Al-Bayan University
College of Technical Engineering

جامعة البيان
الكلية التقنية الهندسية

First Cycle – Bachelor's Degree (B.Sc.) – Power Mechanics- Refrigeration and Air-condition Branch

بكالوريوس – ميكانيك القوى- فرع الطاقة المتجددة (الدورة الأولى)

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1. Mission & Vision Statement

Vision Statement

The Department of Power Mechanic Technical Engineering is one of the nine scientific departments of the Technical College of Engineering at Al-Bayan University College of Technical Engineering in Baghdad. The department had been established in 2023. The department awards a bachelor's degree in the field of mechanical engineering technology in two branches, namely (Renewable Energy Branch, Refrigeration and Air Conditioning Branch)

Mission Statement

The department aims to prepare technical engineers specialized in the field of the two mentioned branches and have scientific and practical skills in diagnosing and repairing faults that occur during the work of the two mentioned branches. As well as the creation of competent engineers with the ability to keep pace with the rapid development in the competence of the two mentioned branches and acquire the necessary skills to develop and modernize the two mentioned branches devices. In addition to providing the graduates with the skill to install and operate various modern the two mentioned branches systems.

As well as this department is creating a distinguished theoretical and practical study environment for students by delivering valuable scientific lectures in the specialty, conducting laboratory experiments and creative scientific research, and interacting with the local and global environment in the field of working on equipment in the department's laboratories.

2. Program Specification

Program code:	PM-RAC	**ECTS**	240
Duration:	4 levels, 8 Semesters	**Method of Attendance:**	Full Time

Mechanical engineering is a wide-ranging subject and is different special branches. The emphasis of the program is the materials and their behavior as well as their physical properties to which everything is related, be it the materials formed a separate system or it is a part of the system. The degree is popular - –or some it's' the breadth of the subject that appeals, for others it's a path to specialization. All students have the opportunity to transfer onto our specialist degrees in mechanical, renewable energy, heating, ventilating and air conditioning at the end of the second year.

Level 1 exposes students to the fundamentals of mechanics, suitable for progression to all program within the mechanical engineering program group. Program-specific core topics are covered at Level 2 preparing for research-led subject specialist modules at Levels 3 and 4. The University mechanical engineering graduate is therefore trained to appreciate how research informs teaching, according to the University and School Mission statements.

At Levels 3 and 4 students are free to choose more than half of their module credits with the proviso a range of modules are selected that reflect the complexity of the different directions of the specializations in the mechanical engineering, through modern modules, to ensure the breadth of knowledge expected of a graduate with an engineering degree. This allows students to develop their own wide-ranging interests in mechanical and thermal energy engineering. Decisions on what to study are made with input from personal tutors.

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

3. Program Objectives

The department aims to provide high-quality technical education, by keeping pace with the rapid technological developments in the world, and respond to the necessities of change in the curriculum to lay the foundations of human development so that graduates acquire skills and expertise to meet the needs of the market by adopting quality assurance and assurance. Therefore, the department aspires to graduate applied engineers familiar with the applications and modern devices in the field of the three mentioned branches and be able to:

1. Installation and operation of all types of devices deals with the specialties in this department.
2. Contributing and supervising the maintenance of different appliances deal with the specialties in this department.
3. Design and implementation of sketches for the installation and operation of modern units.
4. Research, develop and find replacement parts for the unemployed units.

4. Student Learning Outcomes

Mechanical engineering is the study of objects and systems in motion. As such, the field of mechanical engineering touches virtually every aspect of modern life, including the human body, a highly complex machine. Graduates obtain information on the historical, technical and social aspects of mechanical and thermal engineering and utilize basic knowledge toward realizing broader concepts. The Department offers a Bachelor of Engineering in Mechanics and thermal energy with a concentration in General mechanics; renewable energy / thermal energy. Additionally, the Department

offers courses to a large number of students from other departments and supports pre-professional programs. The mechanical engineering curriculum and experiences are designed to prepare students, in part, for entry into professional engineering programs, graduate studies, technical careers and education

Outcome 1

Identification of Complex thermodynamic processes

Graduates will be able to illustrate the thermodynamic processes in different thermal systems and they will able to make the heat and mass balance for the complex systems.

Outcome 2

Oral and Written Communication

Graduates will be able to formally communicate the results of their research investigations using both oral and written communication skills.

Outcome 3

Laboratory and Field Studies

Graduates will be able to perform laboratory experiments and field studies, by using scientific equipment and computer technology while observing appropriate safety protocols.

Outcome 4

Scientific Knowledge

Graduates will be able to demonstrate a balanced concept of how scientific knowledge develops, including the historical development of foundational theories and laws and the nature of science.

Outcome 5

Data Analysis

Graduates will be able to demonstrate scientific quantitative skills, such as the ability to conduct simple data analysis.

Outcome 6

Critical Thinking

Graduates will be able to use critical-thinking and problem-solving skills to develop a research project or paper.

5. Academic Staff كل التدريسين الموجودين بالجانب النظري والعملي

Abd-Alhassan Abdul Karam | Ph.D.Mechanical Engineering / Thermal | Professor Dr.

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6. Credits, Grading and GPA

Credits

Al- Bayan University Al-Bayan University/College of Technical Engineering is following the Bologna Process with the European Credit Transfer System (ECTS) credit system. The total degree program number of ECTS is 240, 30 ECTS per semester. 1 ECTS is equivalent to 25 hrs student workload, including structured and unstructured workload.

Grading

Before the evaluation, the results are divided into two subgroups: pass and fail. Therefore, the results are independent of the students who failed a course. The grading system is defined as follows:

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

Calculation of the Cumulative Grade Point Average (CGPA)

1. The CGPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

   CGPA of a 4-year B.Sc. degree:

   CGPA = [(1st module score x ECTS) + (2nd module score x ECTS) + ……] / 240

7. Curriculum/Modules

Semester 1 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
NTU100	English Language Principles	32	18	2.00	S	

PM 100	Engineering Mechanics / Static	93	107	8.00	C	
TEMO 100	Mathematics Principles	78	122	8.00	B	
TEMO 101	Electrical Technology	78	72	6.00	B	
TEMO 102	Workshop	93	57	6.00	C	

Semester 2 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
PM 102	Thermodynamics Principles	108	92	8.00	C	
NTU 101	Computer Principles	63	87	6.00	B	
NTU 102	Human Rights & Democracy	32	18	2.00	S	
PM 101	Engineering Mechanics/ Dynamics	93	107	8.00	C	
TEMO 103	Engineering Drawing	63	87	6.00	C	

Semester 3 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
PM 200	Fluid Mechanics	108	92	8.00	C	
PM 201	Thermodynamics	123	77	8.00	C	
TEMO 200	Mathematics	63	87	6.00	B	
NTU 200	Professional Ethics	32	18	2.00	S	
PM 202	Mechanical Drawing	63	87	6.00	C	

Semester 4 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
PM 203	Strength of Materials	108	92	8.00	C	
PM 204	Engineering Materials	93	107	8.00	C	
PM 205	Refrigeration & Air Conditioning Principles	108	92	8.00	C	

NTU 201	Arabic Language	32	18	2.00	S	
PM 206	Occupational Safety	32	68	4.00	B	

Semester 5 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
PM 300	Mechanical Design	63	87	6.00	C	
PM 301	Engineering Analysis	48	102	6.00	B	
PM 302	Heat Transfer	123	77	8.00	C	
RE 300	Biofulels	63	87	6.00	C	
RE 301	Renewable Energy	63	36	4.00	C	

Semester 6 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
RE 302	Photovoltaic Energy	63	87	6.00	C	
RE 303	Gas dynamics	63	87	6.00	C	
PM 303	Engineering Computer Applications	48	52	2.00	B	
PM 304	Numerical Analysis	48	102	6.00	B	
RM 305	Theory of Machines and Vibrations	123	77	8.00	C	

Semester 7 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
PM 400	Thermal Power Plants	78	97	7.00	C	
RAC 401	Refrigeration Systems	93	82	7.00	C	
RAC 402	Introduction to Renewable Energy	63	87	6.00	C	
NTU 400	Methodology of Scientific Research	32	68	4.00	B	

RAC 403	Principles of Air Conditioning Systems Design	78	72	6.00	C	

Semester 8 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
PM 401	Computer Aided Design	63	87	6.00	C	
RAC 404	Design of Air Conditioning Systems	78	72	6.00	C	
PM 402	Control Systems	78	72	6.00	C	
TEMO 400	Engineering and Industrial Management	48	102	6.00	S	
TEMO 401	Project	62	88	6.00	C	

8. Contact

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Program Coordinator: **Sara Oday Adnan**
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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	**NTU 100**	
ECTS Credits	**2**	
SWL (hr/sem)	**50**	

Module Level	1	**Semester of Deliver**	1
Administering Department	PM	**College**	TEMO
Module Leader	Sundus Falah Mohammed	**e-mail**	sundus.falah@ntu.edu.iq
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	M. Linguistics and English Language Teaching
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	01/6/2023	**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	1. To develop problem solving skills mainly speaking, reading, writing and listening skills and to understand the English language as a foreign language through the application of many techniques. 2. To understand the general principles of the English language. 3. This course deals with the basic concepts of learning the main rules of English grammar and English vocabularies. 4. This is the basic subject for writing and speaking English well. 5. To understand how to build a correct English sentence.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To recognize how to use the main and auxiliary verbs in addition to the possessive pronouns.. 2. To list the various words associated with questions and many subject pronouns. 3. To talk about social expressions and personal information mainly about jobs by using affirmative, negative and interrogative sentences. 4. To discuss how to use adjectives and their positions in the sentence. 5. To construct the simple present sentence by using I/ we/ you and they and to define the articles. 6. To describe the present simple tense with using he/ she and to discuss adverbs of frequency. 7. To identify the basic question words and demonstrative pronouns and their

	applications. 8. To discuss the use of there is/ are and many prepositions. 9. To discuss the structure of simple past sentences and various irregular verbs. 10. To explain the negative and interrogative structure of the simple past tense sentence in addition to the adverbs of the past tense. 11. To identify the use of many adverbs and the use of can/ can't in the sentence and to explain requests and offers. 12. To elaborate the use of like and would you like and the use of some and any in many expressions. 13. To discuss the use of the present continuous and the difference between present simple and present continuous sentences. 14. To explain the structures that are used to refer to future plants.
Indicative Contents المحتويات الإرشادية	1. An introduction to the importance of English language learning and the role it plays in social communication. 2. An application of various tenses like present and past tenses. 3. Demonstrating many main concepts including (offers, requests, future plants, personal expressions and tenses). 4. Using many skills to learn English like listening, reading, writing and speaking skills, moreover; presenting different examples to elaborate any concept or structure.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in this module is associated with the communicative approach which will be applied to develop students' skills to learn English and to enable students to use English in communication, therefore, using authentic materials in the class is so necessary. This approach is important to encourage students' participation in the class and to highlight their motivation in learning English, while at the same time refining and expanding their interactions and skills to achieve at least more success.

