Contents for heat transfer: 1. Basic modes of Heat Transfer • CONDUCTION HEAT TEANSER • CONVECTION HEAT TRANSFER • COMINED HEAT TRANSFER SYSTEMS 2. Multilayer plane Walls ,cylinder and sphere • Multilayer plane Walls • Heat conduction in cylinders and spheres • Multilayer cylinder and sphere

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	3. Heat Conduction Equation • Heat Generation • One dimensional Heat Conduction Equation • boundary condition 4. Heat Transfer from Finned Surfaces • Infinitely Long Fin • The Fin is Finite Length and Loses Heat by convection from its end • Fin efficiency • Fin effectiveness 5. STEADY –STATE CONDUCTION –MULTIPLE DIMENSIONS • Heat transfer in common configurations • Two-dimensional steady heat conduction • Boundary nodes 6. Transient Heat conduction • Lumped system analysis • Criteria for lumped system analysis • Transient heat conduction in large plane walls • Transient heat conduction long cylinders and spheres with spatial effects • Transient heat conduction in semi-infinite solids 7. fundamentals of convection • Fundamentals of convection • Classification of fluid flows • Laminar versus turbulent flow • Velocity boundary layer • Thermal boundary layer • Laminar and turbulent flows 8. Convection heat transfer (External Flow) Flow Across Cylinder And Sphere Air • External Flow • Parallel Flow over flat plates • Friction coefficient Drag coefficient • Heat transfer coefficient 9. Internal forced convection 10. Natural convection 11. Fundamentals of thermal radiation • Black body Radiation • Emissivity • Absorptivity , Reflectivity , and Transmissivity • The view factor 12.RADIATION HEAT TRANSFER:DIFFUSE, GRAY SURFACES

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	• Radiosity • Net heat radiation to or from surface 13. Radiation Heat Transfer in Two-Surface Enclosures **14. Heat Exchanger** • Type of Heat Exchanger , • compact heat exchanger • double pipe, • shell and tube heat exchanger 15.Analysis of Heat Exchangers • The LMTD method • The Effectiveness-NTU methode

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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	77	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	123	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
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)	4 and 11	LO #1, #2, #3, #9, #10 and #11

	Assignments	6	10% (10)	3,5,7,8,10 and 15	LO #2, #4, #5, #7, #9 and #11
	Seminar	1	10% (10)	7	LO #1-7
	Report	1	10% (10)	12	LO #9-12
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	Basic modes of Heat Transfer • CONDUCTION HEAT TEANSER • CONVECTION HEAT TRANSFER • COMINED HEAT TRANSFER SYSTEMS
Week 2	Multilayer plane Walls ,cylinder and sphere • Multilayer plane Walls • Heat conduction in cylinders and spheres • Multilayer cylinder and sphere
Week 3	Heat Conduction Equation • Heat Generation • One dimensional Heat Conduction Equation • boundary condition
Week 4	. Heat Transfer from Finned Surfaces • Infinitely Long Fin • The Fin is Finite Length and Loses Heat by convection from its end • Fin efficiency • Fin effectiveness
Week 5	STEADY –STATE CONDUCTION –MULTIPLE DIMENSIONS • Heat transfer in common configurations • Two-dimensional steady heat conduction • Boundary nodes
Week 6	Transient Heat conduction • Lumped system analysis • Criteria for lumped system analysis • Transient heat conduction in large plane walls

	• Transient heat conduction long cylinders and spheres with spatial effects • Transient heat conduction in semi-infinite solids
Week 7	fundamentals of convection • Fundamentals of convection • Classification of fluid flows • Laminar versus turbulent flow • Velocity boundary layer • Thermal boundary layer • Laminar and turbulent flows
Week 8	Convection heat transfer (External Flow) Flow Across Cylinder And Sphere Air • External Flow • Parallel Flow over flat plates • Friction coefficient Drag coefficient • Heat transfer coefficient
Week 9	Internal forced convection
Week 10	10. Natural convection
Week 11	Fundamentals of thermal radiation • Black body Radiation • Emissivity • Absorptivity , Reflectivity , and Transmissivity The view factor
Week 12	RADIATION HEAT TRANSFER:DIFFUSE, GRAY SURFACES • Radiosity • Net heat radiation to or from surface
Week 13	13. Radiation Heat Transfer in Two-Surface Enclosures
Week 14	**14. Heat Exchanger** • Type of Heat Exchanger , • compact heat exchanger • double pipe, • shell and tube heat exchanger
Week 15	15.Analysis of Heat Exchangers The LMTD method The Effectiveness-NTU method

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**1.Heat transfer By : J.P. Holman** **2. Heat and mass transfer By: YunusA.Genge**	**No**

Recommended Texts	**Fundamentals of heat and mass transfer. By: Incropera Heat transfer handbook By: Bijan**	**No**
Websites		

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 302	Heat Transfer	8	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	4	123	77

Heat transfer describes the flow of heat (thermal energy) due to temperature differences and the subsequent temperature distribution and changes. The study of transport phenomena concerns the exchange of momentum, energy, and mass in the form of Radiation, Heat exchanger and Mass transfer. These processes can be described via mathematical formulas. The fundamentals for these formulas are found in the laws for conservation of momentum, energy, and mass in combination with constitutive laws, relations that describe not only the conservation but also the flux of quantities involved in these phenomena. For that purpose, differential

equations are used to describe the mentioned laws and constitutive relations in the best way possible. Solving these equations is an effective way to investigate systems and predict their behavior. Heat transfer science is important in engineering application to determination of the rate of heat transfer at specified temperature difference .To estimate the cost ,the feasibility ,and the size of equipment necessary to transfer a specified amount of heat in a given time a detailed heat transfer analysis must be made .The successful operation of equipment components such as Heat exchanger depends on the possibility of cooling certain metal parts by continuously removing heat from surface at rapid rate .A heat transfer analysis must also be made in the design of electric machines ,transformers and bearings to avoid conditions that will cause overheating and damage the equipment .These examples show the importance to understand the basic modes of heat transfer . It is necessary to know the type of heat exchanger , equation of radiation , mass transfer , and to qualitatively understand the mechanism of these modes .

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Biofuels**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**RE 300**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		3	**Semester of Delivery**		5
Administering Department		PM	**College**	TEMO	
Module Leader	Dr. Omar Abdulhadi Mustafa		**e-mail**	omeralhayaly1@ntu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph. D
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		June /01/2025	**Version Number**		2.0

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	Module Objectives for Biofuels: 1. Students will learn the fundamentals of bio fuel. 2. Students will learn how can design the systems using this type of fuel. 3. Students will become familiar with the operation of activators using bio fuels. 4. Students will make the calculations deals with bio fuels.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Module Learning Outcomes for biofuel: **1. Knowledge and Understanding** • Explain the fundamental principles of biofuels: sources, types (biodiesel, bioethanol, biogas), and production processes. • Understand biomass transformation into energy products and compare with fossil fuels. • Identify plant composition and properties relevant to biofuel production. • Evaluate environmental impacts of biofuel use, including greenhouse gas emissions and sustainability. **2. Technical and Analytical Skills** • Analyze different biofuel production technologies (fermentation, transesterification, anaerobic digestion). • Assess efficiency and energy yield of biofuels compared to conventional fuels. • Interpret data in multiple formats (numerical, graphical, multimedia, web-based). • Apply life-cycle assessment (LCA) to evaluate biofuel sustainability. **3. Critical Thinking and Application** • Debate socio-economic and political issues surrounding biofuel adoption (food vs. fuel, land use, energy security). • Assess the role of biofuels in renewable energy strategies and climate change mitigation. • Evaluate integrated biorefineries that produce both biofuels and biomaterials. **4. Communication and Research Skills** • Present scientific information clearly in written, oral, and digital formats. • Engage in informed debate on biofuel-related issues using evidence-based arguments. • Collaborate in multidisciplinary contexts (engineering, environmental science, economics).
Indicative Contents المحتويات الإرشادية	Indicative Contents for biofuel: **1. Introduction to Biofuels** • Definition and classification of biofuels (solid, liquid, gaseous). • Historical development and global trends in biofuel use. • Comparison with fossil fuels: energy density, renewability, and emissions. **2. Biomass Resources** • Types of feedstocks: crops (corn, sugarcane, rapeseed), lignocellulosic biomass, algae, and waste materials. • Availability, cultivation, and harvesting methods. • Food vs. fuel debate and land-use implications.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	3. Biofuel Production Technologies • **Bioethanol**: fermentation of sugars and starches. • **Biodiesel**: transesterification of vegetable oils and animal fats. • **Biogas**: anaerobic digestion of organic waste. • **Advanced biofuels**: cellulosic ethanol, algal biofuels, synthetic fuels. **4. Conversion Processes** • Thermochemical methods: pyrolysis, gasification, liquefaction. • Biochemical methods: enzymatic hydrolysis, microbial fermentation. • Process optimization and efficiency improvement. **5. Properties and Applications** • Fuel characteristics: calorific value, viscosity, cetane/octane number. • Compatibility with existing engines and infrastructure. • Case studies of biofuel use in transport, heating, and electricity generation. **6. Environmental and Economic Aspects** • Life-cycle assessment (LCA) of biofuels. • Impact on greenhouse gas emissions and climate change mitigation. • Economic viability, subsidies, and market competitiveness. **7. Policy and Global Perspectives** • International biofuel policies and standards. • Role of biofuels in energy security and sustainable development. • Future prospects: integration with biorefineries and circular economy.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. The recipient of this material will be able to adapt to modern learning methods and create non-standard models, similar to those encountered in the early years of education. 2. By learning this material, they will be able to keep up with scientific advancements and integrate with modern patterns adopted in the job incubator. 3. This material enables them to design the systems using this type of fuel.

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	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	4 and 11	LO #1, #2, #3, and #4
	Assignments	6	10% (10)	3,5,7,8,10 and 15	LO #2 and #4
	Seminar	1	10% (10)	7	LO #1-3
	Report	1	10% (10)	12	LO #2-4
Summative assessment	**Midterm Exam**	2hr	30% (30)	7	LO #1 - #4
	Final Exam	3hr	30% (30)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Overview of Energy Sources & Utilization, Climate Change & the Impact of Carbon Dioxide
Week 2	overview of biofuel/bioenergy, Fundamental concepts in understanding biofuel/bioenergy production
Week 3	Biofuel crops & potential ecological impacts, Introduction to molecular genetics
Week 4	History of Fossil Fuels, Renewable Energy Sources & Utilization
Week 5	Chemistry & Biochemistry of Hydrocarbons, Industrial Agriculture, Part 1, Industrial Agriculture, Part 2, History of Biofuels,
Week 6	1st Generation Biofuels – Corn Ethanol & Sugarcane Ethanol, 1st Generation Biofuels – Biodiesel, Alternative Sources of Biomass
Week 7	Mid. examine
Week 8	2nd Generation Biofuels – Cellulosic Ethanol, 3rd Generation Aquatic Biomass – Cyanobacteria, Diatoms & Algae, Metabolic Engineering of Photosynthetic Organisms
Week 9	Bio prospecting, Genetic Modification & Synthetic Biology.
Week 10	Thermochemical Conversion Technologies, Biogas & Bio hydrogen
Week 11	Biodiesel – Chemistry and Analysis.
Week 12	Production Processes for Biofuels from Algae, Bioenergy, Water & the Environment
Week 13	Lifecycle Assessment of Biofuels, Policy & Politics of Energy

Week 14	Nutrient Utilization and Recycling, Value-added processing of biofuel residues and co-products, Fuel Conversion and Future Technology
Week 15	Final examines

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Biofuels production, trade and sustainable development: emerging issues, Annie Dufey, 2006	No
Recommended Texts	Biofuel Technology Handbook, Dominik Rutz & Rainer Janssen 2008	No
Websites		

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
RE 300	**Biofuels**	**6**	**5**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	**63**	**87**

The Biofuels module covers the fundamentals of biofuels, including classification (solid, liquid, gaseous), biomass resources (crops, lignocellulosic biomass, algae, waste materials), production technologies (bioethanol via fermentation, biodiesel via transesterification, biogas via anaerobic digestion, and advanced biofuels such as cellulosic and algal biofuels), conversion processes (thermochemical methods like pyrolysis and gasification, biochemical methods like enzymatic hydrolysis), fuel properties (calorific value, viscosity, cetane/octane number), environmental and economic aspects (life-cycle assessment, greenhouse gas emissions, economic viability), and policy perspectives. The module includes theory, lectures, labs, practical work, and seminars. The main advantages are that students gain a comprehensive understanding of biofuel principles and production processes, learn to design systems using biofuels, develop skills in analyzing efficiency and energy yield, apply life-cycle assessment to evaluate sustainability, debate socio-economic issues (food vs. fuel, land use, energy security), and understand the role of biofuels in renewable energy strategies and climate change mitigation—essential for careers in renewable energy engineering, environmental science, and sustainable development.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Renewable Energy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**RE 301**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		3	**Semester of Delivery**		5
Administering Department		PM	**College**	TEMO	
Module Leader	Mohammed Taha Mohammed		**e-mail**	mohammed.taha@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Lecturer	**Module Leader's Qualification**		MASTER
Module Tutor			**e-mail**		
Peer Reviewer Name		Dr. Ammar Hassan	**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**		3.0

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	By the end of this module, students should be able to: 1. Understand the differences between conventional and renewable energy sources. 2. Explain the fundamental physical principles governing renewable energy conversion. 3. Analyze the working principles and design considerations of solar thermal and photovoltaic systems.

	4. Describe wind energy systems, including turbine types and power characteristics. 5. Understand geothermal, hydro, and biomass energy generation processes. 6. Examine emerging technologies such as tidal, wave, and hydrogen energy. 7. Evaluate energy storage methods and their importance in renewable systems. 8. Assess the efficiency and performance of various renewable technologies. 9. Investigate environmental and economic impacts of renewable energy systems. 10. Recognize the role of renewable energy policies in achieving sustainable energy goals.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this module, students will be able to: 1. Define and classify different renewable energy resources. 2. Apply thermodynamic and fluid mechanics principles to energy conversion systems. 3. Compute solar radiation parameters and design solar collectors. 4. Evaluate the performance of photovoltaic systems. 5. Interpret wind turbine performance curves and calculate power output. 6. Analyze geothermal and hydroelectric power systems. 7. Compare various biomass conversion methods and biofuel production processes. 8. Explain the mechanisms of ocean, tidal, and wave energy conversion. 9. Describe hydrogen production, storage, and utilization systems. 10. Discuss energy storage technologies and their integration in hybrid systems. 11. Assess the environmental and economic viability of renewable energy projects. 12. Demonstrate understanding of global trends and national policies supporting renewable energy development.
Indicative Contents المحتويات الإرشادية	Indicative Contents for Engineering Mechanics/Dynamics: 1. Introduction to global energy demand and sustainability challenges 2. Overview of renewable energy resources and technologies 3. Solar energy: thermal collectors, PV systems, efficiency analysis 4. Wind energy: turbine types, aerodynamic principles, and performance curves 5. Geothermal energy: heat extraction and power generation methods 6. Hydroelectric systems: small- and large-scale applications 7. Biomass and bioenergy: resources, conversion techniques, and biofuels 8. Ocean energy: tidal, wave, and thermal gradient systems 9. Hydrogen energy: production methods and fuel cell technologies 10. Energy storage: mechanical, chemical, and electrical methods 11. Environmental impact assessment and life-cycle analysis 12. Economic evaluation and renewable energy policy frameworks

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Learning and Teaching Strategies: • Lectures: to introduce theoretical principles and engineering fundamentals.

	• Laboratory Work: to perform experiments on solar, wind, and hydraulic energy. • Group Projects: to encourage teamwork and design thinking. • Student Seminars: presentations by students on selected renewable energy topics. • Independent Study: guided research and technical report writing.

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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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**	4	10% (10)	2,5,11 and 13	LO #1, #3, #5 and #7
	Assignments	6	10% (10)	3,5,7,8,10 and 14	LO #2, #4, #6, #8, #10 and #11
	Seminar	2	10% (10)	7	LO #12
	Report	4	10% (10)	3,6,10,13	LO #3, LO #3, LO #3 and LO #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO #1, LO #3, LO #5 and LO #6
	Final Exam	3hr	50% (50)	16	All (LO #1- LO #12)
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Conventional and Renewable Energy Sources
Week 2	Solar Energy – Solar Collectors

Week 3	Solar Energy – Photovoltaic Systems
Week 4	Solar Energy – Efficiency Calculations of Solar Collectors
Week 5	Wind Energy – Fundamentals and Principles
Week 6	Wind Energy – Turbine Components and Characteristics
Week 7	Wind Energy – Power Curve and Turbine Performance
Week 8	Midterm Examination
Week 9	Geothermal Energy – Principles and Power Plants
Week 10	Hydroelectric Energy
Week 11	Biomass Energy and Biofuels
Week 12	Tidal, Wave, and Ocean Energy
Week 13	Hydrogen Energy
Week 14	Energy Storage Systems
Week 15	Economic, Environmental, and Policy Aspects of Renewable Energy
Week 15	Final Examination

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Solar radiation intensity
Week 2	Lab 2: Flat plate water based solar collector
Week 3	Lab 3: Flat plate, air-based solar collector
Week 4	Lab 4: Cylindrical solar collector
Week 5	Lab 5: Characteristics of a Single Solar Cell
Week 6	Lab 6: Solar Cell connection in series
Week 7	Lab 7: Solar Cell connection in parallel

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	• Kanoğlu, M., Çengel, Y. A., & Cimbala, J. M. (2021). **Fundamentals and Applications of Renewable Energy.**	No
Recommended Texts	• Rajput, R. K. (2017). **Non-Conventional Energy Sources and Utilisation**. (1st edition) • Duffie, J. A., & Beckman, W. A. (2013). **Solar Engineering of Thermal Processes** (4th ed.)	No
Websites	https://seia.org/	

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
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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
RE 301	**Renewable Energy**	**4**	**5**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	**63**	**37**

This module introduces the fundamental principles, technologies, and applications of renewable energy systems. It explores the physical concepts behind various renewable resources, including solar, wind, geothermal, hydro, biomass, ocean, and hydrogen energy. Emphasis is placed on energy conversion mechanisms, performance evaluation, and the integration of renewable systems into existing energy infrastructures. The course also discusses economic feasibility, environmental impacts, and global energy policies promoting sustainable development.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**English Language**	**Module Delivery**	
Module Type	**Support**	☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**NTU301**		
ECTS Credits	**2**		
SWL (hr/sem)	**50**		
Module Level	3	**Semester of Delivery**	5
Administering Department	PM	**College**	**TEMO**
Module Leader	Wijdan Ahmed Jalal	**e-mail**	Mti.lec227.wajdan@ntu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	M.Sc
Module Tutor		**e-mail**	
Peer Reviewer Name	Dr. Ammar Hassan	e-mail	ammarsuhail@ntu.edu.iq
Scientific Committee Approval Date	01/06/2025	**Version Number**	3.0

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	1. **Enhance communicative competence** – Enable students to use English effectively in academic, professional, and everyday situations relevant to engineering graduates. 2. **Develop integrated language skills** – Improve reading, listening, speaking, and writing for both general and technical contexts. 3. **Strengthen grammatical accuracy and range** – Consolidate intermediate grammatical structures (tenses, modals, conditionals, passive voice, reported speech) for clarity in written and spoken English. 4. **Expand technical and general vocabulary** – Build word formation

	strategies (prefixes, suffixes, compound nouns) and phrasal verbs useful in engineering and workplace communication. 5. **Foster critical thinking and discussion** – Enable students to express opinions, make predictions, give advice, and discuss ethical/social issues related to technology, environment, and work. 6. **Prepare for real-world interactions** – Practice polite requests, small talk, phone calls, appointments, and professional writing (emails, biographies, discursive essays).
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students will be able to: 1. **Use English effectively** in academic, professional, and everyday contexts relevant to mechanical engineering. 2. **Demonstrate integrated language skills** – Read, listen, speak, and write accurately and appropriately in both general and technical situations. 3. **Apply intermediate grammatical structures** – Confidently use tenses, modals, conditionals, passive voice, and reported speech in written and spoken English. 4. **Expand vocabulary strategically** – Use word formation (prefixes, suffixes, compound nouns) and phrasal verbs common in engineering and workplace communication. 5. **Engage in critical discussion** – Express opinions, make predictions, give advice, and debate social/ethical issues related to technology and the environment. 6. **Handle real-world interactions** – Make polite requests, engage in small talk, arrange meetings, use phone/appointment language, and produce professional emails and short written texts.

Indicative Contents المحتويات الإرشادية	1. **Understand and use a full range of tenses** – Present, past, present perfect, past perfect, and *used to* through reading about world cultures, biographies (Van Gogh, Shakespeare), and telling stories. 2. **Master auxiliary verbs and short answers** – Practice *do, be, have* in questions, negatives, and polite short responses in everyday conversations and class surveys. 3. **Apply present tenses and passive voice** – Describe jobs, routines, and workplace activities using simple and continuous forms, state verbs, and the passive in professional contexts. 4. **Use modal and related verbs for advice, obligation, and permission** – Discuss modern dilemmas, school rules, and British laws using *should, must, have to, can, be allowed to*, and *had to*. 5. **Express future possibilities and predictions** – Use *will, going to, present continuous, may, might, could* to discuss climate change, space tourism, and life in 2060. 6. **Form and use conditionals** – Practice second and third conditionals as well as *might/could/should have done* to talk about hypothetical past and present situations. 7. **Build vocabulary through word formation and phrasal verbs** – Learn suffixes, prefixes, compound nouns, and separable/inseparable phrasal verbs (literal and idiomatic). 8. **Develop reading comprehension strategies** – Extract information from articles about families, royalty, technology, architecture, crime, and famous people (jigsaw reading). 9. **Enhance listening skills** – Follow interviews, conversations, radio dramas, weather forecasts, and personal narratives to identify opinions, predictions, and key details. 10. **Participate in spoken interactions** – Make small talk, give and soften opinions, agree/disagree politely, make requests and offers, and arrange meetings through roleplays and discussions. 11. **Write various text types** – Produce informal letters, emails, short biographies, descriptions of people/places, stories, and discursive essays (pros and cons) with correct organization and linking words. 12. **Master pronunciation and everyday English** – Recognize vowel sounds, lost sounds, silent letters, word stress changes, and use polite expressions, clichés, and numbers (percentages, fractions, decimals).

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. **Task-based and communicative activities** – Engage students in pair work, group discussions, roleplays, and surveys to practice real-life language use in engineering and professional contexts. 2. **Integrated skills development** – Combine reading, listening, speaking, and writing within each unit through jigsaw reading, dictation, storytelling, and project-based tasks. 3. **Grammar in context** – Present and practice grammatical structures (tenses,

	modals, conditionals, passive voice, reported speech) through authentic texts, audio materials, and guided exercises. 4. **Vocabulary building strategies** – Teach word formation (prefixes, suffixes, compound nouns), phrasal verbs, and pronunciation patterns (word stress, silent letters, lost sounds) using vocabulary records and drills. 5. **Student-centered and interactive learning** – Encourage active participation through class surveys, interviews, presentations, and peer correction, with teacher acting as facilitator and model.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Classwork	2	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 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	Practice present, past, and present perfect tenses with auxiliary verbs through a world quiz and class survey.
Week 2	Develop question forms, short answers, and word families while reading jigsaw texts about two families.
Week 3	Differentiate present simple vs. continuous and use adjectives to describe jobs and daily routines.

Week 4	Apply present passive voice and adverbs of frequency while discussing salaries and interviewing about jobs.
Week 5	Contrast past simple, past continuous, and past perfect tenses through biography reading and storytelling.
Week 6	Use "used to" for past habits and practice giving strong opinions with question tags.
Week 7	Use modal verbs (should, must, have to) and phrasal verbs to give advice on modern dilemmas.
Week 8	Express past obligation with "had to" and write a short biography of a famous person.
Week 9	Review Units 1–4 through mid-term assessment and error analysis.
Week 10	Express future predictions using will, going to, may, might, and could while reading about life in 2060.
Week 11	Build vocabulary with suffixes, prefixes, and word stress changes, then practice arranging meetings.
Week 12	Form information questions and write a descriptive paragraph about a favourite room.
Week 13	Apply present perfect tenses and verb patterns while discussing personal passions and hobbies.
Week 14	Construct second/third conditionals and write a short discursive essay on pros and cons.
Week 15	Review Units 5–10 and complete final assessment covering all four skills.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	New Headway Intermediate	Yes
Recommended Texts		
Websites		

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
NTU301	English Language	2	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	0	32	18
Description			
The English Language module covers essential content including grammar (tenses, modals, conditionals, reported speech, passive voice), vocabulary (collocations, phrasal verbs, everyday topics like work, travel, technology, and health), listening (dialogues and interviews), speaking (discussions, role-plays, and presentations), reading (skimming, scanning, and identifying main ideas), writing (paragraphs, emails, and letters), and cultural awareness. Its main advantages are that students develop strong core language skills for real-life and academic contexts, gain confidence in spoken communication with improved pronunciation and fluency, expand practical vocabulary, and enhance their understanding of English-speaking cultures—all of which prepare them for effective interaction in diverse personal and professional settings.			

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information					
Module Title	**Photovoltaic Energy**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☒ **Tutorial** ☒ **Lab** ☐ **Seminar**	
Module Code	**RE 302**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	**3**		**Semester of Deliver**	**6**	
Administering Department	**PM**		**College**	**TEMO**	
Module Leader	**Safwan Assaf Hamoodi**		**e-mail**	**Safwan79azb@ntu.edu.iq**	
Module Leader's Acad. Title	**Assistant Professor**		**Module Leader's Qualification**	**M.Sc.**	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Suhail		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	**01/06/2024**		**Version Number**	**3.0**	

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1. Understanding Scientific Fundamentals: Learn the principles of physics and chemistry that explain how light energy is converted into electrical energy. 2. Solar Energy Technology Applications: Study the various systems used to convert solar energy, such as solar cells (photovoltaics) and solar mirrors. 3.System Design: Learn how to design solar energy conversion systems, including selecting appropriate materials and components. 4. Performance Analysis: The ability to evaluate the performance of different systems and analyze their efficiency in converting light energy 5. Environmental and Economic Challenges: Understand the environmental and economic impacts of using solar energy compared to conventional energy sources. 6. Future Directions: Explore recent innovations and developments in the field of converting light energy into electricity.

Module Learning Outcomes	1.Fundamental Concepts: Understand the basic principles of photovoltaic (PV) technology, including the physics of solar energy conversion and the operation of solar cells**.** 2 **.**Types of PV Technologies: Identify and differentiate between various types of photovoltaic technologies (e.g., monocrystalline, polycrystalline, thin-film, and emerging technologies)**.** 3. System Components: Describe the key components of photovoltaic systems, including solar panels, inverters, batteries, and balance of system (BOS) components. 4. System Design: Develop the ability to design a photovoltaic system for different applications, considering factors such as site assessment, energy needs, and system sizing. 5. Performance Analysis: Analyze the performance of photovoltaic systems using metrics such as efficiency, capacity factor, and energy yield. 6. Installation Practices: Understand best practices for the installation and maintenance of photovoltaic systems to ensure optimal performance and safety.
Indicative Contents	Part A: Introduction to Solar Energy [20 hours] Principles of Photovoltaics [20 hours] Revision Session and Quiz [1.5 hours] Part B: 4. Photovoltaic System Components [20 hours] System Design and Sizing [10 hours] Revision Session and Quiz [1.5 hours] **Revised Description: Part A** of the course focuses on building a strong foundation in Photovoltaics Energy. Students will start by understanding the basic principles of This indicative content outline provides a comprehensive framework for understanding photovoltaic energy systems, their applications, and their broader implications for society and the environment. Depending on the course structure, some topics may be expanded or condensed to suit specific learning objectives or audience needs.
Learning and Teaching Strategies	
Strategies	**1 .Lectures and Presentations** • Overview Lectures: Introduce key concepts, theories, and technologies related to photovoltaics. • Guest Speakers: Invite industry professionals or researchers to share insights on current trends and real-world applications. **2. Hands-On Laboratory Experiments** • Solar Cell Testing: Conduct experiments to measure the efficiency of different types of solar cells under various conditions. • System Assembly: Provide opportunities for students to assemble small-scale photovoltaic systems, including wiring and installation. **3. Field Trips and Site Visits** • Visit Solar Farms: Organize trips to local solar installations, allowing students to observe large-scale systems in operation.