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	(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 تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	15% (15)	5 and 1	LO #1, #3 and #6, #13
	Assignments	2	15% (15)	2 and 12	LO #2, #4 and 7#, #12
	Projects / Lab.				
	Report	1	10% (10)	13	LO #5, #8 and #9 #10
Summative assessment	**Midterm Exam**	1hr	10% (10)	7	LO #1 - #7
	Final Exam	2hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Unit one: Hello Am/are/is. my/your This is with practice in work
Week 2	Unit two: Your world He/she/they, his/her Questions
Week 3	Unit three: All about you Personal information/ social expressions
Week 4	Unit four: Family and friends Possessive adjectives/ possessive 's Have/has , adjective + noun
Week 5	Unit five: The way i live Present simple I/we/you/they An/a , adjective + noun
Week 6	Unit six: Every day Present simple he/she Negatives and questions, adverbs of frequency
Week 7	Unit seven: My favorites Question words, pronouns, this/that
Week 8	Unit eight: Where I live

	There is/ are, prepositions
Week 9	Unit nine: Times past Was/ were born, past simple and irregular verbs
Week 10	Unit ten: We had a great time Past simple, regular and irregular Questions, negatives, ago
Week 11	Unit eleven: I can do that! Can/can't, adverbs, requests
Week 12	Unit twelve: Please and thank you I'd like, some and any Like and would like
Week 13	Unit thirteen: Here and now Present continuous Present simple and present continuous
Week 14	Unit fourteen: It's time to go! Future plans, writing email and information letter
Week 15	**Revision**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**

Required Texts	John and liz Soar. (New Headway Beginner) 4th edition. Oxford: Oxford University Press.	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.

Module 1

Code	Course/Module Title	ECTS	Semester
NTU 100	English Language	2	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	0	32	18
Description			
This module will be used to develop problem solving skills mainly speaking, reading, writing and listening skills and to understand English language as a foreign language through the application of many techniques. It is also important to understand the general principles of English language. This course deals with the basic concepts of learning the main rules of English grammar and English vocabularies. It is mainly the basic subject for writing and speaking English well. The module is to understand how to build a correct English sentence. It contains various grammatical rules and different vocabularies with using typical examples to explain the structure and the meaning of any word or expression. The module is valid and reliable to deal with many recognizable situations and how to use English in different contexts associating with life experiences.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mechanics/ Statics**			**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	Tariq Khalid		**e-mail**	tariqaikhalidi@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Professor	**Module Leader's Qualification**		MASTER
Module Tutor	Tariq Khalid		**e-mail**	E-mail	
Peer Reviewer Name		Asma Taha	**e-mail**	asmaa.taha@ntu.edu.iq	
Scientific Committee Approval Date		June /01/2023	**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	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	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	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	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, Varignon 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	Engineering Mechanics/ Statics	8	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	3	93	107

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	**TEMO 100**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		1	**Semester of Delivery**		One
Administering Department		PM	**College**		TEMO
Module Leader	RAID ABDULHADI ABDULQUADER		**e-mail**		raid.alabdullah@ntu.edu.iq
Module Leader's Acad. Title		Assistant 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		01/6/2023	**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 let students be able to identify the advanced basic fundamentals in mathematics (differentiation and integration and their different applications) to develop their mentally capability by exercising solutions. Also can be able to correlate the information data in order to solve the scientific problem and how to make use of it in other scientific subjects.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students are able to relate the significance of comprehending algebra's structure to a higher-level subject. 2. Within the parameters of the theory of modules, students have the ability to generate consciousness, particularly symbolic thinking. 3. Students are capable of using their understanding and analyzing models of mathematics, science, and technology, as well as other fields that are relevant to those disciplines. 4. Students are able to convey the outcomes of the growth of oral and writing comprehension as well as construct a framework for knowledge that supports mathematics, science, and technology.
Indicative Contents المحتويات الإرشادية	Subject-specific Knowledge: • knowledge of key ideas related to mathematics in the university • knowledge of the National Curriculum for mathematics and the way in which it facilitates the development of mathematical understanding • an understanding of the way in which theory informs practice and vice versa Subject-specific Skills: • an informed and critical awareness of research in mathematics education which can enhance the effectiveness of the university mathematics teacher • observe, record accurately and relate educational practice to theory in university and classrooms • critically analyzes literature on a variety of contemporary education issues relating to advanced mathematics Key Skills: • communicate ideas, principles and theories effectively in written form • manage time and work to deadlines • construct and sustain a reasoned argument • evaluate and make use of information from a variety of advance sources

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	To accommodate varied talents, skills, learning rates, and learning styles, teaching and learning strategies might involve a variety of whole class, group, and individual activities. This enables every student to engage and to some extent succeed.

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**	5	20% (20)	3 , 5 , 7 , 10 and 13	LO #1, #3
	Assignments	6	20% (20)	2 , 4 , 6 , 8 , 12 and 14	LO #2, #4
	Projects / Lab.				
	Report				
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	To let students be able to identify the advanced basic fundamentals in mathematics (differentiation and integration and their different applications) to develop their mentally capability by exercising solutions. Also can be able to correlate the information data in order to solve the scientific problem and how to make use of it in other scientific subjects.
Week 2	Trigonometric functions, trigonometric relations, graphic drawing, applications
Week 3	Limits of algebraic and trigonometric functions, limit near, applications
Week 4	Theory of derivatives, derivative of algebraic and trigonometric and empirical functions
Week 5	Chain rules, applications
Week 6	Inverse functions and inverse of trigonometric functions, applications
Week7	Derivatives of logarithmic and exponential functions, hyperbolic and its derivatives, relation and drawing, applications
Week 8	Integration theory, indefinite and definite integration, trigonometric and its inverse
Week 9	Integration of logarithmic and exponential functions, integration of hyperbolic functions, other integrations
Week 10	Methods of integrations, integration by parts
Week 11	Integration by partial fractions
Week 12	Area under a curve, area between two curves
Week 13	Volumes by revolutions, length of a curve
Week 14	Simple differential equations
Week 15	Approximate area by trapezoidal and Simpson rule, numerical integration, applications
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	“Principles of Mathematics”, Katherine A. Loop., (2015)	No
Websites	https://web.math.ucsb.edu/~agboola/teaching/2021/winter/122A/rudin.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.

Module 1

Code	Course/Module Title	ECTS	Semester
TEMO 100	Mathematics Principles	8	One
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	2	78	122
Description			
Mathematics offers a potent and common language. When presenting mathematical ideas, arguments, and conclusions both orally and in writing, students are expected to employ acceptable mathematical terminology and a variety of representational techniques. Students should be able to: 1. employ proper mathematical language (notation, symbols, and terminology) in both spoken and written explanations in order to achieve the goals of mathematics. 2. Present information using the proper mathematical representations. 3. choose between various mathematical representational styles. 4. Express thorough, clear, and simple mathematical arguments. 5. utilizes a logical structure to arrange information.			

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information					
Module Title	**Electrical technology**			**Module Delivery**	
Module Type	**Basic**			☒ Theory	
Module Code	**TEMO 101**			☐ Lecture	
ECTS Credits	**4**			☐ Tutorial	
SWL (hr/sem)	**150**			☒ Practical	
				☐ Seminar	
Module Level	**1**		**Semester of Deliver**	**4**	
Administering Department	**PM**		**College**	**TEMO**	
Module Leader	**Safwan Assaf Hamoodi** **The file (module description form of electrical and electronic engineering) prepared by Prof. Dr. Haitham M. Wadullah**		**e-mail**	**Safwan79azb@ntu.edu.iq** **dr.haitham@ntu.edu.iq**	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name	**Name**		**e-mail**	**E-mail**	
Scientific Committee Approval Date	**1/6/2023**		**Version Number**	**1.0**	

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1. Preparing the student to study the different calculations in alternating current and direct current circuits, and to get acquainted with the various theories to study these calculations. 2. Understanding electrical principles and concepts: The module aims to provide students with a clear understanding of electrical principles and concepts, including voltage, current, resistance, and power. Students will learn how these concepts are applied in electrical circuits and systems. 3. Developing practical skills in electrical measurements and testing: The module aims to equip students with practical skills in using electrical instruments and equipment for measurements and testing. Students will learn how to perform accurate measurements, interpret the results, and troubleshoot electrical systems. 4. Applying knowledge to electrical machines and power systems: The module aims to enable students to apply their knowledge of electrical technology to the operation and maintenance of electrical machines, such as motors and generators. Students will also gain an understanding of power systems and their components, including power generation, transmission, and distribution.
Module Learning Outcomes	1. Understanding electrical circuit theory: Students will gain knowledge of fundamental electrical circuit theory, including concepts such as voltage, current, resistance, and power. They will be able to apply this understanding to analyze and solve basic electrical circuits. 2. Proficiency in electrical measurements and testing: Students will develop skills in using electrical instruments and equipment to measure and test electrical parameters. They will learn how to interpret measurement results and troubleshoot electrical systems to identify faults. 3. Application of electrical machines and power systems: Students will learn about electrical machines, such as motors and generators, and their operating principles. They will understand the characteristics and applications of these machines. Additionally, they will gain a basic understanding of power systems, including power generation, transmission, and distribution.
Indicative Contents	Part A - 1. Basic Electrical Principles, Electrical Measurements and Instruments [20 hrs] 2. Electrical Machines, Power Systems, Electrical Safety, Direct current circuit [20 hrs] 3. Revision and quiz [1.5 hrs] Part B – Alternating current circuit, Circuit Theory, Analogue Electronics Control Systems [20 hrs] 4. , Renewable Energy, Troubleshooting and Maintenance [10 hrs] Revision and quiz [1.5 hrs]

Learning and Teaching Strategies	
Strategies	1. Active Engagement: Actively engage with the subject matter by participating in class discussions 2. Practice Problem Solving: Electrical Technology involves problem-solving skills. 3. Hands-on Experience: Gain practical experience by participating in laboratory sessions and hands-on projects. 4. Collaborative Learning: Engage in group discussions and study sessions with classmates. 5. Utilize Resources: Take advantage of resources such as textbooks, online tutorials, video lectures, and educational websites to supplement your learning. 6. Time Management: Create a study schedule and allocate dedicated time for studying Electrical Technology. 7. Review and Recap: Regularly review previously covered topics to reinforce your understanding and retain information.