	• Manufacturer Tours: Visit solar panel manufacturing facilities to understand production processes and technologies. **4. Project-Based Learning** • Design Projects: Assign students to design a photovoltaic system for a hypothetical building or community, including site assessment and economic analysis. • Research Projects: Encourage students to investigate emerging technologies or policies affecting the solar energy sector. **5. Case Studies and Real-World Applications** • Analyze Successful Projects: Use case studies of successful photovoltaic implementations to highlight best practices and lessons learned. • Problem-Solving Activities: Present real-world challenges related to photovoltaic energy and have students propose solutions. **6. Collaborative Learning** • Group Discussions: Facilitate discussions on current events, policy changes, or technological advancements in photovoltaics. • Peer Teaching: Have students work in pairs or small groups to teach each other about specific topics within the module.

Student Workload (SWL)			
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					
As		**Time/Number**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	**10% (10)**	5 and 10	LO #1and #2
	Assignments	2	**5% (5)**	2 and 12	LO #2 and #3
	Projects / Lab.	5	**15% (15)**	Continuous	LO #1 and #3
	Report	2	**10% (10)**	13	LO #3
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	Introduction to Solar Energy
Week 2	Principles of Photovoltaics
Week 3	Types of Solar Cells
Week 4	Solar Cell Manufacturing
Week 5	System Components
Week 6	System Design and Sizing
Week 7	Performance Analysis
Week 8	Economic Aspects of PV Systems
Week 9	Policy and Regulation
Week 10	Environmental Impact
Week 11	Emerging Technologies
Week 12	Types of solar PV systems
Week 13	Physics of shading and Shading of a single cell
Week 14	Blocking diode
Week 15	By-Pass diode
Week 16	Future Trends and Conclusion

Delivery Plan (Weekly Lab. Syllabus)	
Week	**Material Covered**
Week 1	Lab 1: Characteristics of a Single Solar Cell
Week 2	Lab 2: Effect of solar irradiance on solar PV Module
Week 3	Lab 3: Effect of solar irradiance on solar module based on Matlab/Simulation
Week 4	Lab 4: Effect of temperature on solar PV module
Week 5	Lab 5: Effect of temperature on solar PV module based on Matlab/Simulation
Week 6	Lab 6: Series connection of solar PV modules
Week 7	Lab 7: Series connection of solar PV modules based on Matlab/ Simulink
Week 8	Lab 8: Parallel connection of solar PV modules
Week 9	Lab 9: Parallel connection of solar PV modules based on Matlab/ Simulink
Week 11	Lab 10: Solar PV fed single phase AC motor
Week 12	Lab 11: Solar PV fed DC water pump
Week 13	Lab 12: Solar PV clean dust
Week 14	Lab 13: Innovations in Photovoltaics
Week 15	Lab 14: Integration with Smart Grids

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. Solanki, Chetan Singh. Solar photovoltaic technology and systems: a manual for technicians, trainers and engineers. PHI Learning Pvt. Ltd., 2013	

Recommended Texts	2. Shepherd, William, and David William Shepherd. Energy studies. World Scientific Publishing Company, 2014.	
Websites	3. www. PV-iteach. eu	

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
RE 302	**Photovoltaic Energy**	**8**	**6**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	**4**	**123**	**77**

Description

Photovoltaic energy is a type of renewable energy that relies on converting light into electricity using solar cells based on the photovoltaic effect. In this process, light is absorbed by semiconductor materials within the solar cells, which excites electrons inside these materials and stimulates them to produce an electric current. Photovoltaic energy is one of the most prominent renewable energy sources that contributes to achieving environmental sustainability and reducing dependence on fossil fuels.

Students delve into the fundamental principles of studying how sunlight is directly converted into electricity using special materials called semiconductors (the most common of which is silicon). This process is known as the photovoltaic effect. It encompasses a wide range of fields, including power and electricity generation.

This field focuses on practical experience through laboratory work, where students gain hands-on skills to meet the growing demand for cleaner and more efficient energy solutions. Photovoltaic energy is a

promising option for the future of renewable energy, providing an effective solution for generating electricity in a clean and sustainable manner. By improving technologies and increasing investment in these systems, the world can reduce greenhouse gas emissions and rely more heavily on sustainable energy sources.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Gas Dynamics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RE 303**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	AM		**College**	TEMO	
Module Leader	Firas Aziz Ali		**e-mail**	firasaziz@ntu.edu.iq	
Module Leader's Acad. Title	Assist prof.		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	1. To discuss the effect of compressibility in gas flow 2. To derive the steady one-dimensional isentropic flow equation 3. To discuss the effects of friction and heat transfer on compressible flows through constant area duct 4. To familiarize the occurrence of shocks and calculate property changes across a shock wave 5. To derive the thrust equation and discuss its application in jet and rocket.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. **CO1**: Apply the thermodynamics concepts in relation to compressible flows and derive relationships between various compressible flow parameters 2. **CO2**: Understanding of isentropic compressible flows in variable area ducts and apply in design of static components like nozzles and diffusers 3. **CO3**: Solve for compressible flow characteristics with friction and heat transfer 4. **CO4**: Develop relationship for shocks and determine their characteristics under various conditions 5. **CO5**: Analyse the performance of aircraft and rocket propulsion engines
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Introduction to gas dynamics, Isentropic flow, Bryton cycle ideal and actual. [15hrs] Shock waves in supersonic flow, normal shock and oblique shock waves[15 hrs] Introduction to gas turbine power plant, [10 hrs] Introduction to rockets thrust equations, [15hrs] Part B – Fundamentals To understand the charts of oblique shock waves, [15 hrs] Types of pumps, pumps Characteristics, [7 hrs] Introduction to jet propulsion, The Kinds, Impulse Turbine, Blades Efficiency. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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.

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	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	3 and 12	LO #1, #2 and #10, #11
	Assignments	-	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	2	20% (20)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	3hr	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	**Conservations laws, Mass, Energy, and Momentum equations**
Week 2	**Introduction to Compressible Flow**, classifications of fluid flow
Week 3	**Wave Propagation, stagnation condition, Thermodynamics relationships**
Week 4	**Isentropic flow of a perfect gas in varying area duct**
Week 5	**Isentropic Flow in Converging-diverging Nozzles and Diffusers**
Week 6	**Thrust of Rocket Engine**, specific thrust equation
Week 7	**Introduction to Stationary Normal Shock Waves**
Week 8	**Stationary Normal Shock Waves in C-D Nozzles**
Week 9	**Stationary Normal Shock Waves in C-D Diffusers**
Week 10	**Moving Normal Shock Waves**
Week 11	**Introduction to Oblique Shock Waves** relationships
Week 12	**Oblique Shock Waves over wedges and inlets**
Week 13	**Introduction to pumps**, pumps classifications
Week 14	**Introduction to Compressors**, types of compressors
Week 15	**Introduction to Gas Turbines**.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Week 1	Introduction of gas dynamics instruments
Week 2	Subsonic wind tunnel pressure distribution
Week 3	Subsonic wind tunnel velocity distribution

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Dynamics and Thermodynamics of compressible flow, A. Shapiro, 1980.	No
Recommended Texts	Fundamentals 0f engineering thermodynamics, Michael J. Moran and Howard N. Shapiro, Fifth edition	No
Websites	https://www.linquip.com/ Linquip Content Managment Team	

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
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	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
RE 303	Gas Dynamics	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	
Description			
A course on gas dynamics Includes the following sections:			

Introducing students to thermodynamics by studying thermal systems in terms of energy interactions with its immediate surroundings. and measure differences in the appropriate properties of both the system and its surroundings and applications in engineering fields. One-dimensional compressible flows including basic concepts; isentropic flow; normal and oblique shock waves; flows with heat transfer (Rayleigh line), friction (Fanno line), and mass addition; simple waves; small perturbation theory for linearized, steady flows; method of characteristics for two-dimensional, steady flow and one-dimensional, unsteady flow.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Computer Applications**			**Module Delivery**	
Module Type	**Basic**			☐ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 303**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	PM		**College**	TEMO	
Module Leader	Husam Naufal Saleh Yassien		**e-mail**	husam.naufal@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Prof.		**Module Leader's Qualification**	MASTER	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	1. To develop students fundamental knowledge for modeling the mechanical different parts in 2D & 3D. 2. To develop students fundamental knowledge of insight into drawing the mechanical different parts in 2D & 3D. 3. To understand the basic principles of simulation and creating mechanical parts systems in 2D & 3D using developed design software. 4. This course deals with the basic concept of mechanical drawing.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	5. Identify and describe the icons components of a typical insertion of different mechanical parts into different mechanical structures. 6. To explain different important mechanical parts involved in mechanical systems processes. 7. To develop students' fundamental knowledge of analyzing and calculating the important strength of materials factor that is very significant in manufacturing of designed mechanical parts in 2D & 3D.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define mechanical parts and identify their applications. 2. Define and calculate mechanical parts using developed design software. 3. Recognize how to use the icons components of a typical insertion of different mechanical parts. 4. Analyze the important strength of materials factor that is very significant in manufacturing of designed mechanical parts in 2D & 3D. 5. Describe the significance the accurate successfully 2D & 3D designation of mechanical parts in the manufacturing. 6. Identify the employing of the successful 2D & 3D designation way of the mechanical parts in the manufacturing.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Define and show significance, of [Fasteners {Nuts, Screws, Washer}; {Shaft generators: Cylinder, Wrench, thread, gear, chamfer and fillet}; {Shaft Component: Roller Bearing, (Key: Parallel and Woodruff Key), Seals}; {Drill Bushing: Assembly Drawing}; {Springs: Compression, Extension and Torsion}; {Deflection Line}; {moment of inertia}]. • Calculation and analysis of [Fasteners {Nuts, Screws, Washer}; {Shaft generators: Cylinder, Wrench, thread, gear, chamfer and fillet}; {Shaft Component: Roller Bearing, (Key: Parallel and Woodruff Key), Seals}; {Drill Bushing: Assembly Drawing}; {Springs: Compression, Extension and Torsion}; {Deflection Line}; {moment of inertia}]. • Create, design and inert of [Fasteners {Nuts, Screws, Washer}; {Shaft generators: Cylinder, Wrench, thread, gear, chamfer and fillet}; {Shaft Component: Roller Bearing, (Key: Parallel and Woodruff Key), Seals}; {Drill Bushing: Assembly Drawing}; {Springs: Compression, Extension and Torsion}; {Deflection Line}; {moment of inertia}].

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The Creation, designation and insertion of mechanical parts 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 mechanical designing 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 interactively module promotes equipping students with the knowledge and skills necessary for success in the field of designation of mechanical parts.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.46
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)	5 and 10	LO #1, #2 and #3
	Assignments	2	10% (10)	7 and 13	LO #2, #3 and #4, #6
	Seminar	10	10% (10)	2 - 11	LO #2, #3 and #4, #6
	Report	10	10% (10)	3 - 12	LO #2, #3 and #4, #6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1, #2 and #3
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fasteners: • Nuts • Screws • Washer • Screw connection
Week 2	Shaft generators • Cylinder • Cone
Week 3	Shaft generators • Wrench • Thread
Week 4	Shaft generators • Gears
Week 5	Shaft generators • Chamfer and Fillet
Week 6	Assembly Drawing
Week 7	Shaft Component • Roller Bearing and Bearing calculations
Week 8	Shaft Component • Key: Parallel , Woodruff Key
Week 9	Shaft Component • Seals
Week 10	Drill Bushing and Assembly Drawing
Week 11	Springs: • Compression
Week 12	Springs: • Extension
Week 13	Springs: • Torsion
Week 14	Moment of Inertia
Week 15	Deflection Line

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• **Autodesk Mechanical Desktop Program.**	No
Recommended		No

Texts		
Websites		

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 303	**Engineering Computer Applications**	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
0	**3**	**48**	**52**

The Computer Applications in this level provides students with a comprehensive fundamental knowledge for modeling the mechanical different parts in 2D & 3D. And make them understanding the definition, significance, calculation, analysis, create, design and inert of [Fasteners {Nuts, Screws, Washer}; {Shaft generators: Cylinder, Wrench, thread, gear, chamfer and fillet}; {Shaft Component: Roller Bearing, (Key: Parallel and Woodruff Key), Seals}; {Drill Bushing: Assembly Drawing}; {Springs: Compression,

Extension and Torsion}; {moment of inertia}; {Deflection Line}]. As well as identifying and description the icons components of a typical insertion of different mechanical parts into different mechanical structures. Also enhancing and developing the student's capability for following the right steps in mechanical design and analysis the different mechanical parts into different mechanical structures with simulating the strength of material important parameters for accurate design performing.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	**Numerical Analysis**		**Module Delivery**	
Module Type	**Basic**		☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 304**			
ECTS Credits	**4**			
SWL (hr/sem)	**150**			
Module Level	**3**	**Semester of Deliver**	**6**	
Administering Department	**PM**	**College**	**TEMO**	
Module Leader	**Qais A. Yousif**	**e-mail**	**kaisyusuf@ntu.edu.iq**	
Module Leader's Acad. Title	**Asst. Prof.**	**Module Leader's Qualification**	**Ph.D.**	
Module Tutor		**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan	**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	**01/06/2025**	**Version Number**	**3.0**	

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	By the end of the semester, the student should not only be familiar, but more confident, in effectively using numerical tools to solve problems in their own field of interest. In particular, the students will become proficient: 1. To understand the theoretical and practical aspects of the use of numerical methods. 2. To introduce the fundamentals of numerical methods used for the solution of engineering problems. 3. To introduce various techniques for solving; linear, non-linear, and difference equations using various numerical methods. 4. To apply gained knowledge to solve practical problems. 5. To recognize the difference between analytical and numerical solutions. 6. To recognize the difference between true relative error ε_t, approximate relative error ε_a, and acceptable error εs, and 7. To understand how εa and εs are used to terminate an iterative computation. 8. To know the relationship between finite divided differences and derivatives. 9. To be able to analyze how errors are propagated through functional relationships.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successfully completing the module, students will be able to: 1. demonstrate knowledge and critical understanding of the well-established principles within a wide range of basic numerical methods, including iterative methods, interpolation, quadrature, finite difference approximation of initial-value problems for ordinary differential equations (ODEs); 2. demonstrate the capability to use a range of established techniques and a reasonable level of skill in calculation and manipulation of the material to solve problems in the following areas: root finding, interpolation, numerical quadrature, finite differences, initial-value problems for ODEs; 3. apply the concepts and principles in basic numerical approximation in well-defined contexts beyond those in which they were first studied, showing the ability to evaluate critically the appropriateness of different tools and techniques; 4. make appropriate use of MATLAB commands to implement numerical methods.
Indicative Contents المحتويات الإرشادية	1. Specific goals, such as verifying a design, improving performance, or investigating a failure. 2. Translating a physical system into a mathematical model. 3. Equations governing the system's behavior, such as Newton's laws of motion, Fourier's heat transfer laws, or Maxwell's equations. 4. An evaluation of the results in relation to the design objectives and requirements. 5. Cost-benefit analysis to select the most efficient design. 6. Definition of what is included and, crucially, what is excluded from the analysis.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Detailed explanation of the scientific material. 2. Students' participation in solving mathematical problems during the class lecture time. 3. Discussion and dialogue about vocabulary related to the topic.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (hr./w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**3**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (hr./w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**3**
Total SWL (h/sem)	**100**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	10	10% (10)	3, 5, 6, 7, 8, 9, 10, 13, 14 and 15	
	Assignments	5	10% (10)	2, 4, 6, 8, and 10	
	Seminars	2	10% (10)	5 and 10	
	Reports	2	10% (10)	4 and 12	
Summative assessment	**Midterm Exam**	2hr	10% (10)		
	Final Exam	3hr	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	Definition and significance of numerical analysis.
Week 2	Iteration Methods for Solving linear Equations (Jacobi`s or Gauss- Jacobi and Gauss-Seidel Method). Strictly Diagonally Dominant Matrix.
Week 3	Quiz
	Iteration Methods for solving Nonlinear Equations (Root Finding); Graphical approach.
Week 4	Bracketing Methods: Bisection Method, False-Position (Regula Falsi) Method.
Week 5	Quiz
	Open Methods: Newton-Raphson Method, Secant Method, Fixed-point iteration.
Week 6	Quiz
	Iteration Methods for solving System of Nonlinear Equations: Newton-Raphson and Fixed-point method.
Week 7	Quiz
	Numerical Differentiation: Approximation of First Order Derivative (Finite difference formulas; Forward, Backward, Central differences).
Week 8	Quiz
	Numerical Differentiation: Approximation of Second Order Derivative (Finite difference formulas; Forward, Backward, Central differences).
Week 9	Quiz
	Numerical Solution of Differential Equations (Runge-Kutta method).
Week 10	Quiz
	Numerical Integration: Newton-Cotes formulas (Trapezoidal Rule, Simpson1/3rd, Simpson3/8th Rule, and Boole`s Rule).
Week 11	Midterm Exam
Week 12	Composite integration
Week 13	Quiz
	Approximating Definite Integrals Using Left, Right, and Midpoint with Riemann Sums.
Week 14	Quiz
	Numerical Integration: Gaussian Quadrature
Week 15	Quiz
	Review
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. **An Introduction to Numerical Analysis Solutions to Exercises, Endre Suli and David F. ayers, University of Oxford.** 2. **Advanced Engineering Mathematics** by Erwin Kreysizg	**No**
Recommended Texts	Fundamental Numerical Methods and Data Analysis, by George W. Collins, II	**No**
Websites	http://www.numerical-methods.com	

Grading Scheme **مخطط الدرجات**				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A - E**xcellent	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 – F**ail	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**"; therefore, 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 304	Numerical Analysis	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	0	48	52

Description

The Numerical Analysis (PM304) module covers iterative methods for solving linear equations (Jacobi, Gauss-Seidel), nonlinear equations (root-finding: graphical approach, bisection, false-position, Newton-Raphson, secant, fixed-point iteration), systems of nonlinear equations, numerical differentiation (finite difference formulas for first and second order derivatives: forward, backward, central), numerical solution of differential equations (Runge-Kutta method), and numerical integration (Newton-Cotes formulas: trapezoidal rule, Simpson's 1/3 and 3/8 rules, Boole's rule, composite integration, Riemann sums, and Gaussian quadrature). The module includes theory, lectures, and tutorials, with an emphasis on MATLAB implementation. The main advantages are that students understand theoretical and practical aspects of numerical methods, learn to solve engineering problems that lack analytical solutions, distinguish between true, approximate, and acceptable errors, use error analysis to terminate iterative computations, apply finite differences to derivatives, and gain confidence in using numerical tools for design verification, performance improvement, and cost-benefit analysis—essential for advanced engineering and scientific computing.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Theory of Machines and Vibrations**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 305**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	PM		**College**	TEMO	
Module Leader	Dr. Yasir Hassan Ali		**e-mail**	Yha2006@ntu.edu.iq	
Module Leader's Acad. Title	Lacturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	The main purpose of this course : 1- Acquiring the skill and ability to interact with devices and machines and use them, calculate vibrations and ways to reduce and treat them, and demonstrate the student's ability to use knowledge to prepare scientific and applied research. 2. The ability to use electronic programs to solve problems in mechanical systems. 3. The ability to think critically to develop engineering solutions to problems related to mechanical parts.

	4. The ability to keep pace with scientific and technological advancements. 5. Teaching leadership skills and the value and quality of commitment, love of work, and dedication
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- To develop student's fundamental knowledge and insight into the theory of machines. 2. The ability to design belts and calculate balancing of rotating masses to be used in machines design. 3. The ability to use experiments, obtain results, and analyze them. 4. The ability to provide comfortable working conditions within the work environment, free from problems such as vibration, noise, etc. 5. The ability to calculate mechanical loads 6. The ability to design mechanical parts without vibration.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Introduction to Theory of Machines and Vibrations. [hrs] Introduction to Theory of Machines and Vibrations, Balancing . Belts, [hrs] Velocity and Acceleration, [hrs] Equation Of Motion, Two - degree of freedom system [hrs] Part B – Fundamentals - To understand the modern technologies of Theory of Machines and Vibrations [hrs] - Ability to design different types of Machines and calculate the Vibrations [hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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.

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)	3 and 12	LO #1, #2
	Assignments	-	10% (10)	2 and 12	LO #3, #4
	Projects / Lab.	2	20% (20)	Continuous	All
	Report				
Summative assessment	Midterm Exam	3hr	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 and Definition. Graphical Representation of Displacement, velocity, and acceleration with respect to time. Solved problems.
Week 2	Velocity and Acceleration in mechanisms.
Week 3	Velocity and Acceleration in mechanisms.
Week 4	Balancing of rotating masses. Balancing of a single rotating mass by a single mass rotating in the same plane. Balancing of a single rotating mass by two masses rotating in different planes. (a) Analytical method. (b) Graphical method.
Week 5	Balancing of several masses rotating in the same plane. (a) Analytical method. (b) Graphical method.
Week 6	Belts
Week 7	Belts
Week 8	Basic concepts of vibration
Week 9	Introduction to oscillatory motion, Free vibration of an undamped single degree of freedom system
Week 10	Energy method (Rayleigh Principle)
Week 11	Free vibration of a viscously damped single degree of freedom system
Week 12	Equivalent springs and dampers, Forced vibration of a single degree of freedom system
Week 13	Two - degree of freedom system

Week 14	**Two - degree of freedom system**
Week 15	**Two - degree of freedom system**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Gyroscopic
Week 2	bearings
Week 3	balance
Week 4	belt
Week 5	springs
Week 6	simple pendulum
Week 7	damping of water
Week 8	damping of air
Week 9	Bifilar
Week 10	Machinery soft foot

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1-Theory of Vibration with Applications 2- Theory of Machines	No
Recommended Texts	1-Theory of Vibration with Applications 2- Theory of Machines	No
Websites	1- https://svantek.com/academy/vibration-guide/ 2-https://ocw.mit.edu/courses/2-003sc-engineering-dynamics-fall-2011/pages/syllabus/ 3- https://www.scribd.com/document/431196398/Vibration-Lecture-1	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group	**A** – Excellent	امتياز	90 - 100	Outstanding Performance

(50 - 100)	**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 305	Theory of Machines and Vibrations	8	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	123	77

Description

The main purpose of this course :
1- Acquiring the skill and ability to interact with devices and machines and use them, calculate vibrations and ways to reduce and treat them, and demonstrate the student's ability to use knowledge to prepare scientific and applied research.
2. The ability to use electronic programs to solve problems in mechanical systems.
3. The ability to think critically to develop engineering solutions to problems related to mechanical parts.
4. The ability to keep pace with scientific and technological advancements.
5. Teaching leadership skills and the value and quality of commitment, love of work, and dedication

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Thermal Power Plants**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 400**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	PM		**College**	TEMO	
Module Leader	Bahjat Hassan Alyas		**e-mail**	Bahjat.me@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	1. Power plant engineering deals with the study of energy, , its sources and utilization of energy for power generation. 2. The power is generated by prime movers (example Hydraulic turbines, steam turbines, diesel engines) 3. Large amount of power is generated using prime movers in a site or layout called power plants, where all the equipment and machineries required for power generation is located

	4. Energy may be defined as the capacity to do work. Energy exists in various forms, such as Mechanical Energy, thermal energy, electrical energy, solar energy etc 5. Energy may be defined as the capacity to do work. Energy exists in various forms, such as Mechanical Energy, thermal energy, electrical energy, solar energy etc
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Explain about the plant steam cycles 2. To make the students understanding Binary cycle working on mercury and steam, combine condenser 3. To make the students understanding Combustion and Fuels 4. Enables the students to learn Steam Condensers, Kinds, Direct Contact Condensers, Surface Condenser 5. To make the students understanding all about the Steam Nozzles, Applications 6. To explain the Pumps, Kinds of Pumps 7. Explain the operation of Pumps in series and Parallel, Centrifugal pumps 8. To help student how to calculate Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency 9. To help students understanding how to solve the water treatment and testing in boiler
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Introduction to power cycle, Carnot cycle, Rankin cycle ideal and actual, Rankin cycle with reheat. [15 hrs] Open feedwater heater and close feedwater heaters, binary cycle, combine cycle[15 hrs] Steam condenser are direct and indirect contact, the efficiency of steam condenser [10 hrs] Fuel and combustion, and how to calculate the air to fuel ratio [15 hrs] Calculate the heat of combustion [6hrs] Part B – Fundamentals . To understand the diagram of nozzle converge- diverge nozzles, Applications v [15 hrs] System Characteristics, Pumps Characteristics, Matching Pumps to System Characteristics. [7 hrs] Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency. Water Treatment and Testing [15 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	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.

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**	4	10% (10)	3,6 and 9, 14	LO #2, #3 and #7, #8
	Assignments	5	10% (10)	1, 5, 7 and 12, 15	LO #1, #4 ,#5and #6, #9
	Projects / Lab.	7	20% (20)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	3hr	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	Introductions ,Plant steam cycles, main cycles
Week 2	reheat cycle , Regenerative cycle, open feed water heater
Week 3	closed feed water heaters , combine cycles
Week 4	Binary cycle working on mercury and steam, combine condenser

Week 5	Combustion and Fuels
Week 6	Correct Air/Fuel Ratio
Week 7	Steam Condensers, Kinds
Week 8	Direct Contact Condensers, Surface Condenser
Week 9	Design and Manufacturing, Efficiency of the Condensers
Week 10	Steam Nozzles, Applications
Week 11	The Pumps, Kinds of Pumps,
Week 12	System Characteristics, Pumps Characteristics, Matching Pumps to System Characteristics
Week 13	Operation of Pumps in series and Parallel, Centrifugal pumps
Week 14	Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency
Week 15	Water Treatment and Testing

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction of boiler
Week 2	Boiler feed water repeated for times with variable inputs
Week 3	To calculate the efficiency of steam condenser
Week 4	Air to fuel ratio of combustion
Week 5	To calculation the power of pumps kinds
Week 6	The steam nozzle repeated for times with variable inputs
Week 7	Water treatment in boiler

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Thermal engineering (eighth edition) R. K. RAJPUT	No
Recommended Texts	Fundamentals 0f engineering thermodynamics, Michael J. Moran and Howard N. Shapiro, Fifth edition	No
Websites	https://www.linquip.com/ Linquip Content Management Team	

Grading Scheme
مخطط الدرجات

Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group	**A –** Excellent	امتياز	90 - 100	Outstanding Performance

(50 - 100)	**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 400	Thermal Power Plants	8	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	4	123	77

Description

A course on Thermal Power Plants. Includes the following sections:

1. Introducing students to thermodynamics by studying thermal systems in terms of energy interactions with its immediate surroundings. and measure differences in the appropriate properties of both the system and its surroundings and applications in engineering fields

2. To understand the fuel and combustion, show the combustion is perfect or in perfect

3. To study the steam turbine. By using the single or double blade and calculation the efficiency of blades

4. To explain steam condenser explain the types of condensers

5. To study the types of pumps by state the law that use in pumps and the advantage and disadvantage of pumps

6. To study the water treatment, explain the method of water treatment (thermal, chemical, mechanical)

7. How to use the steam tables to find the properties (enthalpy, entropy, ect.)

8. How to use the combustion charts.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Solar Energy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RE 400**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	PM		**College**	TEMO	
Module Leader	Firas Aziz Ali		**e-mail**	firasaziz@ntu.edu.iq	
Module Leader's Acad. Title	Assist prof.		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	3.0	