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					
		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.	**9**	**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)	
	Material Covered
Week 1	Symbols and abbreviations, electric circuit and its elements
Week 2	The direct-current network (kerchief's law & their use in network analysis
Week 3	Conversion of delta-connected resistance into an equivalent Wye connection & vice versa
Week 4	Power sources connected in parallel, node voltage method
Week 5	Loop current method.
Week 6	Super position method.
Week 7	Thevenin's theorem and Norton's theorem.
Week 8	Maximum power transfer.
Week 9	Reciprocity theorem
Week 10	Sinusoidal excitation, average, effective values and their steady- state analysis
Week 11	Generation of alternating current, sinusoidal current
Week 12	The mean values of current and voltage
Week 13	Complex Frequency, s-Plane, Poles and Zeros, Response Function, Bode Plots
Week 14	Frequency Response of Series/Parallel Resonances, High-Q Circuits
Week 15	Mutual Inductance, Linear and Ideal Transformers, Circuits with Mutual Inductance
Week 16	Final Examination

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: : Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: Kirchhoff's Laws
Week 3	Lab 3: series circuit
Week 4	Lab 4: Parallel circuit
Week 5	Lab 5: Thévenin's Theorem.
Week 6	Lab 6: Norton's Theorem.
Week 7	Lab 7: Y-connection delta-connection
Week 8	Lab 8: Second-Order Transient Responses
Week 9	Lab 9: Frequency Response of RC Circuits
Week 11	Lab 10: Frequency Response of RLC Circuits
Week 12	Lab 11: Filters
Week 13	Lab 12: AC circuit
Week 14	Lab 13: sine wave form
Week 15	Lab 14: Review

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	**1. "Electric Machinery and Power System Fundamentals" by Stephen J. Chapman** **2. "Electricity and Electronics for HVAC" by Rex Miller and Mark R. Miller** **3. "Principles of Electric Machines and Power Electronics" by P.C. Sen** **4. "Electrical Power Systems: Design and Analysis" by Mohamed E. El-Hawary**	
Recommended Texts	**1. "Electrical Wiring Residential" by Ray C. Mullin and Phil Simmons** **2. "Industrial Electrical Troubleshooting" by Lynn Lundquist** **3. "Electrical Safety Handbook" by John Cadick, Mary Capelli - Schellpfeffer, and Dennis Neitzel** **4. "Digital Control Systems" by Benjamin C. Kuo** **5. "Electromechanical Energy Conversion" by David J. Braun**	
Websites	● **(www.allaboutcircuits.com)** ● **(www.electrical4u.com)** ● **(www.khanacademy.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.

Module 1

Code	Course/Module Title	ECTS	Semester
TEMO 101	**Electrical technology**	**6**	**1**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**3**	**78**	**72**
Description			
Electrical technology encompasses the study of electrical systems, circuits, devices, and their applications. It focuses on understanding the principles and theories behind electricity, electrical power generation, transmission, and distribution. This field involves the design, installation, maintenance, and troubleshooting of electrical systems in various industries, such as power generation, manufacturing, telecommunications, and transportation. Electrical technology professionals work with electrical equipment, control systems, and renewable energy technologies. They are skilled in analyzing electrical circuits, performing measurements, and ensuring safety and compliance with electrical codes and standards. A strong foundation in electrical technology enables individuals to contribute to the development and advancement of electrical systems, energy efficiency, and the integration of new technologies in the field.			

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	**TEMO 102**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		1	**Semester of Deliver**		1
Administering Department		PM	**College**	TEMO	
Module Leader	Abdullah Adel Badr		**e-mail**	abdulladel06@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Lecturer	**Module Leader's Qualification**		M.Sc.
Module Tutor	Mohamed Nazar Yahya		**e-mail**	mohammed.nazar.yahya@ntu.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/6/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**Maintenance of Refrigeration & Air Conditioning Systems**	**Semester**	**six**
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] Noise and source. [15 hrs] Awareness of the dangers of industrial machines and caution against them. [10 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	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**	No	No	No	No
	Assignments	No	No	No	No
	Projects / Lab.	14	10% (10)	Continuous	All
	Report	14	30% (30)	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		

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 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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Principles**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**NTU 101**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Deliver**	2	
Administering Department	PM		**College**	TEMO	
Module Leader	Name : Luluwah abdulwahaab Yaseen		**e-mail**	E-mail : luluwah.alhubaity@ntu.edu.iq	
Module Leader's Acad. Title	Ass.Lecturer		**Module Leader's Qualification**	M.S.C.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/6/2023		**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	1. To learn about computers and their characteristics and features, compare different types of computers. 2. To learn about the computer's Hardware, Identify the factors that affect the computer's performance, Learn about the numerical systems and data representation. 3. Learn about the computer's Hardware(2), CPU, Memory 4. Learn about operating system software 5. Learn about the utility software programming languages, application software. 6. 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] 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) 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	Demonstrates knowledge of the Introduction to computer, computer component (hardware, software)
Week 2	• Demonstrates knowledge of the Operating system (windows), • Able to install windows (formatting)
Week 3 &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
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 power point 2020
Week 12	Able to use Internet , Internet explorer, starting, menus of internet explorer
Week 13	Able to create and use E-Mail: Yahoo, Hotmail
Week 14	• Able to utilize Search engines • Able to use google, yahoo, search information
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)	Yes
Recommended Texts	MICROSOFT ACCESS, EXCEL & POWER BI FOR BEGINNERS & POWER USERS, Tech Demystified (Author)	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**	**6**	**2**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**2**	**63**	**87**

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

حقوق الانسان والديمقراطية

HUMAN RIGHTS and DEMOCRACY

HUMAN RIGHTS and DEMOCRACY حقوق الانسان والديمقراطية					
Module Title	**Human Rights and Democracy**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**NTU 102**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		1	**Semester of Deliver**		2
Administering Department		PM	**College**	TEMO	
Module Leader	Assist Prof. Dr. Mohmmed Abd Almojod Hussan		**e-mail**	dr.mohmmed67@ntu.edu.iq	
Module Leader's Acad. Title		Assist Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/6/2023	**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	- زيادة معرفة الطالب بالجانب المفاهيمي النظري والتطور التاريخي لمادة حقوق الانسان والديمقراطية - تنمية مهارات الطالب التحليلية والنقدية فيما يتعلق بواقع ومستقبل حقوق الإنسان والديمقراطية - تدريب الطالب على أهمية المشاركة الفاعلة في جوانب الحياة العامة كتعزيز احترام مبادئ حقوق الإنسان العامة والمشاركة الفاعلة في الحياة السياسية والثقافية. - تمكين الطلاب من فهم أهمية التعليم ودوره في نشر ثقافة حقوق الإنسان والديمقراطية في بناء مجتمع حضاري يقوم على أساس الحكم الصالح الذي من أهم مقوماته الإيمان بحقوق الإنسان والتربية عليها والمشاركة الفاعلة في الحكم عبر الانتخابات الحرة والعادلة
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. حقوق الإنسان ، تعريفها ، أهدافها 2. حقوق الإنسان في التاريخ المعاصر والحديث 3. الاعتراف الإقليمي بحقوق الإنسان 4. حقوق الإنسان الحديثة 5. ضمانات احترام وحماية حقوق الإنسان على الصعيد الوطني 6. مصطلح الديمقراطية.

Indicative Contents المحتويات الإرشادية	1. حقوق الانسان ، تعريفها ، أهدافها حقوق الإنسان في الحضارات القديمة وخصوصا حضارة وادي الرافدين ضمانات واحترام وحماية حقوق الإنسان على الصعيد الدولي : - دور الأمم المتحدة ووكالاتها المتخصصة في توفير الضمانات - دور المنظمات الإقليمية (الجامعة العربية ، الاتحاد الأوروبي ، الاتحاد الافريقي ، منظمة الدول الأمريكية ، منظمة آسيان) . [15 hrs] دور المنظمات الدولية الاقليمية غير الحكومية والرأي العام في احترام وحماية حقوق الانسان 1. مصطلح الديمقراطية ، نشأته، دلالته، تاريخ الديمقراطية. الأنظمة الديمقراطية في العالم/الديمقراطية في العالم الثالث/ المشاكل التي تواجه البلدان العربية في التحول الديمقراطي .[15 hrs]

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	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	20% (20)	5 and 10	LO #1, #2, and #5, #6
	Assignments	2	10% (10)	6 and 12	LO#3 and #4
	Projects / Lab.	0	0% (0)		
	Report	1	10% (10)	14	LO #5
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	حقوق الإنسان ، تعريفها ، أهدافها حقوق الإنسان في الحضارات القديمة وخصوصا حضارة وادي الرافدين
Week 2	حقوق الانسان في الشرائع السماوية مع التركيز على حقوق الانسان في الاسلام
Week 3	حقوق الإنسان في التاريخ المعاصر والحديث : الاعتراف الدولي بحقوق الإنسان منذ الحرب العالمية الأولى وعصبة الامم المتحدة
Week 4	الاعتراف الإقليمي بحقوق الإنسان : الاتفاقية الاوربية لحقوق الانسان 1950 ، الاتفاقية الامريكية لحقوق الانسان 1969 ، الميثاق الافريقي لحقوق الانسان 1981 ، الميثاق العربي لحقوق الانسان 1994
Week 5	حقوق الإنسان الحديثة : الحقائق في التنمية ، الحق في البيئة النظيفة ، الحق في التضامن ، الحق في الدين حقوق الانسان ، المنظمات الوطنية لحقوق الانسان)