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	The main purpose of this course is to introduce students with renewable energy resources availability, potential and suitability as a substitute for conventional energy resources in future energy demand. Having completed the courses, the student should have Knowledge: Advanced knowledge about different renewable energy resources. Advanced knowledge about potential of using renewable energy technologies as a complement to and to the extent possible, replacement for conventional technologies, and possibilities to combining renewable and non-renewable energy technologies in

	hybrid systems. Knowledge about strategies for enhancing the use of renewable energy resources for future demand. Skills: Analysis on importance of renewable energy solutions for sustainable development.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1.demonstrate an ability to use critical thinking and problem-solving skills to evaluate business energy use and how and when to apply renewable energy solutions 2. demonstrate an understanding of, and assess the obstacles associated with implementation of renewable energy systems 3. evaluate the advantages, limitations and potential of various clean energy sources for buildings and businesses 4. demonstrate an understanding and familiarity with engineering and financial aspects of projects 5. demonstrate an understanding and familiarity with the regulatory aspects of renewable energy projects
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Energy Sources and Environmental Effects [15hrs] Solar Photovoltaic: o Solar Power Systems - Electrical o Solar Power Systems - Thermal [15 hrs] Wind Power Fundamentals o Wind Power Systems o Wind Turbine Control [15hrs] Biomass Technologies, Geothermal Power Generation [6hrs] Part B – Fundamentals to understand the class project based on technology to be selected Generators [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	122	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
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)	3 and 12	LO #1, #2 and #10, #11
	Assignments	-	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	2	20% (20)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	3hr	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	**Renewable energy, definition and Resources**
Week 2	**Solar energy, solar constant, and Solar radiation at earth`s surface**
Week 3	**Solar energy, solar constant, and Solar radiation at earth`s surface**
Week 4	**Global Radiaton (Beam and Diffuse) Radiation Components**
Week 5	**Absorbed Solar Energy**
Week 6	**Concentrating collectors, part A**
Week 7	**Concentrating collectors, part B**
Week 8	**Solar Space Heating Systems**
Week 9	**Solar Space Cooling Systems**
Week 10	**Hydro-electric power plant**
Week 11	**Types of Hydraulic Turbines**
Week 12	**Introduction to Wind turbines**
Week 13	**Classification of Wind Turbines**
Week 14	**Introduction to Geothermal Energy**
Week 15	**Ocean Energy Conversion Technologies (Waves, Currents, and Tides)**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Week 1	Estimating the useful heat or heat gain using solar water heater
Week 2	Estimating the useful heat or heat gain using solar air heater
Week 3	Estimating the amount of Distilled water using solar distillation unit
Week 4	Estimating the useful heat or heat gain using solar chimeny device
Week 5	Kaplan turbine rig test
Week 6	Pelton turbine rig test
Week 7	Open channel with zero head flow turbine rig test
Week 8	Photovoltaic power generation rig-part 1
Week 9	Photovoltaic power generation rig-part 2

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Renewable Energy: Law, Policy and Practice (American Casebook Series) 2nd Edition,2021	No
Recommended Texts	Solar Energy Engineering Processes and Systems Second Edition, 2014	No
Websites	https://www.linquip.com/ Linquip Content Managment Team	

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
RE 400	Solar Energy	8	7

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	122

Description

A course on solar energy . Includes the following sections:

Worldwide, increased focus on sustainable development has led to sharp rise in development of solar power projects. As solar power is a clean and renewable energy option, countries are promoting its large-scale usage wherever possible. Technology improvements, mass manufacturing and innovative financing mechanisms have made solar power achieve grid parity in many countries. Thus, with reduced solar power prices and dependable electricity storage options, large-scale integration of solar power to the grid has been planned. This has opened up numerous job opportunities worldwide. In this course, students will be engaged to help them acquire technical and commercial knowledge and skills associated with solar power development and management. Classroom activities will be designed to encourage students to play an active role in the construction of their own knowledge and in the design of their own learning strategies. We will combine traditional lectures with other active teaching methodologies, such as group discussions, cooperative group solving problems, quizzes, presentations, etc. Class participation is a fundamental aspect of this course. Students will be encouraged to actively take part in all group activities and to give an oral group presentation. Students will be expected to interact with media resources, such as, web sites, YouTube videos, blogs, and newspapers articles.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Measurement Systems**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**PM 401**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		4	**Semester of Delivery**		7
Administering Department		PM	**College**	TEMO	
Module Leader	Ashraf Emad		**e-mail**	ashroo.emad@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Lecturer	**Module Leader's Qualification**		MASTER
Module Tutor	Karam Hashim / Lecturer		**e-mail**	karam.hashim@ntu.edu.iq	
Peer Reviewer Name		Dr. Ammar Hassan	e-mail	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**	3.0	

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	Module Objectives for Engineering Measurement Systems: 1. Develop a strong foundation in the fundamental principles of metrology and engineering measurements. 2. Understand the various types of measurement instruments, their operating principles, and their limitations.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	3. Master the statistical analysis of experimental data to identify and minimize sources of error. 4. Apply regression analysis techniques (Linear and Non-linear) to model engineering data using Excel. 5. Gain a comprehensive understanding of transient measurement techniques for time-varying variables. 6. Analyze the dynamic response of measurement systems, focusing on time constants and damping ratios. 7. Understand the principles of advanced thermometry, including thermoelectric, resistance, and radiation methods. 8. Develop the ability to select and calibrate appropriate sensors for specific industrial tasks (Pressure, Temperature, Flow). 9. Enhance critical thinking and problem-solving skills through virtual simulation and hands-on laboratory experiments. 10. Communicate technical findings effectively through standardized reports and data visualization. By achieving these module objectives, students will gain a comprehensive understanding of the principles and applications of modern measurement technology. They will be able to analyze experimental data with high precision, identify systematic and random errors, and apply advanced statistical tools to engineering problems. Furthermore, students will develop the practical skills required to calibrate industrial sensors and design reliable measurement systems, ensuring they are well-prepared for careers in engineering research, quality control, and industrial development.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Module Learning Outcomes for Engineering Measurement Systems: 1. Demonstrate a thorough understanding of key measurement concepts, including accuracy, precision, sensitivity, and uncertainty. 2. Apply mathematical and statistical tools to calculate best estimates, error bounds, and confidence intervals from replicate data. 3. Analyze and evaluate the dynamic response of first-order and second-order measurement systems to various inputs. 4. Utilize Microsoft Excel to perform complex regression analysis and evaluate the "Goodness of Fit" for engineering models. 5. Calibrate and characterize various industrial sensors (LVDT, Strain Gauges, Thermocouples, RTDs) using virtual and physical labs. 6. Evaluate different measurement techniques for fluid velocity and pressure, selecting the most appropriate method for a given application. 7. Design simple experiments to measure specific physical parameters while minimizing potential sources of error.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	8. Demonstrate professionalism and technical competence in diagnosing faults and interpreting results from automated measurement systems. By achieving these module learning outcomes, students will have a solid foundation in both theoretical metrology and practical instrumentation. They will be equipped to handle complex data analysis tasks, perform precise calibrations, and implement reliable measurement strategies in diverse engineering environments, from laboratory research to large-scale industrial processes.
Indicative Contents المحتويات الإرشادية	Indicative Contents for Engineering Measurement Systems: 1 .General Concepts of Metrology • The nature of measurement and its significance in engineering design. • Types of Metrologies: Legal, Deterministic, and Industrial. • Methods of Measurement: Direct, Indirect, Null, and Contactless methods. • Units, Standards, and Traceability in the SI system. 2 .Error Analysis and Statistical Treatment • Classification of Errors: Systematic (Bias) vs. Random errors. • Statistical Analysis: Mean, Variance, and Standard Deviation of replicate data. • Uncertainty Analysis and Error Propagation in derived quantities. • Regression Analysis: Linear, Polynomial, and Multiple Linear Regression. 3 .Displacement and Strain Measurement • Principles of Linear Variable Differential Transformers (LVDT). • Strain Gauge technology: Bridge circuits and sensitivity analysis. • Calibration procedures for displacement and force sensors. 4 .Advanced Thermometry and Temperature Measurement • The Zeroth Law of Thermodynamics and Temperature Scales (ITS-90). • Thermoelectric Thermometry: Seebeck, Peltier, and Thomson effects. • Resistance Temperature Detectors (RTD) and Thermistors. • Pyrometry: Measuring high temperatures using radiation and blackbody principles. 5 .Dynamic Response and Transient Measurements • Transient Temperature Measurement: First-order thermal systems and time constants. • Transient Response of Pressure Instruments: U-tube manometers and bellows-type gauges. • Damping ratios and their impact on measurement stability. 6 .Fluid Velocity and Flow Measurement • Intrusive methods: Pitot tubes and Hot-wire anemometry. • Non-intrusive methods: Doppler velocimetry and Time-of-Flight (TOF) techniques.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module adopts a multi-faceted teaching strategy designed to bridge the gap between theoretical metrology and practical instrumentation. Theoretical concepts are delivered through Interactive Lectures that focus on real-world engineering applications. Statistical and data analysis skills are developed through Computer-Based Workshops using Microsoft Excel for regression and error treatment. The practical component utilizes Simulation-Based Learning via high-end Virtual Laboratories (vlab.co.in), allowing students to perform precise sensor calibrations and dynamic response analysis in a controlled digital environment. Furthermore, Problem-Based Learning is integrated through lab reports where students must critically evaluate experimental uncertainties and propose methods for error minimization.

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	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	4 and 11	LO #1, #2, #6
	Assignments	6	10% (10)	3, 5, 8, 10, 15	LO #2, #4, #7
	Seminar	1	10% (10)	14	LO #1-8
	Report	1	10% (10)	12	LO #3, #5, #8
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 - Theory) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	General Concept of Engineering Measurement Systems Basic measuring process and types of Metrologies. Methods of Measurement, units, and standards.
Week 2	Measuring Instruments and Measurement Errors Classification of instruments and sensitivity analysis. Systematic vs. Random errors and calibration concepts.
Week 3	Statistical Analysis of Experimental Data Best estimates from replicate data and variance minimization. Normal distribution and confidence intervals.
Week 4	Regression Analysis and Error Propagation Linear regression and the method of least squares. Error propagation formula for derived quantities.
Week 5	Non-Linear and Polynomial Regression Fitting data to non-linear models and polynomial equations. Evaluating "Goodness of Fit" using correlation coefficients.
Week 6	Design of Experiments (DOE) Introduction to Experimental Design and Factorial Design. Dimensional analysis to simplify experimental trials.
Week 7	Midterm Exam (Theoretical & Practical)
Week 8	Thermometry: Temperature Measurement Principles of thermometry and thermometric properties. International Temperature Scale of 1990 (ITS-90).
Week 9	Thermoelectric Thermometry Seebeck, Peltier, and Thomson effects. Thermocouple types, tables, and reference junctions.
Week 10	Resistance Thermometry RTD (Pt100) characteristics and the Calendar equation. Bridge circuits and lead-wire compensation methods.
Week 11	Pyrometry: Radiation Measurement Blackbody radiation and Stefan-Boltzmann Law. Vanishing filament and two-color pyrometers.
Week 12	Transient Temperature Measurement Temperature sensors as first-order thermal systems. Time constant analysis and response to step/ramp inputs.
Week 13	Errors in Temperature Measurement Conduction errors in surfaces and flowing fluids. Strategies for minimizing thermometric errors.
Week 14	Transient Response of Pressure Instruments Dynamic response of U-tube manometers and bellows. Damping ratios and frequency response in pressure sensing.
Week 15	Fluid Velocity Measurement Techniques Pitot tubes, Hot-wire anemometry, and Doppler shift methods.

	Time-of-Flight (TOF) and cross-correlation velocity meters.

Delivery Plan (Weekly Lab Syllabus) المنهاج الاسبوعي العملي	
	Material Covered
Week 1	Lab Safety & Measurement Standards • Introduction to laboratory safety protocols. • Familiarization with standard measuring instruments. • Understanding traceability and SI unit standards.
Week 2	Uncertainty Analysis in Physical Measurements • Estimating Type, A and Type B uncertainties. • Reporting measurements with appropriate confidence levels. • Significant figures and rounding in engineering data.
Week 3	Statistical Analysis using Microsoft Excel • Calculating Mean, Variance, and Standard Deviation for large datasets. • Using Excel's "Data Analysis Tool Pak" for descriptive statistics. • Visualizing data distribution using Histograms.
Week 4	Linear Regression and Graphing Uncertainties • Applying the Method of Least Squares for curve fitting. • Determining the Correlation Coefficient (R-squared). • Plotting error bars and trendlines in Excel.
Week 5	Displacement Measurement: LVDT Characteristics • Operating principles of Linear Variable Differential Transformers. • Determining sensitivity and linearity range. • Calibration of LVDT for precise displacement sensing.
Week 6	Force Measurement: Strain Gauge Characteristics • Understanding the Gauge Factor and Wheatstone Bridge circuits. • Measuring strain and calculating applied force/stress. • Temperature compensation techniques in strain measurement.
Week 7	Practical Midterm Exam
Week 8	Calibration of Temperature Sensors • Calibration using the Ice Point and Boiling Point methods. • Comparing accuracy across different sensor types. • Developing calibration curves and correction factors.
Week 9	Thermocouple Characteristics & Seebeck Effect • Measuring thermoelectric voltage vs. temperature. • Understanding Cold Junction Compensation (CJC). • Characterizing different thermocouple types (J, K, T).
Week 10	Resistance Temperature Detector (RTD) Study • Analyzing the Resistance-Temperature relationship of Pt100. • Comparing 2-wire, 3-wire, and 4-wire bridge configurations. • Evaluating self-heating errors in RTDs.

Week 11	Radiation Pyrometry & Stefan-Boltzmann Constant • Measuring high temperatures using non-contact radiation methods. • Experimental verification of the Stefan-Boltzmann Law. • Analyzing the effect of emissivity on temperature readings.
Week 12	Dynamic Response of First-Order Systems • Determining the Time Constant of a thermal sensor. • Analyzing system response to Step and Ramp inputs. • Evaluating measurement lag in transient processes.
Week 13	Pressure Gauge Calibration • Using a Dead Weight Tester for primary pressure calibration. • Characterizing Bourdon Tube pressure gauges. • Analyzing hysteresis and repeatability in pressure sensing.
Week 14	Fluid Flow Measurement (Venturi/Orifice) • Measuring flow rates using differential pressure meters. • Calculating the Coefficient of Discharge (Cd). • Comparing Venturi vs. Orifice plate performance.
Week 15	Final Practical Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Morris, A. S., & Langari, R. (2020). Measurement and Instrumentation: Theory and Application. Academic Press.	No
Recommended Texts	Hughes, T. A. (2007). Measurement and Control Basics. ISA.	No
Websites	Primary Source Link , Suggested Source Link , Virtual Labs Portal	

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 401	**Engineering Measurement Systems**	6	**7**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	63	87

Course Description / وصف المادة الدراسية

Engineering Measurement Systems is a fundamental module designed to provide senior engineering students with the critical skills required to quantify physical phenomena with scientific rigor. In an era dominated by data-driven decision-making and high-precision manufacturing, understanding the "science of measurement" (Metrology) is essential. This course bridges the gap between theoretical physics and practical engineering by focusing on the systematic analysis of measurement chains, from the initial sensing element to the final data output.

The curriculum is structured to provide a deep dive into Statistical Error Analysis and Uncertainty Quantification, enabling students to distinguish between systematic biases and random fluctuations. By mastering advanced tools such as Linear and Non-linear Regression in Microsoft Excel, students learn to transform raw experimental data into reliable mathematical models. The course further explores the Dynamic Response of sensors, teaching students how to account for time lags and damping in high-speed industrial processes.

A significant portion of the module is dedicated to Advanced Instrumentation, covering the full spectrum of industrial sensors for temperature, pressure, displacement, and fluid flow. Students explore the physics behind Thermoelectric effects, Resistance thermometry, and Radiation pyrometry, while simultaneously gaining hands-on experience through a state-of-the-art Virtual Laboratory framework. This integration of simulation-based learning with classical theory ensures that graduates can design, calibrate, and troubleshoot complex measurement systems in sectors ranging from aerospace and automotive to energy and robotics.

By the end of this module, students will possess the technical authority to lead experimental projects, ensure quality standards through precise calibration, and interpret complex datasets with confidence. This comprehensive approach prepares them for the technical demands of modern industry, where accurate measurement is the foundation of all control, optimization, and innovation.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Methodology of Scientific Research**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 402**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**4**	**Semester of Deliver**	**7**		
Administering Department	PM	**College**	TEMO		
Module Leader	Omar Sadoon Khaleel	**e-mail**	omarsadoon@ntu.edu.iq		
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	MASTER		
Module Tutor		**e-mail**			
Peer Reviewer Name	Dr. Ammar Hassan	**e-mail**	ammarsuhail@ntu.edu.iq		
Scientific Committee Approval Date	01/06/2025	**Version Number**	3.0		

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	Develop students' understanding of **scientific research principles in engineering**. Enhance **analytical thinking and problem-solving skills**. Enable students to **formulate engineering problems and build mathematical models**. Introduce students to **experimental, numerical, and analytical research methods**.

	Develop skills in **data collection, analysis, and interpretation**. Prepare students for **graduation projects and academic research writing**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Understand **research foundations and engineering principles**. Select appropriate **research topics** and identify **research gaps**. Formulate clear **research problems and objectives**. Develop **mathematical models** and apply **governing equations**. Design and conduct **experiments or simulations (CFD, numerical methods)**. Analyze data using **statistical and engineering methods**. Interpret results and **compare with existing literature**. Write structured **research reports using proper referencing (IEEE)**.
Indicative Contents المحتويات الإرشادية	**1. Research Foundations** • Scientific research principles • Engineering problem-solving • Mathematical modeling **2. Literature Review** • Critical review techniques • Identifying research gaps **3. Research Methodology** • Experimental methods • Numerical methods • Analytical approaches **4. Experimental Design** • Measurement techniques • Uncertainty analysis **5. Numerical & CFD Methods** • Finite methods • CFD simulation process • Turbulence modeling **6. Data Handling** • Data collection • Data analysis • Statistical methods **7. Engineering Applications** • Heat transfer • Fluid mechanics • Thermodynamics **8. Results & Discussion** • Graph interpretation • Comparison with literature **9. Research Writing** • Abstract, introduction, methodology • Results and discussion writing **10. Academic Skills** • Referencing (IEEE style)

	• Plagiarism avoidance • Research ethics **11. Professional Skills** • Presentation skills • Communication skills • Project planning and time management **12. Numerical Analysis & Simulation Validation** • Convergence and residuals • Mesh independence study • Validation of numerical results **13. Advanced Engineering Analysis** • Dimensionless analysis • Sensitivity analysis • Optimization techniques **14. Experimental & Measurement Systems** • Sensors and instrumentation • Error analysis • Data accuracy and reliability **15. Modern Engineering Topics** • Renewable energy systems • Energy efficiency • Introduction to machine learning in engineering

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	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	68	**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)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	2	10% (10)	Continuous	All
	Report	2	10% (10)	13	LO #5, #8 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	**Research Foundations** • Scientific research principles • Engineering problem-solving • Mathematical modeling
Week 2	**Literature Review** • Critical review techniques • Identifying research gaps
Week 3	**Research Methodology** • Experimental methods • Numerical methods • Analytical approaches
Week 4	**Experimental Design** • Measurement techniques • Uncertainty analysis
Week 5	**Numerical & CFD Methods** • Finite methods • CFD simulation process • Turbulence modeling
Week 6	**Data Handling** • Data collection • Data analysis • Statistical methods
Week 7	**Engineering Applications** • Heat transfer • Fluid mechanics • Thermodynamics

Week 8	**Results & Discussion** • Graph interpretation • Comparison with literature
Week 9	**Research Writing** • Abstract, introduction, methodology • Results and discussion writing
Week 10	**Academic Skills** • Referencing (IEEE style) • Plagiarism avoidance • Research ethics
Week 11	**Professional Skills** • Presentation skills • Communication skills • Project planning and time management
Week 12	**Numerical Analysis & Simulation Validation** • Convergence and residuals • Mesh independence study • Validation of numerical results
Week 13	**Advanced Engineering Analysis** • Dimensionless analysis • Sensitivity analysis • Optimization techniques
Week 14	**Experimental & Measurement Systems** • Sensors and instrumentation • Error analysis • Data accuracy and reliability
Week 15	**Modern Engineering Topics** • Renewable energy systems • Energy efficiency • Introduction to machine learning in engineering

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Incropera, F. P., DeWitt, D. P., Bergman, T. L., & Lavine, A. S., *Fundamentals of Heat and Mass Transfer*. Çengel, Y. A., & Cimbala, J. M., *Fluid Mechanics: Fundamentals and Applications*.	Yes
Recommended Texts	Holman, J. P., *Experimental Methods for Engineers*. Versteeg, H. K., & Malalasekera, W., *An Introduction to Computational Fluid Dynamics: The Finite Volume Method*. Montgomery, D. C., *Design and Analysis of Experiments*. White, F. M., *Fluid Mechanics*.	Yes

	Fox, R. W., McDonald, A. T., & Pritchard, P. J., *Introduction to Fluid Mechanics*	
Websites	Google Scholar – https://scholar.google.com ScienceDirect – https://www.sciencedirect.com IEEE Xplore Digital Library – https://ieeexplore.ieee.org ResearchGate – https://www.researchgate.net Coursera – https://www.coursera.org edX – https://www.edx.org	

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 402	**Methodology of Scientific Research**	**4**	**7**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	**32**	**68**

Description

The Methodology of Scientific Research (PM402) module covers research foundations (scientific principles, engineering problem-solving, mathematical modeling), literature review techniques, research methodology (experimental, numerical, and analytical methods), experimental design (measurement techniques, uncertainty analysis), numerical and CFD methods (finite methods, simulation, turbulence modeling), data handling (collection, analysis, statistics), engineering applications (heat transfer, fluid mechanics, thermodynamics), results and discussion, research writing (abstract, introduction, methodology, results),

academic skills (IEEE referencing, plagiarism avoidance, research ethics), professional skills (presentation, communication, project planning, time management), numerical analysis and simulation validation (convergence, mesh independence, validation), advanced engineering analysis (dimensionless, sensitivity, and optimization techniques), experimental and measurement systems (sensors, error analysis, data accuracy), and modern engineering topics (renewable energy, energy efficiency, machine learning in engineering). The main advantages are that students develop a deep understanding of scientific research principles in engineering, enhance analytical thinking and problem-solving skills, learn to formulate engineering problems and build mathematical models, gain skills in data collection and analysis, and prepare effectively for graduation projects and academic research writing—essential for postgraduate studies and professional engineering research careers.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Industrial Engineering Management**			**Module Delivery**	
Module Type	**Basic learning activities**			☒ **Theory** ☐ **Lecture** ☐ **Laboratory** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 403**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**4**	**Semester of Deliver**	**7**		
Administering Department	**PM**	**College**	**TEMO**		
Module Leader	**Banan Najim Al-deen 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	Dr. Ammar Hassan	**e-mail**	ammarsuhail@ntu.edu.iq		
Scientific Committee Approval Date					

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	Introduce students to the basic principles of management and their application in engineering fields. Develop skills in planning, organizing, and supervising engineering projects. Enable students to effectively manage time and resources within projects. Understand the fundamentals of project management, including scheduling, cost, and quality control. Enhance the ability to make informed engineering and managerial decisions. Improve leadership and teamwork skills in engineering environments. Learn methods for risk analysis and risk management in projects. Understand economic aspects such as cost analysis and feasibility studies. Develop effective communication and professional interaction skills. Bridge the gap between engineering knowledge and practical industry applications
Module Learning	Demonstrate understanding of basic management concepts and principles in

Outcomes	engineering contexts. Apply project management techniques such as planning, scheduling, and resource allocation. Analyze and evaluate engineering project costs and economic feasibility. Identify and assess risks associated with engineering projects and propose mitigation strategies. Make effective managerial and technical decisions based on data and analysis. Work efficiently within a team environment and demonstrate leadership skills. Communicate ideas clearly through technical reports and presentations. Utilize appropriate tools and methods for time management and productivity mprovement.
1. Indicative Contents	Introduction to engineering management and its role in engineering practice Basic functions of management: planning, organizing, leading, and controlling Principles of project management and project life cycle Project planning techniques (Work Breakdown Structure, scheduling methods) Time management and resource allocation in engineering projects Cost estimation and engineering economics (cost analysis, feasibility studies) Risk management and decision-making techniques Quality management and quality control systems Leadership styles and team management Communication skills in engineering environments (reports and presentations)

2. Learning and Teaching Strategies	
3. Strategies	1. **Lectures:** Presenting the fundamental concepts of engineering management in an organized and clear manner. 2. **Class Discussions:** Encouraging students to participate and analyze managerial and engineering problems. 3. **Project-Based Learning:** Assigning students real-world projects to apply management concepts. 4. **Problem-Solving Sessions:** Solving problems related to planning, costs, and decision-making. 5. **Assignments and Reports:** Preparing reports and assignments to enhance theoretical understanding and application.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**33**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**2**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**67**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**4**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes		15% (10)	5 and 10	LO #2
	Assignments		15% (10)	2 and 12	LO #3
	Projects / Lab.				
	Report			8 and 13	LO #1 and LO #2
Summative assessment	Midterm Exam	1hr.	10% (10)	7	LO #1 - #2
	Final Exam	3hr.	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	introduction
Week 2	What is Engineering Management
Week 3	Example areas of engineering management area
Week 4	Function of management
Week 5	managerial skills
Week 6	Project management
Week 7	Net work
Week 8	Critical Path
Week 9	EXAMPLE
Week 10	Feasibility Study
Week 11	Cost
Week 12	Marketing
Week 13	The Marketing Process
Week 14	Project Planning Techniques (Gantt chart)
Week 15	EXAMPLE
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Engineering Management – William J. Stevenson .1	
Recommended Texts		
Websites		

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 403	**Industrial Engineering Management**	**4**	**7**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**0**	**33**	**67**
Description			
Engineering Management is an important course that combines engineering knowledge with management skills. It teaches students how to plan, organize, execute, and control engineering projects efficiently while managing resources such as time, cost, and workforce. The course covers key topics like project management, cost analysis, decision-making, risk management, and teamwork, along with developing leadership and communication skills in engineering environments.			

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Thermal Systems Design**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RE 401**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		4	**Semester of Delivery**		8
Administering Department		PM	**College**	TEMO	
Module Leader	Dr. Nabeel Mukhlif Abdulrazaq		**e-mail**	Nabil84m@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Ammar Hassan Suhail		**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**	3.0	

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	**By the end of this module, students should be able to:** 1. **To introduce the fundamental principles of thermal systems** and their classification across various engineering applications. 2. **To provide a structured methodology for the engineering design process**, from problem formulation and conceptual design to modeling, simulation, and evaluation. 3. **To develop proficiency in modeling and simulation** of key thermal system components, particularly heat exchangers (parallel-flow, counter-flow, cross-flow, multipass) and flat-plate solar collectors. 4. **To teach systematic approaches for system-level simulation** using tools like Information Flow Diagrams (IFDs) to manage the complexity of interconnected components.

	5. **To introduce mathematical optimization techniques** for thermal systems, including calculus methods (Lagrange multipliers), search methods, and geometric programming, with the goal of minimizing cost or maximizing performance.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**After completing this module, students will be able to:** 1. **Classify and describe** various types of thermal systems and their key operating principles. 2. **Apply the LMTD (Logarithmic Mean Temperature Difference) and effectiveness-NTU methods** to calculate heat transfer rates and design/simulate single-pass and multipass heat exchangers. 3. **Analyze the performance of flat-plate solar collectors**, including calculating useful energy gain, collector efficiency, and overall heat loss coefficients (top, bottom, and edge losses). 4. **Construct and interpret Information Flow Diagrams (IFDs)** to represent the input/output relationships of components and to develop efficient strategies for simulating complex thermal systems (e.g., a refrigeration cycle or a pump-heat exchanger system). 5. **Formulate an optimization problem** by defining an objective function (e.g., minimize cost), independent variables, and constraints (equality and inequality). 6. **Apply calculus-based methods (e.g., Lagrange multipliers) and geometric programming** to solve unconstrained and constrained optimization problems relevant to thermal system design. 7. **Use sensitivity analysis** to understand the impact of parameter changes on the optimal design.
Indicative Contents المحتويات الإرشادية	**Indicative Contents for Thermal Systems Design** 1. **Introduction to Thermal Systems** – Defines thermal systems, their complexity (fluid mechanics, heat transfer), and classifications across manufacturing, energy, aerospace, and HVAC applications. 2. **Engineering Design Process** – Covers stages from need/opportunity identification, market analysis, and feasibility to conceptual design, modeling, and moving from acceptable to optimal design. 3. **Heat Exchanger Configurations** – Explains parallel-flow, counter-flow, cross-flow, and multipass arrangements, including temperature profiles and application contexts. 4. **LMTD and Effectiveness-NTU Methods** – Derives Logarithmic Mean Temperature Difference and effectiveness-NTU relations for calculating heat transfer rates and sizing heat exchangers. 5. **Overall Heat Transfer Coefficient** – Addresses convection, conduction through tube walls, fouling factors, and combined thermal resistance in double-pipe and shell-and-tube heat exchangers.