Week 6	حقوق الإنسان في الدساتير العراقية بين النظرية والواقع
Week 7	Mid-term Exam+ حقوق الإنسان الاقتصادية والاجتماعية والثقافية وحقوق الانسان المدنية والسياسية
Week 8	حقوق الإنسان الحديثة : الحقائق في التنمية ، الحق في البيئة النظيفة ، الحق في التضامن ، الحق في الدين
Week 9	ضمانات احترام وحماية حقوق الإنسان على الصعيد الوطني ، الضمانات في الدستور والقوانين الضمانات في الرقابة الدستورية ، الضمانات في حرية الصحافة والرأي العام ، دور المنظمات غير الحكومية في احترام وحماية حقوق الإنسان
Week 10	ضمانات واحترام وحماية حقوق الإنسان على الصعيد الدولي : - دور الأمم المتحدة ووكالاتها المتخصصة في توفير الضمانات - دور المنظمات الإقليمية (الجامعة العربية ، الاتحاد الأوروبي ، الاتحاد الافريقي ، منظمة الدول الأمريكية ، منظمة آسيان) دور المنظمات الدولية الإقليمية غير الحكومية والرأي العام في احترام وحماية حقوق الإنسان
Week 11	مصطلح الديمقراطية ، نشأته، دلالته، تاريخ الديمقراطية.
Week 12	الإسلام والديمقراطية ومساوئ الحكم الاستبدادي .
Week 13	الانتقادات الموجهة للديمقراطية، ومحاسن النظام الديمقراطي .
Week 14	الأنظمة الديمقراطية في العالم/الديمقراطية في العالم الثالث/ المشاكل التي تواجه البلدان العربية في التحول الديمقراطي
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	حقوق الإنسان والديمقراطية للدكتور محمد عابدالجابري 2006	Yes
Recommended Texts	حقوق الإنسان والديمقراطية اعداد أ.م.د. غسان كريم مجذاب و أ.م. امجد زين العابدين طعمة للعام 2018	No
Websites	" طرق وتعليم وثقافة حقوق الانسان" ، منشور على شبكة المعلومات الدولية (الانترنت) على الموقع الالكتروني http://ghrorg-learning.blogspot.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
NTU 102	**Human Rights & Democracy**	**2**	**2**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**0**	**32**	**18**

Description
مادة حقوق الإنسان والديمقراطية تقدم فهمًا شاملاً للمفاهيم والمبادئ الأساسية لحقوق الإنسان والنظم الديمقراطية. تركز المادة على دراسة القيم والمبادئ التي تحكم حقوق الإنسان وحمايتها، بالإضافة إلى فهم أهمية الديمقراطية في تنظيم الحكم وضمان مشاركة المواطنين في صنع القرارات. يتناول المقرر مواضيع مثل المساواة، وحرية التعبير، وحقوق المرأة والطفل، وحقوق الأقليات، وحقوق العمال واللاجئين، وأسس ومؤسسات الديمقراطية. تهدف المادة إلى تعزيز الوعي القانوني والأخلاقي بين الطلاب، وتمكينهم من فهم أهمية حقوق الإنسان والمشاركة الديمقراطية في بناء مجتمع عادل ومتقدم.

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 101**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		1	**Semester of Delivery**		2
Administering Department		PM	**College**	TEMO	
Module Leader	Tariq Khalid		**e-mail**	tariqaikhalidi@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Professor	**Module Leader's Qualification**		MASTER
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name		Dr. Ayman sabah	**e-mail**	aymansabah@ntu.edu.iq	
Scientific Committee Approval Date		June /01/2023	**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	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. 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. 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
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

Note: The indicative contents provided above give an overview of the topics typically covered in an Engineering Mechanics/Dynamics course. The actual contents may vary depending on the specific curriculum and academic institution.

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	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	5	15% (15)	2,4,9,11 and 13	LO #1, #3 ,#8,#9 and #10,
	Assignments	6	15% (15)	3,5,7,8,10a nd 15	LO #2, #4, #5, #7, #9 , and #11
	Projects / Lab.				
	Report	1	10% (10)	15	LO #6, #12,#13 and #14
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, STATICS AND DYNAMICS TWELFTH EDITION R. C. HIBBELER	yes
Recommended Texts	Theory and Problems of Engineering Mechanics Statics and Dynamics/ Fifth Edition, Shaum's Outline	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 101	Engineering Mechanics/ Dynamics	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	3	93	107

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	**Thermodynamics principles**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**PM 102**				
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		lecturer	**Module Leader's Qualification**		M.Tech. Mechanical Engineering
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/6/2024	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	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	108	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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 102	Thermodynamics principles	8	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**(SSWL (hr/sem**	**(USWL (hr/sem**
3	5	108	92

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	**Engineering drawing**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**TEMO 103**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		1	**Semester of Deliver**		2
Administering Department		PM	**College**	TEMO	
Module Leader	Name: Shaima Salim Younus		**e-mail**	E-mail: Shaima.salem@ntu.edu.iq	
Module Leader's Acad. Title		Ass. 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		01/6/2024	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	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 مخرجات التعلم للمادة الدراسية	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. 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. <u>Part A -</u> 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] <u>Part B -</u> 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) 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**	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.	14	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		

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.

Semester	ECTS	Course/Module Title	Code
2	6	ENGINEERING DRAWING	TEMO 103
USWL (hr/sem)	**SSWL (hr/sem)**	**Lect/Lab./Prac./Tutor**	**Class (hr/w)**
87	63	2	2
DESCRIPTION			
Definition of engineering drawing orders and its uses - the concept of engineering programs in engineering drawing and their fields - engineering drawing tools. Types of engineering lines and their uses, exercises + function. Drawing geometric shapes on computer) rectangular, parallelepiped, square, the circle (exercises + function. Dimensions and how to put them on the drawing. Principles of projection in engineering drawing (simple shapes). Cartesian projection on three levels. uncomplicated shapes, medium complexity, Complex geometric shapes			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Professional Ethics**			**Module Delivery**	
Module Type	**Support**			☒ Theory	
Module Code	**NTU 200**			☐ Lecture	
ECTS Credits	**2**			☐ Tutorial	
SWL (hr/sem)	**50**			☐ Practical	
				☐ Seminar	
Module Level	**2**	**Semester of Deliver**		**3**	
Administering Department	**PM**	**College**	**TEMO**		
Module Leader	**Haitham M. Wadullah**	**e-mail**	**Dr.haitham@ntu.edu.iq**		
Module Leader's Acad. Title	**Prof.**	**Module Leader's Qualification**	**PhD**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
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. To develop an understanding of the ethical principles and values that are relevant to professional practice. 2. To explore the role of ethics in decision-making processes within professional contexts. 3. To cultivate critical thinking skills and the ability to analyze ethical dilemmas in professional settings. 4. To promote ethical awareness and sensitivity towards ethical issues that may arise in the chosen profession. 5. To equip students with the knowledge and skills to apply ethical theories and frameworks in professional decision-making and problem-solving.
Module Learning Outcomes	1. Understand the fundamental ethical theories and principles relevant to professional practice. 2. Identify and analyze ethical issues and dilemmas that commonly occur in their chosen profession. 3. Apply ethical reasoning and critical thinking skills to evaluate and resolve ethical problems in professional contexts. 4. Demonstrate an awareness of the legal and regulatory frameworks that govern professional ethics. 5. Communicate and discuss ethical principles and considerations effectively with colleagues, clients, and stakeholders. 6. Develop a personal code of ethics and a commitment to ethical behavior in their professional roles. 7. Recognize and navigate conflicts of interest and maintain professional integrity. 8. Reflect on personal and professional growth in ethical decision-making and ethical leadership.
9. Indicative Contents	Indicative content includes the following. <u>Part A - Theory</u> 1. Introduction to Professional Ethics; Overview of professional ethics and its importance in various fields, Ethical principles and values in professional practice. Ethical Theories and Frameworks; Exploration of major ethical theories and frameworks, Application of ethical theories to real-world ethical dilemmas. Ethical Decision-Making; Understanding the process of ethical decision-making, Analysis of ethical decision-making models and strategies. 4. Professional Codes of Ethics and Standards; Examination of professional codes of ethics and standards in different professions, Discussion on the role of codes

	of ethics in guiding professional behavior. 5. Ethical Issues in the Workplace; Identification and analysis of common ethical issues and challenges in professional settings, Case studies and discussions on ethical dilemmas specific to various professions [10 hrs] Ethical Leadership and Responsibility; Exploration of ethical leadership principles and practices, Understanding the responsibility of professionals towards stakeholders. Ethical Communication and Professional Relationships; Effective communication of ethical considerations to colleagues, clients, and stakeholders, Development of professional relationships based on ethical principles. 8. Ethical Decision-Making in Complex Situations; Analysis of ethical challenges in complex and ambiguous situations, Strategies for making ethical decisions in challenging contexts. Professional Integrity and Conflicts of Interest; Understanding conflicts of interest and their impact on professional integrity, Techniques for managing conflicts of interest ethically. Ethical Issues in Technology and Innovation; Examination of ethical challenges arising from technological advancements, Ethical considerations in research, development, and implementation of new technologies. [10 hrs] Revision problem classes [2 hrs] <u>Part B – Practice</u> Social and Environmental Responsibility; Discussion on ethical responsibilities towards society and the environment, Exploration of sustainable and socially responsible practices. Ethics in Professional Relationships; Ethical considerations in working with colleagues, supervisors, and subordinates, Navigating ethical challenges in team dynamics and collaborations. Ethics in Decision-Making and Problem-Solving; Ethical considerations in making effective and ethical decisions, Techniques for resolving ethical dilemmas and managing ethical risks. [10 hrs] Ethical Professionalism and Career Development; Integration of ethical principles in career development and advancement, Ethical considerations in professional networking and job search. Ethical Reflection and Personal Development; Reflecting on personal values, ethical growth, and ongoing professional development, Developing an ethical action plan for future professional practice. [2 hrs]

10. Strategies	1. Active Engagement: Actively participate in discussions, debates, and case studies to enhance understanding of ethical concepts and apply them to real-world scenarios. Engage in critical thinking and reflective practices to analyze ethical dilemmas and formulate well-reasoned arguments. 2. Ethical Reflection: Regularly reflect on personal values, beliefs, and biases to develop self-awareness and cultivate ethical decision-making skills. Consider how ethical principles align with professional goals and responsibilities. 3. Case Studies and Role-Playing: Engage in case studies and role-playing exercises to simulate ethical dilemmas and practice ethical decision-making. Analyze and discuss different perspectives, ethical implications, and potential consequences. **4.** Collaborative Learning: Foster a collaborative learning environment by engaging in group discussions, peer review, and collaborative projects. Exchange ideas, share experiences, and learn from diverse perspectives to enhance ethical reasoning and decision-making skills.