	6. **Cross-Flow and Multipass Heat Exchangers** – Presents effectiveness formulas for mixed/unmixed cross-flow and analytical methods for multipass (e.g., 1-2 pass) configurations. 7. **Flat-Plate Solar Collectors** – Models energy balance, useful gain (Hottel-Whillier-Bliss equation), collector efficiency, and heat removal factor. 8. **Solar Collector Heat Losses** – Calculates top, bottom, and edge loss coefficients using thermal network analysis and empirical relations for multiple glazing covers. 9. **System Simulation with Information Flow Diagrams (IFDs)** – Uses IFDs to represent component input-output relationships and develop efficient strategies for simulating interconnected systems. 10. **Optimization Fundamentals** – Defines objective functions, independent variables, equality/inequality constraints, and levels of optimization (concept comparison vs. within-concept). 11. **Lagrange Multipliers for Constrained Optimization** – Applies calculus-based method to find minima/maxima subject to constraints, with examples like minimum material boxes and heat exchanger sizing. 12. **Geometric Programming** – Solves posynomial objective functions with zero or positive degree of difficulty, providing optimal variable values and cost distribution among terms. 13. **Unconstrained Optimization and Sensitivity Analysis** – Uses derivatives to find optimal points, second-derivative tests for max/min, and sensitivity coefficients to assess constraint change effects.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching strategies for the "Thermal Systems Design" module center on a blended approach that combines **expository lectures** with extensive **guided and independent problem-solving**. The instructor presents core concepts and step-by-step mathematical derivations (e.g., LMTD, effectiveness-NTU, Hottel-Whillier-Bliss equation), immediately followed by **worked examples** that model the application of theory to numerical problems. Students then reinforce their skills through **problem-based tutorials**, often drawing from a core textbook (Stoecker), to develop fluency. A strong emphasis is placed on **modeling and simulation** as core activities, where students learn to simplify real systems, make appropriate assumptions, and use **Information Flow Diagrams (IFDs)** to represent component interactions and manage computational flow for whole-system simulation. Finally, **optimization is taught as an integral design philosophy**, introducing students to multiple methods (calculus, Lagrange multipliers, geometric programming) and instilling the mindset of seeking the "best" solution within constraints, not merely an acceptable one. A **core textbook** supports independent learning and provides additional reference material.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	2,5,11 and 13	LO1, LO2, LO3, LO4
	Assignments	6	10% (10)	3,5,7,8,10 and 14	LO1, LO2, LO3, LO4, LO5, LO6
	Seminar	2	10% (10)	6 and 12	LO5, LO7, LO8
	Report	4	10% (10)	3,6,10,13	LO2, LO4, LO5, LO6
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO1, LO2, LO3, LO4, LO6, LO7
	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 Thermal Systems & Engineering Design
Week 2	Design Problem Formulation & Conceptual Design
Week 3	Heat Exchanger Basics: Parallel & Counter-Flow
Week 4	Effectiveness-NTU Method for Heat Exchangers
Week 5	Overall Heat Transfer Coefficient & Fouling
Week 6	Cross-Flow & Multipass Heat Exchangers
Week 7	Heat Exchanger Design Problems
Week 8	Flat-Plate Solar Collectors: Energy Balance
Week 9	Solar Collector Efficiency & Heat Removal Factor
Week 10	Overall Loss Coefficient for Solar Collectors

Week 11	System Simulation using Information Flow Diagrams (IFDs)
Week 12	Case Study: Simulation of a Pump-Heat Exchanger System
Week 13	Optimization Fundamentals & Lagrange Multipliers
Week 14	Geometric Programming
Week 15	Unconstrained Optimization & Sensitivity Analysis
Week 16	Review & Final Assessment

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	• Stoecker, W. F. **Design of Thermal Systems**. McGraw-Hill	No
Recommended Texts	• Dhar, P. L. and Thyageswaran, S. **Thermal System Design and Simulation**. Elsevier (2nd Edition). • Das, M. K. and Panigrahi, P. K. **Design and Analysis of Thermal Systems**. CRC Press.	No
Websites		

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
RE 401	**Strength of Materials**	**6**	**8**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**0**	**48**	**87**

This module provides a comprehensive introduction to the design, simulation, and optimization of thermal systems, which are essential across diverse engineering applications including energy generation, manufacturing, aerospace, HVAC, and electronic cooling. Students will learn the structured engineering design process from problem formulation and conceptual design to modeling and simulation, with particular emphasis on two core component types: heat exchangers (covering parallel-flow, counter-flow, cross-flow, and multipass configurations using LMTD and effectiveness-NTU methods) and flat-plate solar collectors (analyzing energy balance, efficiency, heat removal factors, and overall loss coefficients). The module then advances to system-level simulation using Information Flow Diagrams (IFDs) to manage component interconnections and reduce computational complexity. Finally, students are introduced to mathematical optimization techniques—including calculus methods, Lagrange multipliers for constrained problems, and geometric programming—to move beyond acceptable designs toward optimal solutions that minimize cost or maximize performance within real-world constraints. Throughout the module, theoretical derivations are reinforced through worked examples, tutorial problems, and case studies drawn from standard textbooks.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Combustion and Pollution Engineering**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**RE 402**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		4	**Semester of Delivery**		2
Administering Department		PM	**College**	TEMO	
Module Leader	Omar Mohammed Yousif		**e-mail**	omar.m.yousif@ntu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name		Dr. Ammar Hassan	**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**		3.0

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	Module Objectives for Combustion and Pollution Engineering: 1. Students will learn about the types of combustion. 2. Students will be able to calculate the adiabatic flame temperature and energy generated from burning hydrocarbon fuels. 3. Students will learn to classify types of internal combustion engines. 4. Students will be able to calculate the performance and engine efficiency coefficients.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	5. Students will learn about the physical and chemical fundamentals. 6.Students will be able to calculate concentrations of air pollutants in atmosphere. 7.Students will learn to classify types of air pollutants 8 . Students will learn air pollution regulation laws
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Module Learning Outcomes for Combustion and Pollution Engineering: 1 . Ability to differentiate between adiabatic flame temperature at constant pressure and volume. 2. The capacity to comprehend the various forms of complete, stoichiometric , and incomplete combustion. 3.Ability to analyse combustion products. 4. Ability to calculate the thermal energy produced by burning hydrocarbon fuel at constant volume and pressure 5.Evaluate engine performance under different conditions. 6. Ability to differentiate between basic Law for environmental pollution control in USA and Japan 7.The capacity to comprehend the various types of air pollutants 8.Ability to analyse of air pollutants . 9.Ability to calculate the concentrations air pollutants 10. Evaluate air purity
Indicative Contents المحتويات الإرشادية	Indicative Contents for Combustion and Pollution Engineering: 1.Thermodynamic of combustion • Specific Heat • Ideal gas mixture 2. FUEL AND COMBUSTION • Types of combustion • Air fuel ratio (A/F) • Equivalence ratio 3. Application of 1st law of thermodynamic on combustion process • Closed system (non-flow process) • Open system (steady -flow process) 4.Adiabatic flame temperature • Adiabatic flame temperature at P=C • Adiabatic flame temperature at V=C 5. Classifications of engines and their performance • Classifications of engines • engines performance 6. Air-Standard cycle • Otto Cycle • Diesel cycle 7. Air-fuel cycle • gasoline engine cycle

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	• Diesel engine cycle 8. hydrocarbon fuels 9. Octane Number &Cetane Number 10. Introduction to pollution • Ecological Systems and pollution • physical and chemical fundamentals 11. Ambient air quality standards for criteria pollutants • Air pollution regulation • Air pollutants classification 12. Transport and air pollution • Causes of air pollution from Transportation 13. Calculation of concentrations of air pollutants in atmosphere 14. Description of air pollutants. • CO , NOx ,Sox • PM-10 , VOCs, HC, O3 15. other type of air pollutants • Toxic Pollutants • Radioactive pollutants • indoor pollutants 16. Non-Criteria pollutants • Micro and Macro air pollution 17. Global Climate Change - Greenhouse Gases

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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	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)	4 and 11	LO #1, #2, #3, #9, #10 and #11
	Assignments	6	10% (10)	3,5,7,8,10 and 15	LO #2, #4, #5, #7, #9 and #11
	Seminar	1	10% (10)	7	LO #1-7
	Report	1	10% (10)	12	LO #9-12
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	Thermodynamic of combustion • Specific Heat • Ideal gas mixture • H,U
Week 2	FUEL AND COMBUSTION • Types of combustion • Air fuel ratio (A/F) • Equivalence ratio
Week 3	Application of 1st law of thermodynamic on combustion process • Closed system (non-flow process) • Open system (steady -flow process)
Week 4	Adiabatic flame temperature • Adiabatic flame temperature at P=C • Adiabatic flame temperature at V=C
Week 5	Classifications of engines and their performance • Classifications of engines • engines performance
Week 6	Air-Standard cycle • Otto Cycle

	• Diesel cycle
Week 7	Air-fuel cycle • gasoline engine cycle • Diesel engine cycle
Week 8	hydrocarbon fuels Octane Number &Cetane Number
Week 9	Introduction to pollution • Ecological Systems and pollution • physical and chemical fundamentals
Week 10	Ambient air quality standards for criteria pollutants • Air pollution regulation • Air pollutants classification • Transport and air pollution • Causes of air pollution from Transportation
Week 11	Calculation of concentrations of air pollutants in atmosphere
Week 12	Description of air pollutants. • CO , NOx ,Sox • PM-10 , VOCs, HC, O3
Week 13	other type of air pollutants • Toxic Pollutants • Radioactive pollutants • indoor pollutants
Week 14	Non-Criteria pollutants • Micro and Macro air pollution
Week 15	Global Climate Change - Greenhouse Gases

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	**Stephen R. Turns-An Introduction to Combustion_ Concepts and Applications-McGraw-Hill (2000).**	**No**
Recommended Texts	**turns-an_introduction_to_combustion**	**No**
Websites		

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
RE 402	**Combustion and Pollution Engineering**	**8**	**2**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	**4**	**123**	**77**

Combustion and Pollution Engineering is a branch of Engineering Mechanics that focuses on the study of studies the thermodynamics of combustion, the types of complete and ideal combustion, incomplete combustion, calculating the adiabatic flame temperature, the energy produced from burning hydrocarbon fuel, studying the classification of types of internal combustion engines, calculating the coefficient of performance and engine efficiency, and studying the real gasoline and diesel engine cycle. It also studies the types of fuel, the octane number, and their effect on engine performance and studies the ecological systems and pollution, toxic pollutants, physical and chemical fundamentals, Air pollution standards, Air pollution regulation, Air pollutants classification, Transport and air pollution, Calculation of concentrations of air pollutants in

atmosphere and Description of air pollutants, and studying Radioactive pollutants, indoor pollutants and Non-Criteria pollutants

The primary goal Combustion and Pollution Engineering is to provide engineers with a comprehensive understanding of how ' knowledge and ability to distinguish the types of fuel used in internal combustion engines, as well as their understanding of the advantages and disadvantages of each type and its appropriate use. ability to choose the appropriate fuel for each engine. ability to calculate engine power as well as the engine's thermal, mechanical, and volumetric efficiency and learn about the physical and chemical fundamentals ability to calculate concentrations of air pollutants in atmosphere. ability to learn how to classify types of air pollutants. ability to learn air pollution regulation laws

In this subject, students explore ability to differentiate between adiabatic flame temperature at constant pressure and volume. The capacity to comprehend the various forms of complete, stoichiometric , and incomplete combustion. Ability to analyse combustion products. Ability to calculate the thermal energy produced by burning hydrocarbon fuel at constant volume and pressure Ability to differentiate between basic Law for environmental pollution control in USA and Japan The capacity to comprehend the various types of air pollutants Ability to analyse of air pollutants . Ability to calculate the concentrations air pollutants Evaluate air purity..

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Automatic Control Systems**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☒ **Seminar**	
Module Code	**PM 404**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		4	**Semester of Delivery**		8
Administering Department		PM	**College**	TEMO	
Module Leader	Ashraf Emad		**e-mail**	ashroo.emad@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Lecturer	**Module Leader's Qualification**		MASTER
Module Tutor	Karam Hashim / Lecturer		**e-mail**	karam.hashim@ntu.edu.iq	
Peer Reviewer Name		Dr. Ammar Hassan	**e-mail**	ammarsuhail@ntu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**		3.0

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	Module Objectives for Automatic Control Systems: 1. Understand the fundamental concepts of control systems, including open-loop and closed-loop architectures. 2. Master the mathematical modeling of physical systems using Laplace transforms and transfer functions. 3. Analyze the dynamic behavior and stability of mechanical and electrical systems.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	4. Develop proficiency in representing complex systems through Block Diagrams and Signal Flow Graphs. 5. Apply reduction techniques and Mason's Gain Formula to simplify multi-variable control systems. 6. Understand the operating principles of classic control components (Relays, Contactors, Timers, and Overloads). 7. Design and simulate industrial motor control circuits (DOL, Star-Delta, Forward/Reverse) using CADe_SIMU. 8. Gain a comprehensive understanding of Programmable Logic Controllers (PLC) hardware and architecture. 9. Develop logical programming skills using Ladder Logic (LAD) for industrial automation. 10. Bridge the gap between theoretical control laws and practical physical wiring on training boards. 11. Develop critical thinking and troubleshooting skills in diagnosing faults in automated systems. By achieving these module objectives, students will gain a solid theoretical and practical foundation in automation. They will be able to model, simulate, and implement control strategies for industrial processes. Furthermore, students will develop the technical competence required to transition from traditional hard-wired control to modern PLC-based automation, ensuring they are industry-ready for the challenges of modern engineering environments.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Module Learning Outcomes for Automatic Control Systems: 1. Demonstrate a thorough understanding of the fundamental concepts of feedback control and its industrial importance. 2. Apply mathematical tools to derive transfer functions for mechanical (spring, mass, damper) and electrical (RLC) elements. 3. Analyze and calculate the overall transfer function of interconnected systems using block diagrams and signal flow graphs. 4. Apply Newton's laws and electrical circuit laws to model dynamic engineering systems. 5. Utilize CADe_SIMU software to design, simulate, and debug classic control circuits (DOL, Star-Delta, etc.). 6. Implement physical wiring of power and control circuits on training boards, considering safety and protection standards. 7. Program PLCs using Ladder Logic to control motors, timers, and counters in sequential industrial operations. 8. Demonstrate critical thinking by effectively diagnosing and fixing faults in automated control systems.