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	4	30% (10)	5,8,10 and 13	LO #1,#2, #3,#4,#6,#7 and #8
	Assignments	2	10% (10)	3 and 12	LO #3, #4 and #6, #7
	Projects / Lab.		0% (0)	0	0
	Report		0% (0)	0	0
Summative assessment	Midterm Exam	1hr.	10% (10)	7	LO #1 - #4
	Final Exam	2hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

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

Week 8	8. اتخاذ القرارات الأخلاقية في الحالات المعقدة: تحليل التحديات الأخلاقية في الحالات المعقدة والغامضة، استراتيجيات اتخاذ القرارات الأخلاقية في سياقات تحدي.
Week 9	9. النزاهة المهنية وتعارض المصالح؛ فهم تعارض المصالح وتأثيره على النزاهة المهنية، تقنيات إدارة تعارض المصالح بشكل أخلاقي.
Week 10	10. القضايا الأخلاقية في التكنولوجيا والابتكار؛ دراسة التحديات الأخلاقية الناشئة من التقدم التكنولوجي، الاعتبارات الأخلاقية في البحث والتطوير وتنفيذ التقنيات الجديدة.
Week 11	11. المسؤولية الاجتماعية والبيئية؛ مناقشة المسؤوليات الأخلاقية تجاه المجتمع والبيئة، استكشاف الممارسات المستدامة والمسؤولة اجتماعياً.
Week 12	12. الأخلاق في العلاقات المهنية؛ الاعتبارات الأخلاقية في التعامل مع الزملاء والمشرفين والمرؤوسين، التعامل مع التحديات الأخلاقية في ديناميكيات الفريق والتعاون.
Week 13	13. الأخلاق في اتخاذ القرارات وحل المشكلات؛ الاعتبارات الأخلاقية في اتخاذ قرارات فعالة وأخلاقية، تقنيات لحل الصعوبات الأخلاقية وإدارة المخاطر الأخلاقية.
Week 14	14. الاحترافية الأخلاقية وتطوير الحياة المهنية؛ دمج المبادئ الأخلاقية في تطوير وتقدم الحياة المهنية، الاعتبارات الأخلاقية في شبكات العمل المهنية والبحث عن وظيفة
Week 15	15. الانعكاس الأخلاقي والتطوير الشخصي؛ التفكير في القيم الشخصية والنمو الأخلاقي والتطور المهني المستمر، وضع خطة عمل أخلاقية لممارسة المهنة في المستقبل
Week 16	16. **Preparatory week before the final Exam**

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

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

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

Module 1

Code	Course/Module Title	ECTS	Semester
NTU 200	Professional Ethics	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	0	32	18
Description			
مادة أخلاقيات المهنة تعنى بدراسة المفاهيم والمبادئ الأخلاقية التي ترتبط بممارسة المهن المختلفة. يتم توجيه الطلاب لفهم الأخلاقيات والقيم الأساسية في بيئة العمل وتطبيقها في مواقف واقعية. يشمل المنهج تحليل القضايا الأخلاقية والتعرف على الأطر الأخلاقية المختلفة التي يمكن أن تستخدم لاتخاذ قرارات أخلاقية صائبة. كما يتم استكشاف القوانين والقوانين المهنية ذات الصلة ودورها في توجيه سلوك المهنيين. تُعزز المهارات اللازمة للتواصل الأخلاقي وبناء العلاقات المهنية الصحيحة. يتم تسليط الضوء أيضًا على المسؤولية الاجتماعية والبيئية وتحديات التكنولوجيا وابتكاراتها في سياق المهن المختلفة. تهدف المادة إلى تطوير الوعي الأخلاقي والقدرة على اتخاذ قرارات أخلاقية صائبة في مجال المهنة.			

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 200				
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level	2		**Semester of Deliver**	3	
Administering Department	PM		**College**	TEMO	
Module Leader	Noor Moneer Basher		**e-mail**	noorabasher@ntu.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**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	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	108	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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.

Module 1

Code	Course/Module Title	ECTS	Semester
PM 200	Fluid Mechanics	8	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	3	108	92
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

Module Information					
Module Title	**Thermodynamics**			**Module Delivery**	
Module Type	**Core**			☒ Theory	
Module Code	**PM 201**			☐ Lecture	
ECTS Credits	**8**			☒ Lab	
SWL (hr/sem)	**200**			☒ Tutorial	
				☐ Practical	
				☐ Seminar	
Module Level	**2**	**Semester of Deliver**	**3**		
Administering Department	**PM**	**College**	**TEMO**		
Module Leader	**Anwar Ahmed Yousif**	**e-mail**	**nawarayousif@ntu.edu.iq**		
Module Leader's Acad. Title	**lecturer**	**Module Leader's Qualification**	**MSc. Mechanical Engineering**		
Module Tutor	**Name (if available)**	**e-mail**	**E-mail**		
Peer Reviewer Name	**Name**	**e-mail**	**E-mail**		
Scientific Committee Approval Date	**01/06/2023**	**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	**Part A** 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] **Part B** Fundamentals: Temperature: This section covers the measurement of temperature, including units of measurement, conversion between different scales, various measuring methods, and the principles of the Zeroth Law of Thermodynamics. Energy: The concept of energy is defined, and different forms of energy such as potential, kinetic, and thermal energy are explained. Work, capacity, flow work, and pressure diagrams are also discussed. Internal energy and enthalpy are introduced as important thermodynamic properties. [9 hrs] Steam Procedures and Pressure-Volume Chart: This topic focuses on the procedures related to steam and their representation on a pressure-volume chart. Students will learn about the behavior of steam during various processes and how to interpret and analyze such processes graphically. [10 hrs] Types of Pressure Gauges in Refrigeration: This section covers the different types of pressure gauges commonly used in refrigeration systems. Students will become familiar with these gauges, their working principles, and their specific applications in refrigeration processes. [6 hrs] Types of Air Velocity Gauges and Their Uses: This topic explores the various types of air velocity gauges and their respective uses. Students will learn about the different instruments used to measure air velocity and how these measurements are relevant in various contexts, such as HVAC systems or airflow analysis. [6 hrs]

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

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

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

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. "Thermodynamics: An Engineering Approach" by Yunus A. Çengel and Michael A. Boles 2. "Fundamentals of Engineering Thermodynamics" by Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey 3. "Introduction to Chemical Engineering Thermodynamics" by J.M. Smith, Hendrick C. Van Ness, Michael M. Abbott, and Mark T. Swihart	No
Recommended Texts	1. "Thermodynamics: An Engineering Approach" by Yunus A. Çengel and Michael A. Boles 2. "Fundamentals of Engineering Thermodynamics" by Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey 3. "Introduction to Chemical Engineering Thermodynamics" by J.M. Smith, Hendrick C. Van Ness, Michael M. Abbott, and Mark T. Swihart	No
Recommended Texts	Heat and mass transfer (SI UNITS) (Er. R. K. RAJPUT) (S. CHAND)	No
Websites	(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 201	**Thermodynamics**	**8**	**3**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
4	**4**	**123**	**5**
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 معلومات المادة الدراسية					
Module Title	**Mechanical drawing**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 202**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	PM		**College**	TEMO	
Module Leader	Asmaa taha Hussein		**e-mail**	Asmaa.taha@ntu.edu.iq	
Module Leader's Acad. Title	Ass. Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**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	1. to train students: to read the technical drawings through the application of techniques. 2. Learn students to read symbols, technical terms, standard specifications. 3. To understand the basic principle for descriptive geometry.. 4. This course deals with the basic concept of the computer in mechanical drawing. 5. To be able to communicate with manufacturers of mechanical systems. 6. To understand standard specifications, draw simple and complex assembly drawings. 7. To be able to communicate with other mechanical engineering professionals regardless of their spoken language.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Capability to use AutoCAD for 2-D representations. 2. To make the students understand all about the screw threads and their definitions also to teach the students all common types for screw threads and the common types for bolts and nuts with overview in details. 3. To make the students understand all about the Keys, types of keys, spline shaft and hub concept, and the basic definitions for Keys also the correct manner for Keys drawing. 4. Enables the students to learn the techniques and standard practices of technical graphics. 5. To make the students understand all about the riveting and types of rivets. 6. Read a working or assembly drawing (blueprint) 7. Represent mechanical components in multi view orthographic representation 8. understanding all about the welding, types of weld joints and the basic definitions for welding also the correct manner for all types of welding symbol drawing. 9. To help students understand all about the Gears classification, draw spur gear, definitions, formulas and calculations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A -</u> Introduction to (CAD), components of computer aided drawing (CAD), Exercises. [4 hrs] Screw threads, forms of screw thread, international metric threads (ISO screw), Common types of fasteners. [8hrs]

	Method of drawing (Hexagonal & Square headed bolts and nuts) Screw threads, Nuts, Forms and types of screw threads and types of nuts, ISO. Also method of drawing (Hexagonal & Square headed bolts and nuts), with an exercise for these objects. [8 hrs] general introduction for Keys, types of keys, spline shaft and hub Drawing, and the basic definitions for Keys also the correct manner for Keys drawing. The common types for Keys also an explanation in detail. Also the pin and cotter joint [12hrs] Revision and quiz [8hrs] <u>Part B -</u> Fundamentals of rivets and riveted joints, types of riveted joints, Conventional rivet symbol, and the basic definitions for riveting also the correct manner for all types of rivets drawing, also an explanation in details for all types. [10 hrs] general introduction for Welding, type of welding, welding symbols standard. [4 hrs] general introduction for Pulleys, types of pulleys. location and dimension of Pulleys, and the basic definitions for Pulleys also the correct manner for all types of Pulleys drawing, also an explanation in details for all types. [10 hrs] Gears classification of gears, Assembly and details of common mechanical unit [15 hrs] Pipes and pipe joints, piping fittings, pipe symbols standard. [10 hrs]

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	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**	3	10% (10)	3, 6 and 12	LO #1, #2, #4, #6 and
	Assignments	5	10% (10)	2, 5, 9, 11 and 14	LO #3, #5, #7,#8 and #9
	Projects / Lab.	14	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 to (CAD), components of computer aided drawing (CAD), Exercises
Week 2	Screw threads, forms of screw thread, international metric threads (ISO screw), Common types of fasteners.
Week 3	Method of drawing (Hexagonal & Square headed bolts and nuts)
Week 4	Keys, types of keys.
Week 5	Pins and Cotters.
Week 6	Rivets and riveted joints.

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

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	k. l. Narayana p. kannaiah k. venketa reddy mechanical engineering.	Yes
Recommended Texts	Up.and.Running.with.AutoCAD.2012.2D.and.3D.Drawing.and.Modeling	yes
Websites	https://learnengineering.in/mechanical-drawing-books/	

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

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

Code	Course/Module Title	ECTS	Semester
PM 202	Mechanical drawing	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	3	63	87
Description			
The course on Mechanical Drafting provides comprehensive training on various aspects of drafting and design in mechanical engineering. It covers topics such as the use of AutoCAD system for mechanical drafting, screw threads, bolts, nuts, keys, pin and cotter joints, riveting joints, welding symbols, gear drawings, assembly drawings, detail drawings, and coupling, bearing, and pipe joints. The course includes practical examples and exercises that allow students to gain hands-on experience in drawing each component. By completing this course, students can enhance their knowledge and skills in mechanical engineering drafting, enabling them to create accurate and detailed drawings for various mechanical components and systems.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics**			**Module Delivery**	
Module Type	**Base**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**TEMO 200**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		Undergraduate	**Semester of Delivery**		3
Administering Department		PM	**College**	TEMO	
Module Leader	Ahmed Mustaffa Saleem		**e-mail**	ahmedmustafa@ntu.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		M. Sc.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/06/2023	**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	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	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	20% (20)	5,8,10 and 14	LO #1,#2,#3 and #4
	Assignments	4	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.

Module 1

Code	Course/Module Title	ECTS	Semester
TEMO 200	Mathematics	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	1	63	87
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	**Arabic Language**			**Module Delivery**	
Module Type	**Support**			☒ Theory	
Module Code	**NTU 201**			☐ Lecture	
ECTS Credits	**2**			☐ Tutorial	
SWL (hr/sem)	**50**			☐ Practical	
				☐ Seminar	
Module Level	**2**	**Semester of Deliver**		**4**	
Administering Department	**PM**	**College**	**TEMO**		
Module Leader	**Shaimaa Salem Hameed**	**e-mail**	**@ntu.edu.iq**		
Module Leader's Acad. Title	**Assist Lect.**	**Module Leader's Qualification**	**M.Sc.**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
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. تعزيز التواصل الفعال: يهدف تعلم اللغة العربية إلى تمكين الطلاب من التواصل بشكل فعال في البيئة العربية، سواء كان ذلك في الحياة اليومية أو في السياق الأكاديمي والعملي.** **2. فهم الثقافة العربية: يعتبر تعلم اللغة العربية مفتاحًا لفهم الثقافة العربية وقيمها، ويساعد الطلاب على التعرف على التراث العربي الغني وفهم تعدد الثقافات في العالم العربي.** **3. تعزيز القدرات البحثية والأكاديمية: تعلم اللغة العربية يساهم في تطوير مهارات البحث والكتابة الأكاديمية للطلاب، مما يمكنهم من المشاركة بفاعلية في النقاشات الأكاديمية وإنتاج المعرفة.** **4. توفير فرص وظيفية: يعتبر إتقان اللغة العربية مهارة قيمة في سوق العمل، حيث يمكن للطلاب العربية العمل في مجالات متعددة مثل الترجمة، الإعلام، العلاقات العامة، والتعليم.** **1.** Enhancing effective communication: Teaching Arabic aims to enable students to communicate effectively in the Arab environment, both in daily life and in academic and professional contexts. **2.** Understanding Arab culture: Learning Arabic is a key to understanding Arab culture and its values, helping students to explore the rich Arab heritage and comprehend the cultural diversity within the Arab world. **3.** Enhancing research and academic skills: Learning Arabic contributes to developing research and academic writing skills for students, enabling them to actively participate in academic discussions and contribute to knowledge production. **4.** Providing job opportunities: Proficiency in Arabic is a valuable skill in the job market, allowing students to .
Module Learning Outcomes	1. القدرة على التواصل الفعال: يكتسب الطلاب مهارات الاستماع والتحدث والقراءة والكتابة في اللغة العربية، مما يمكنهم من التواصل بطلاقة وفهم المحتوى بشكل صحيح. 2. القدرة على فهم النصوص والثقافة: يتعلم الطلاب قراءة وفهم النصوص الأدبية والثقافية باللغة العربية، مما يساهم في تطوير فهمهم للتراث العربي والتحليل النقدي للأعمال الأدبية. 3. القدرة على البحث والكتابة الأكاديمية: يتعلم الطلاب كيفية إجراء البحوث والكتابة الأكاديمية باللغة العربية، ويتمكنون من تقديم أوراق بحثية وتقارير أكاديمية بشكل متميز. 4. التفاعل الثقافي والاجتماعي: يتمكن الطلاب من المشاركة في المجتمع العربي بشكل أعمق وفهم التقاليد والقيم والعادات المحلية، مما يعزز التفاهم الثقافي والتعايش السلمي. 1. Effective communication skills: Students acquire listening, speaking, reading, and writing skills in Arabic, enabling them to communicate fluently and understand content accurately. 2. Understanding texts and culture: Students learn to read and comprehend literary and cultural texts in Arabic, enhancing their understanding of Arab heritage and developing critical analysis of literary works. 3. Research and academic writing abilities: Students learn how to conduct research and engage in academic writing in Arabic, enabling them to present research papers and academic reports effectively. 4. Cultural and social interaction: Students are able to actively participate in the Arab community, gaining a deeper understanding of local traditions, values, and customs, fostering cultural understanding and peaceful coexistence.

Indicative Contents	1. مقدمة في المحتويات الإشارية: تعريف المحتويات الإشارية وأهميتها، ودورها في مجالات وتخصصات متنوعة. 2. أنواع وصيغ المحتويات الإشارية: استكشاف مختلف أنواع وصيغ المحتويات الإشارية، مثل الجداول والرسوم البيانية والنقاط البارزة والملخصات. 3. إنشاء المحتويات الإشارية: تقنيات واستراتيجيات إنشاء المحتويات الإشارية الفعالة، بما في ذلك اختيار المعلومات الرئيسية، وتبسيط المفاهيم المعقدة، وتنظيم المحتوى لسهولة الفهم. 4. التمثيل البصري للمحتويات الإشارية: استخدام الوسائط البصرية، مثل الرسوم البيانية والمخططات والرسومات، لتقديم المحتويات الإشارية بشكل جذاب ومفيد بصريًا. 5. أمثلة ودراسات الحالة: تحليل أمثلة ودراسات حالة حقيقية لفهم كيفية استخدام المحتويات الإشارية في سياقات مختلفة، مثل التقارير البحثية ومواد التسويق والموارد التعليمية. 1. Introduction to Indicative Contents: Defining indicative contents and understanding their significance in various fields and disciplines. 2. Types and Formats of Indicative Contents: Exploring different types and formats of indicative contents, such as tables, charts, bullet points, and summaries. 3. Creating Indicative Contents: Techniques and strategies for effectively creating indicative contents, including selecting key information, simplifying complex concepts, and organizing content for easy comprehension. 4. Visual Representation of Indicative Contents: Utilizing visual aids, such as infographics, diagrams, and illustrations, to present indicative contents in an engaging and informative manner. 5. Examples and Case Studies: Analyzing real-life examples and case studies to understand how indicative contents are used in various contexts, such as research reports, marketing materials, and educational resources.

Learning and Teaching Strategies	
Strategies	1. Interactive Language Activities: Engaging students in interactive activities such as role-plays, group discussions, and language games to practice and reinforce language skills. 2. Communicative Approach: Emphasizing real-life communication and providing opportunities for students to actively engage in speaking, listening, reading, and writing tasks to develop their language proficiency. 3. Authentic Materials: Incorporating authentic materials such as newspaper articles, songs, videos, and literature to expose students to real-world language usage and cultural contexts

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**	**4**	**30% (30)**	**3,6,10 and 14**	**LO #1, #2 , #3, and #4**
	Assignments	**2**	**10% (10)**	**4 and 12**	**LO #1and #4**
	Projects / Lab.		**0% (0)**	**0**	**0**
	Report		**0% (0)**	**0**	**0**
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)		
	Material Covered	
Week 1	مقدمة عن الأخطاء اللغوية	Introduction to Language Errors:
Week 2	–التاء المربوطة والتاء المفتوحة	• Taa Marbuta and Taa Marbuta (Bound and Open Taa): Understanding the rules and usage of the Taa Marbuta and Open Taa in Arabic language.
Week 3	همزة الوصل والقطع	• Hamzat Al-Wasl and Al-Qat' (Hamza of Connection and Hamza of Disconnection): Differentiating between Hamzat Al-Wasl and Al-Qat' and their respective roles in pronunciation.
Week 4	الهمزة المتوسطة والمتطرفة	• Alif Al-Maddooda and Alif Al-Muqassara Writing Rules: Exploring the rules for writing Alif Al-Maddooda (elongated Alif) and Alif Al-Muqassara (shortened Alif).
Week 5	قواعد كتابة الالف الممدودة والمقصورة –	• Solar and Lunar Letters: Identifying the distinction between solar and lunar letters in Arabic pronunciation.
Week 6	الحروف الشمسية والقمرية	• Adad (Numbers): Learning about the numerical system in Arabic and its usage.
Week 7	الضاد والظاء	• Verbs: Understanding verb conjugation and the different verb forms in Arabic.
Week 8	العـدد	• Parts of Speech: Exploring the different parts of speech, including nouns, verbs, adjectives, adverbs, etc.
Week 9	المفاعيل	• Meanings of Prepositions: Examining the meanings and usage of prepositions in Arabic.
Week 10	أقسام الكلام	• Common Language Errors: Analyzing common language errors and their applications in practical contexts.
Week 11	معاني حروف الجر	• Noon and Tanween: Understanding the usage and pronunciation of Noon and Tanween in Arabic.
Week 12	تطبيقات الأخطاء اللغوية الشائعة	• Taa Marbuta and Taa Marbuta (Bound and Open Taa): Understanding the rules and usage of the Taa Marbuta and Open Taa in Arabic language.
Week 13	النون والتنوين .	• Hamzat Al-Wasl and Al-Qat' (Hamza of Connection and Hamza of Disconnection): Differentiating between Hamzat Al-Wasl and Al-Qat' and their respective roles in pronunciation.
Week 14	مقدمة عن الأخطاء اللغوية	• Alif Al-Maddooda and Alif Al-Muqassara Writing Rules: Exploring the rules for writing Alif Al-Maddooda (elongated Alif) and Alif Al-Muqassara (shortened Alif).
Week 15	الأخطاء اللغوية	• Solar and Lunar Letters: Identifying the distinction between solar and lunar letters in Arabic pronunciation.
Week 16	Preparatory week before the final Exam	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. "الكافية" للكندي: يعتبر من أهم الكتب في علم النحو، حيث يشرح القواعد والتراكيب النحوية بأسلوب مبسط وشامل. 2. "الصرف" لابن مالك: كتاب مشهور يتناول قواعد تصريف الأفعال والأسماء في اللغة العربية، ويعد من أعمال النحو الكلاسيكية. 3. "المفصل في علم العربية" لابن جني: كتاب شامل يغطي مجموعة واسعة من موضوعات النحو والصرف والبلاغة والأدب	**Yes**
Recommended Texts	1. "الألفية" لابن مالك: كتاب مشهور في علم النحو والصرف، يعتبر من أهم المراجع الكلاسيكية في دراسة اللغة العربية. 2. "المستطرف في كل فن مستظرف" لابن الأنباري: كتاب يشمل العديد من الألفاظ والتعابير العربية المستخدمة في الأدب والشعر. 3. "البيان والتبيين" لابن حجر العسقلاني: كتاب يتناول موضوعات النحو والصرف والبلاغة، ويعتبر مرجعًا قيمًا في دراسة اللغة العربية.	**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.