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
	By achieving these module learning outcomes, students will have a solid foundation in both theoretical and practical control engineering. They will be equipped to design, simulate, and implement automated solutions, enabling them to handle complex engineering tasks in the field of industrial automation and stability analysis.
Indicative Contents المحتويات الإرشادية	Indicative Contents for Automatic Control Systems: 1 .Fundamentals of Control Theory • Introduction to Control Systems: History and Evolution. • Open-Loop vs. Closed-Loop (Feedback) Systems. • Effects of Feedback on Gain, Stability, and Noise. • Requirements for a Good Control System (Accuracy, Sensitivity, Speed). 2 .Mathematical Modelling of Physical Systems • Review of Laplace Transforms in Control Engineering. • Transfer Function Definition and Properties. • Modelling Mechanical Systems: Springs, Dampers, and Masses. • Modelling Electrical Systems: RLC Circuits and Impedance Concepts. 3 .Graphical Representation and System Reduction • Block Diagram Representation of Interconnected Systems. • Block Diagram Reduction Rules and Algebra. • Signal Flow Graphs (SFG): Nodes, Branches, and Loops. • Mason's Gain Formula for Complex System Analysis. 4 .Classic Control Components and Circuits • Switching Devices: Push Buttons, Limit Switches, and Selectors. • Electromagnetic Relays and Contactors: Construction and Operation. • Protection Devices: Fuses, Circuit Breakers, and Thermal Overloads. • Timing Relays: ON-Delay and OFF-Delay Logic. 5 .Industrial Motor Control Strategies • Direct On-Line (DOL) Starters: Power and Control Wiring. • Forward-Reverse Control Circuits with Interlocking. • Star-Delta Starting Methods for Induction Motors. • Sequential Control of Multiple Motors. 6 .Programmable Logic Controllers (PLC) • PLC Architecture: CPU, Memory, I/O Modules, and Power Supply. • Number Systems and Data Handling in PLCs (Bit, Byte, Word). • Ladder Logic Programming (LAD): Basic Instructions and Rungs. • Advanced PLC Functions: Software Timers and Counters.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	The module adopts an integrated Blended Learning strategy. Theoretical foundations are delivered through interactive lectures and problem-solving sessions. The practical component is divided into two phases: Virtual Prototyping using CADe_SIMU software to validate designs, followed by Physical Implementation in the laboratory. Project-Based Learning (PBL) is utilized in the final weeks, where students work in groups to design and program a complete industrial automation cycle using PLC, fostering teamwork and real-world troubleshooting skills.

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	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	4 and 11	LO #1, #2, #7
	Assignments	6	10% (10)	3, 5, 8, 10, 15	LO #2, #4, #5
	Seminar	1	10% (10)	14	LO #1-8
	Report	1	10% (10)	12	LO #5, #6, #7
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 - Theory)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Control Systems • Overview of Automation and Control History.

	• Open-Loop vs. Closed-Loop Systems: Definitions and Examples.
Week 2	Feedback Control Principles • Components of Feedback Systems (Sensors, Controllers, Actuators). • Advantages and Effects of Feedback on System Performance.
Week 3	Mathematical Modelling I • Laplace Transforms and their Application in Control. • Defining Transfer Functions and System Response.
Week 4	Mathematical Modelling II • Modeling Mechanical Systems (Translational and Rotational). • Impedance Concepts in Mechanical Elements.
Week 5	Mathematical Modeling III • Modeling Electrical Systems (RLC Circuits). • Analogous Quantities between Mechanical and Electrical Systems.
Week 6	Block Diagram Representation • Representing Systems using Block Diagrams. • Interconnected Systems: Series, Parallel, and Feedback.
Week 7	Midterm Exam (Theoretical & Practical)
Week 8	Block Diagram Reduction • Rules for Simplifying Complex Block Diagrams. • Deriving Overall Transfer Functions.
Week 9	Signal Flow Graphs (SFG) • Introduction to SFG: Nodes, Branches, and Gains. • Constructing SFG from Algebraic Equations.
Week 10	SFG and Block Diagrams • Converting Block Diagrams to Signal Flow Graphs. • Terminology: Paths, Loops, and Non-touching Loops.
Week 11	Mason's Gain Formula I • Introduction to Mason's Gain Formula. • Step-by-step Application on Standard Systems.
Week 12	Mason's Gain Formula II • Solving Complex Multi-loop Systems. • Verification of Results using Block Diagram Reduction.
Week 13	Introduction to PLC Systems • PLC Architecture, Hardware Components, and Scanning Cycle. • Number Systems (Binary, Hex, BCD) and Addressing.
Week 14	PLC Logic and Programming • Introduction to Ladder Logic (LAD) and Basic Instructions. • Logic Gates Implementation in PLC.
Week 15	Advanced Automation Concepts • System Stability Analysis Overview. • General Review and Final Practical Assessment.

Delivery Plan (Weekly Lab Syllabus) المنهاج الاسبوعي العملي	
	Material Covered
Week 1	CADe_SIMU Software Environment • Interface Overview, Toolbars, and Library Management. • Drawing Basic Electrical Lines and Symbols.
Week 2	Switches and Indicators • Wiring and Simulating NO/NC Push Buttons and Pilot Lamps. • Understanding Momentary vs. Latched Logic.
Week 3	Electromagnetic Relays • Relay Construction and Operating Principles. • Designing Latching Circuits (Self-Holding Logic).
Week 4	Power Contactors • Main vs. Auxiliary Contacts. • Wiring Power Circuits for 3-Phase Induction Motors.
Week 5	Circuit Protection • Implementing Fuses and Circuit Breakers. • Wiring and Setting Thermal Overload Relays (OLR).
Week 6	Industrial Timers • ON-Delay and OFF-Delay Timer Applications. • Sequential Control Logic using Timers.
Week 7	Practical Midterm Exam
Week 8	DOL Starter Implementation • Simulation and Physical Wiring of Direct On-Line Starters. • Troubleshooting Common Wiring Faults.
Week 9	Forward-Reverse Motor Control • Designing Electrical Interlocking for Safety. • Physical Implementation on Training Boards.
Week 10	Star-Delta Starting Method • Power and Control Circuit Design for Large Motors. • Simulation of Transition Timing.
Week 11	PLC Hardware and Wiring • Connecting Power Supply, Inputs (Sensors), and Outputs (Actuators). • PC-to-PLC Communication Setup.
Week 12	Basic Ladder Logic Programming • Implementing AND, OR, NOT Logic in PLC. • Creating Simple Motor Start/Stop Programs.
Week 13	PLC Timers and Counters • Programming Software Timers for Industrial Delays. • Using Counters for Production Line Simulation.
Week 14	Integrated PLC Project • Automating a Sequential Process (e.g., Traffic Light or Multi-Motor Sequence).

Week 15	Final Practical Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• **Dorf, R. C., & Bishop, R. H. (2008). Modern Control Systems. Prentice Hall.** • Nagrath, I. J. (2006). Control Systems Engineering. New Age International.	No
Lab manual	• Control & PLC Lab Manual (Prepared by Ashraf Emad & Karam Hashim). • CADe_SIMU V3.0 (Simulation), LOGO! Soft Comfort (PLC Programming).	No
Websites	Book Link 1 , Book Link 2 , CADe-SIMU	

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
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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 404	**Automatic Control Systems**	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**2**	63	87

Course Description / وصف المادة الدراسية

Automatic Control Systems is a cornerstone of modern engineering technology, focusing on the systematic regulation and management of dynamic processes to achieve desired performance objectives with precision and autonomy. This module builds upon advanced mathematical foundations to analyze how feedback mechanisms can stabilize systems, minimize steady-state errors, and enhance transient responses. It provides a comprehensive transition from conventional manual operations to sophisticated, autonomous industrial environments, which are essential in the era of Industry 4.0.

The primary goal of this course is to equip senior engineering students with a rigorous analytical framework for modeling physical systems. By mastering Laplace transforms and Transfer Functions, students learn to predict system behavior under various conditions. The curriculum delves deeply into graphical representation techniques, including Block Diagram Algebra and Signal Flow Graphs (SFG), enabling engineers to simplify complex, multi-variable industrial architectures and determine overall system gains using Mason's Gain Formula.

Beyond theoretical modeling, this module emphasizes high-level practical field competence. Students explore the intricate logic of Classic Electromagnetic Control, mastering the operation of Relays, Contactors, Timers, and Thermal Overload protection. This is seamlessly integrated with modern Programmable Logic Controllers (PLC) technology. Through the use of industry-standard simulation software such as CADe_SIMU and hands-on laboratory implementation on physical training boards, students bridge the gap between abstract control laws and real-world hardware execution.

By the end of this module, students will possess the technical expertise to design, simulate, and troubleshoot advanced automated systems. They will be proficient in implementing Direct On-Line (DOL), Star-Delta, and Forward-Reverse motor control strategies, alongside developing logical programs using Ladder Logic (LAD). This comprehensive approach ensures that graduates are industry-ready, possessing the critical thinking and logical programming skills necessary to lead automation and control projects across diverse sectors, including manufacturing, power mechanics, and robotics.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Aided Design**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 405**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**4**	**Semester of Deliver**	**8**		
Administering Department	PM	**College**	TEMO		
Module Leader	Omar Sadoon Khaleel	**e-mail**	omarsadoon@ntu.edu.iq		
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	MASTER		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	01/06/2025	**Version Number**	3.0		

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	1. Introduce students to the concept of Computer-Aided Design (CAD). 2. Use AutoCAD software for 2D and 3D engineering drawing. 3. Prepare engineering drawings in accordance with standard drafting conventions and specifications. 4. Develop students' skills in three-dimensional (3D) modeling. 5. Produce engineering drawings ready for printing and professional presentation

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this module, the student will be able to: 1. Use the **AutoCAD interface** efficiently. 2. Create accurate **2D engineering drawings**. 3. Develop **3D models** using AutoCAD tools. 4. Apply **Extrude, Revolve, Sweep, and Loft** commands in 3D modeling. 5. Use **User Coordinate System (UCS)** and **Viewports** effectively. 6. Prepare **final engineering drawings** for printing and presentation
Indicative Contents المحتويات الإرشادية	• Indicative content includes the following. • Introduction to CAD • AutoCAD Interface & Workspaces • Drawing Units & Templates • 2D Drafting Commands • Coordinate Systems • 3D Modeling & Primitives • Boolean Operations • Solid Editing • UCS & Viewports • Dimensioning & Annotation • Mini Project (3D Design)

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	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	2	10% (10)	Continuous	All
	Report	2	10% (10)	13	LO #5, #8 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 Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to Computer Aided Design (CAD). Overview of AutoCAD software, applications, and course requirements.
Week 2	AutoCAD interface, workspaces, menu bar, toolbars, command line, and status bar
Week 3	Drawing setup: units, limits, grid, snap, templates, and standard sheet sizes (ISO).
Week 4	Basic 2D drawing commands: Line, Polyline, Circle, Arc, Rectangle.
Week 5	Modify commands: Move, Copy, Rotate, Mirror, Scale, Trim, Extend, Offset, Fillet, Chamfer.
Week 6	Coordinate systems: absolute, relative, and polar coordinates. Object snap (OSNAP) and drawing accuracy.
Week 7	Layers, colors, linetypes, lineweights, and drawing organization. Midterm review
Week 8	Introduction to 3D modeling. 3D workspace, visual styles, and navigation tools
Week 9	3D primitives: Box, Cylinder, Sphere, Cone, Torus, Pyramid, Wedge.
Week10	3D modeling operations: Extrude, Revolve, Sweep, and Loft.
Week 11	Solid editing and Boolean operations: Union, Subtract, Intersect, Shell, and Fillet edges.
Week 12	User Coordinate System (UCS) and Viewports for 3D modeling and layout control.
Week 13	Dimensioning, annotation, text styles, and drawing standards
Week 14	Plotting and printing: layouts, scale setting, plot styles, and output preparation.
Week 15	Mini project presentation and comprehensive review for the final exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	AutoCAD 2010 and AutoCAD LT 2010 Essentials, Autodesk Official Training Guide. Engineering Drawing with CAD Applications.	Yes

Recommended Texts	AutoCAD and AutoCAD LT Essentials, Autodesk Press. Technical Drawing with Engineering Graphics. CAD/CAM Principles and Applications.	Yes
Websites	https://www.autodesk.com https://knowledge.autodesk.com	

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 405	**Computer Aided Design**	**4**	**8**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
0	**3**	**48**	**52**

Description

The Computer Aided Design (PM405) module covers AutoCAD interface, 2D drafting commands, coordinate systems, layers, 3D modeling primitives, Boolean operations, solid editing (Extrude, Revolve, Sweep, Loft), UCS, viewports, dimensioning, annotation, and plotting. Practical lab work progresses from basic drawing setup to advanced 3D modeling and a mini project. The main advantages are that students gain proficiency in using AutoCAD for 2D and 3D engineering drawings, learn to apply standard drafting conventions, develop skills in creating accurate models ready for printing and professional presentation, and prepare for engineering design careers in manufacturing, construction, and product development.