Module 1

Code	Course/Module Title	ECTS	Semester
NTU 201	Arabic language	**2**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**0**	**32**	**18**
Description			

The description for the Arabic language is:
Arabic is a rich and diverse language spoken by millions of people around the world. It is the official language of over 20 countries and holds great cultural and historical significance. With its unique alphabet, intricate grammar, and beautiful calligraphy, Arabic offers a fascinating linguistic journey. Whether you are interested in exploring the language for academic, professional, or personal reasons, learning Arabic opens doors to understanding Arab culture, literature, and society. From basic greetings to advanced conversational skills, mastering Arabic provides opportunities for communication, travel, and career prospects. Embrace the beauty of Arabic as you embark on a journey of language discovery and cultural immersion.

الوصف الاكاديمي لمادة اللغة العربية
اللغة العربية هي لغة غنية ومتنوعة يتحدثها الملايين من الأشخاص حول العالم. إنها اللغة الرسمية في أكثر من 20 دولة وتحمل أهمية ثقافية وتاريخية كبيرة. بفضل أبجديتها الفريدة، وقواعدها المعقدة، والخط الجميل، تقدم اللغة العربية رحلة لغوية مثيرة. سواء كنت مهتمًا باستكشاف اللغة لأسباب أكاديمية، مهنية أو شخصية، فإن تعلم العربية يفتح أبوابا لفهم الثقافة العربية والأدب والمجتمع. من التحية الأساسية إلى مهارات المحادثة المتقدمة، يوفر اتقان العربية فرصًا للتواصل والسفر وفرص العمل

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	**8**				
SWL (hr/sem)	**200**				
Module Level	**2**		**Semester of Delivery**	4	
Administering Department	PM		**College**	TEMO	
Module Leader	Hussein Mohammed Ali		**e-mail**	alabadi.hussein@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**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	1) To know different types of the stresses which may subjected to the mechanical elements and their expected effects such as strain. 2) To study the shear forces and bending moment diagrams with essential stresses
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Students who successfully complete this course will have demonstrated an ability to: 1. Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials. 2. Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings. 3. Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels. 4. Determine the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading. 5. Determine and illustrate principal stresses, maximum shearing stress, and the stresses acting on a structural member. 6. Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural. 7. Analyze slender, long columns subjected to axial loads. 8. Design simple bars, beams, and circular shafts for allowable stresses and loads.
Indicative Contents المحتويات الإرشادية	1. Introduction to Strength of Materials A. Definition and Importance of Strength of Materials B. Historical Background C. Applications of Strength of Materials 2. Stress and Strain A. Basic Definitions B. Types of Stresses C. Types of Strains D. Hooke's Law 3. Axial Loading A. Normal Stress and Strain B. Deformation of Axially Loaded Members C. Stress-Strain Diagrams D. Elastic and Plastic Deformation E. Factor of Safety 4. Torsion A. Torque and Torsional Shear Stress B. Polar Moment of Inertia C. Torsional Deformation D. Power Transmission in Shafts 5. Bending

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	108	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	(108/15)= 7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	(92/15)= 6
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**	5	10% (10)	3,6,11,13 and 15	LO #1, #3, #5, #6and #7
	Assignments	3	10% (10)	4,7 and 14	LO #2, #4 and #8
	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	Simple stress
Week 2	Shearing stress, Bearing stress
Week 3	Thin wall cylinders
Week 4	Simple strain, stress-strain diagram, Hook's law
Week 5	Thermal stress
Week 6	Welded connection
Week 7	Riveted joints
Week 8	Torsion
Week 9	Spring
Week 10	Shear and moment in Beam
Week 11	Beam deflection
Week 12	Deflection cantilever Beam
Week 13	Deflection of simply supported Beam
Week 14	Combined stresses
Week 15	Stress at a point /Mohr circle
Week 16	**Preparatory week before the final Exam**

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
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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

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Module 1

Code	Course/Module Title	ECTS	Semester
PM 203	Strength of Materials	8	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	3	108	92
Description			
The field of strength of materials, also known as mechanics of materials, focuses on analyzing the stresses and strains experienced by structural components like beams, columns, and shafts. Engineers use different techniques to determine how these structures will respond to loads and potential failure modes. This analysis takes into consideration material properties, including yield strength, ultimate strength, Young's modulus, and Poisson's ratio. By understanding these properties, engineers can predict the behavior of a structure and design it to withstand the expected forces and stresses. Strength of materials is essential in ensuring the structural integrity and safety of engineering projects.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

odule 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)	**200**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	PM		**College**	TEMO	
Module Leader	Dr. Jamal. N. Sultan		**e-mail**	Jamal.nayyef@ntu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**		

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Understand the Structure of Materials: Learn about the atomic and molecular structure of materials, including the arrangement of atoms, crystal structures, and the relationship between structure and material properties. 2. Study Material Properties: Explore the various physical and mechanical properties of materials such as strength, hardness, elasticity, conductivity, thermal expansion, and corrosion resistance. Understand how these properties influence the behavior of materials in different applications. 3. Learn about Material Processing: Gain knowledge about different manufacturing and processing techniques used to modify the structure and properties of materials. This may include topics such as casting, forging, welding, heat treatment, and surface treatment. 4. Comprehend Material Selection: Understand the principles and criteria for selecting materials for specific engineering applications. Consider factors such as mechanical requirements, environmental conditions, cost, and sustainability in the material selection process. 5. Explore Material Failure and Fracture: Study the causes and mechanisms of material failure, including fracture, fatigue, creep, and wear. Learn how to analyze and prevent failures through the application of material science principles. 6. Examine Material Testing and Characterization: Familiarize yourself with different experimental techniques and methods used to evaluate material properties and performance. This may include tensile testing, hardness testing, microscopy, spectroscopy, and non-destructive testing. 7. Understand Material Behavior under Different Conditions: Learn how materials respond to external factors such as temperature, pressure, and loading conditions. Study the concepts of elasticity, plasticity, viscoelasticity, and the behavior of materials at extreme temperatures. 8. Gain Knowledge of Material Sustainability: Explore the concepts of sustainable materials, recycling, and environmental impact assessment. Understand the importance of considering the lifecycle of materials and their ecological footprint. 9. Develop Material Design Skills: Apply material selection principles and knowledge of material properties to design components and systems that meet specific engineering requirements. Understand the relationship between material properties, manufacturing processes, and design optimization. 10. Enhance Problem-Solving Abilities: Develop critical thinking and problem-solving skills related to material selection, material performance, and failure analysis. Apply theoretical knowledge to practical engineering challenges.
Module Learning Outcomes	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

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

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	2, 6, 12 and 14	LO #1, #3, and #6
	Assignments	5	10% (10)	1, 3, 5, and 9, 15	LO #2, #4 and #5, #7
	Projects / Lab.	10	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 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. Materials Today - Materials Today (www.materialstoday.com) is an online platform that covers various aspects of materials science, including news, articles, reviews, and interviews. It covers a broad range of material classes, such as metals, polymers, composites, and nanomaterials. 4. ASM International - ASM International (www.asminternational.org) is an organization that focuses on the science and engineering of materials. Their website provides access to technical publications, educational resources, events, and a knowledge base with information on various materials and their applications. 5. National Institute of Standards and Technology (NIST) - The NIST website (www.nist.gov/materials-science-and-engineering) offers resources related to materials science and engineering, including research papers, databases, measurement techniques, and standards. It is a valuable resource for those interested in materials characterization and properties. 6. Elsevier Materials Science - Elsevier's Materials Science website (www.elsevier.com/physical-sciences/materials-science) provides access to a wide range of scientific journals and publications in the field of materials science. It covers topics such as materials synthesis, characterization, properties, and applications.

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

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

Module 1

Code	Course/Module Title	ECTS	Semester
PM 204	Engineering Materials	8	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	2	93	107
Description			

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Refrigeration & Air Conditioning Principles**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 205**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	**2**	**Semester of Deliver**	**4**		
Administering Department	**PM**	**College**	**TEMO**		
Module Leader	**Husam Naufal Saleh Yassien**	**e-mail**	**husam.naufal@ntu.edu.iq**		
Module Leader's Acad. Title	**Lecturer**	**Module Leader's Qualification**	**Msc**		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**01/6/2023**	**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	1. Understand the basic principles of refrigeration and air conditioning systems. 2. To understand the fundamental properties of Air and Water vapor mixture. 3. This course deals with the basic concept of air-conditioning processes. 4. Identify and describe the components of a typical refrigeration and air conditioning system. 5. To explain the thermodynamic principles involved in refrigeration and air conditioning processes. 6. Demonstrate knowledge of refrigerants and their properties, including safety considerations and environmental impacts.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define Refrigeration and Air conditioning and identify their applications. 2. Define and calculate moist air properties using related equations. 3. Recognize how to use a Psychrometric chart in solving various Air conditioning processes. 4. Analyze the simple vapor compression cycle. 5. Describe the factors affecting vapor compression cycle performance. 6. Identify the multi pressure Refrigeration systems. 7. Recognize the refrigerant types and their effect on Ozone and How to Number it.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **<u>Part A - Air conditioning</u>** Air conditioning definition , Air conditioning systems and applications, SI units, Fundamental properties of Air and Water vapor mixture; definition of (moist air properties), Calculation of moist air properties using related equations. [14 hrs] Psychrometric chart and its construction, Air-conditioning processes, Air-conditioning processes (sensible cooling, and sensible heating). [14 hrs] Air-conditioning processes (Dehumidification, Humidification, Mixing of air streams, Cooling and dehumidification with reheat, and Pre heating with humidification and reheat). [14 hrs] Summer and winter cycle. [4 hrs] **<u>Part B - Refrigeration</u>** Refrigeration definition, Refrigeration systems and applications, heat pump, reversed Carnot cycle, [7 hrs]

	Simple vapor compression cycle components and analysis, Ideal and actual vapor compression cycle, factors affecting vapor compression cycle performance, Multi Pressure systems. [30 hrs] Refrigerants. [14 hrs]

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	108	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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**	5	10% (10)	2, 6, 10, 12, and 14	LO #1, #3 and #6

	Assignments	4	10% (10)	1, 3, 5 and 15	LO #2, #4 and #5, #7
	Projects / Lab.	10	20% (10)	continuous	ALL
	Report				
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	Air conditioning, Air conditioning systems, SI units, Fundamental properties of Air and Water vapour mixture; definition of (moist air properties) , Dry bulb, wet bulb and Dew point temperatures, partial pressure, Relative humidity, moisture content, Specific volume and Enthalpy.
Week 2	The General Gas Law, Dalton's law of partial pressure, Calculation of moist air properties using related equations.
Week 3	Psychrometric chart, Construction of psychrometric chart, Sensible Heat and Latent Heat.
Week 4	Air-conditioning processes, Adiabatic saturation process, sensible cooling, and sensible heating.
Week 5	Dehumidification; by pass factor, contact factor, Humidification – Humidification by water injection, steam injection.
Week 6	Mixing of air streams, Cooling and dehumidification with reheat.
Week 7	Preheating with humidification and reheat. Summer and winter cycle.
Week 8	Refrigeration application, refrigeration theory, heat pump, reversed Carnot cycle.
Week 9	Simple vapour compression cycle, vapour compression cycle components, Simple vapour compression cycle analysis.
Week 10	Ideal and actual vapour compression cycle, factors affecting vapour compression cycle performance (effect of suction temperature, effect of condensing temperature, effect of subcooling, effect of superheating, effect of pressure loss).
Week 11	Multi Pressure systems: Removing of flash gas, inter-cooler.
Week 12	Single evaporator and single compressor, single compressor and two evaporators.
Week 13	Two compressors and two evaporators, multi-stage compression cycle using, water intercooler, flash intercooler, liquid refrigerants intercooler.
Week 14	Refrigerants, types of old and new refrigerant. Effect of refrigerant on Ozone, secondary refrigerants.
Week 15	Numbering of Refrigerants.
Week 16	Preparatory week before the final Exam

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

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

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

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

Module 1

Code	**Course/Module Title**	**ECTS**	**Semester**
PM 205	Refrigeration & Air Conditioning Principles	8	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	3	108	92
Description			
The Refrigeration and Air Conditioning Principles module provides students with a comprehensive understanding of the principles, components, and applications of refrigeration and air conditioning systems. This module combines theoretical knowledge with practical skills. Throughout the module, students delve into the fundamental principles of thermodynamics, heat transfer, and psychrometrics, which form the basis of refrigeration and air conditioning processes. They learn about the various components involved in these systems, including compressors, condensers, evaporators, expansion devices, and controls, and understand their functions and interactions. Hands-on activities and laboratory sessions enable students to calculate and analyze different air conditioning processes and refrigeration systems. The module encourages the students to communicate effectively and work collaboratively in teams, simulating real-world scenarios they may encounter in the field.			

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information					
Module Title	**Occupational Safety**			**Module Delivery**	
Module Type	**Support**			☐ **Theory** ☐ **Lecture** ☒ **Laboratory** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 206**				
ECTS Credits	**2**				
SWL (hr/sem)	**100**				
Module Level	**2**	**Semester of Deliver**		**4**	
Administering Department	**PM and AM**	**College**	**TEMO**		
Module Leader	**Haitham M. Wadullah**	**e-mail**	**Dr.haitham@ntu.edu.iq**		
Module Leader's Acad. Title	**Prof.**	**Module Leader's Qualification**		**PhD**	
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**1/6/2023**	**Version Number**	**1.0**		

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1. Understand the importance of occupational safety: The module aims to provide students with a comprehensive understanding of the significance of occupational safety in the workplace. Students will learn about the potential hazards and risks associated with different industries and the impact they can have on the well-being of employees. 2. Identify common workplace hazards: Students will learn how to identify and assess various workplace hazards, including physical, chemical, biological, and ergonomic hazards. They will gain knowledge about different types of safety hazards that exist in different work environments and how to recognize them to prevent accidents and injuries. 3. Implement safety protocols and practices: The module will equip students with the knowledge and skills to implement effective safety protocols and practices in the workplace. They will learn about safety regulations, standards, and best practices, and understand the importance of following safety guidelines to create a safe working environment. 4. Develop risk assessment and management skills: Students will be trained in conducting risk assessments and developing risk management strategies. They will learn how to identify potential risks, evaluate their severity and likelihood, and develop appropriate control measures to mitigate or eliminate those risks.
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.
5. Indicative Contents	Indicative content includes the following. Part A - Theory 1. 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 problem classes [2 hrs] Part B – Practice Training and Communication in Engineering Safety Incident Investigation and Reporting in Engineering Safety Management Systems in Engineering Application in Occupational Safety 1 Application in Occupational Safety 2. [10 hrs]

6. Learning and Teaching Strategies	
7. Strategies	1. Familiarize yourself with the subject: Start by understanding the key concepts, principles, and regulations related to Occupational Safety in the engineering field. This will provide a foundation for further exploration and learning. 2. Actively engage in practical applications: Apply the theoretical knowledge to real-world scenarios by analyzing case studies, conducting risk assessments, and identifying safety measures in engineering projects. This hands-on approach will help reinforce understanding and develop problem-solving skills. 3. 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. 4. 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	**68**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**(18/15)= 1**
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**	**1**	**10% (10)**	**5 and 10**	**LO #2**
	Assignments	**1**	**10% (10)**	**2 and 12**	**LO #3**
	Projects / Lab.				
	Report	**2**	**20% (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	مقدمة في السلامة المهنية
Week 2	تحديد المخاطر وتقييم المخاطر
Week 3	وسائل السيطرة الهندسية وأنظمة السلامة
Week 4	معدات الحماية الشخصية ومعدات السلامة
Week 5	الصحة المهنية والصحة الصناعية
Week 6	سلامة الحرائق والاستعداد للطوارئ
Week 7	سلامة الكهرباء في الهندسة
Week 8	سلامة الآلات والمعدات
Week 9	سلامة البناء في مشاريع الهندسة
Week 10	إدارة المواد الخطرة
Week 11	التدريب والتواصل في سلامة الهندسة
Week 12	تحقيق الحوادث وتقاريرها في الهندسة
Week 13	أنظمة إدارة السلامة في الهندسة
Week 14	تطبيق في السلامة المهنية 1
Week 15	تطبيق في السلامة المهنية2
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. 2. "السلامة والصحة المهنية في البناء والتشييد" بواسطة فوزي عطا الله. 3. "السلامة والصحة المهنية والبيئية" بواسطة مجدي الغول. 4. "السلامة المهنية وإدارة المخاطر" بواسطة سلطان القحطاني. 5. "السلامة المهنية والوقاية من المخاطر" بواسطة نزار السعودي. 6. "السلامة المهنية والحريق" بواسطة حسن السناني. 7. "السلامة والصحة المهنية في المعامل" بواسطة عمرو حسين.	**Yes**
Recommended Texts	1. "Occupational Safety and Health for Technologists, Engineers, and Managers" بواسطة David L. Goetsch و Eugene R. Pierce. 2. "Introduction to Occupational Health in Public Health Practice" بواسطة Bernard D. Goldstein و Mary Sue Henifin. 3. "Safety and Health for Engineers" بواسطة Roger L. Brauer. 4. "Occupational Safety and Health for Technologists, Engineers, and Managers" بواسطة David L. Goetsch و Eugene R. Pierce.	**No**
5. Websites	1. No Occupational Safety and Health Administration (OSHA): The official website of OSHA, a government agency responsible for enforcing workplace safety regulations in the United States. It offers a wealth of resources, guidelines, and educational materials on various safety topics. 2. National Institute for Occupational Safety and Health (NIOSH): NIOSH is a U.S. federal agency focused on conducting research and providing guidance on occupational safety and health. Their website offers publications, databases, training materials, and tools related to workplace safety. 3. Health and Safety Executive (HSE): HSE is the national independent regulator for workplace health and safety in the United Kingdom. Their website provides guidance, publications, and tools to help businesses and individuals understand and comply with health and safety regulations. 4. Centers for Disease Control and Prevention (CDC): While primarily focused on public health, the CDC also offers resources and information on occupational safety and health. Their website provides research, guidelines, and educational materials on various workplace safety topics. 5. Canadian Centre for Occupational Health and Safety (CCOHS): CCOHS is a Canadian organization dedicated to promoting occupational health and safety.	

	Their website offers a wide range of resources, including fact sheets, guidelines, courses, and databases related to workplace safety. 6. European Agency for Safety and Health at Work (EU-OSHA): EU-OSHA is an agency of the European Union focused on promoting safety and health in the workplace. Their website provides information, publications, and tools to help improve workplace safety across Europe

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

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

Module 1

Code	Course/Module Title	ECTS	Semester
PM 206	**Occupational Safety**	**4**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	**2**	**32**	**68**

Description

السلامة المهنية هي مجال دراسة يركز على تحقيق بيئة عمل آمنة وصحية للعاملين في جميع الصناعات والقطاعات. يهدف العلماء والباحثون في هذا المجال إلى تحليل وتقييم المخاطر المحتملة في مكان العمل وتطوير وتنفيذ استراتيجيات وأنظمة للوقاية والتحكم في هذه المخاطر. تشمل مجالات الدراسة في السلامة المهنية تحديد المخاطر، وتقييم المخاطر، وتصميم وتنفيذ إجراءات السلامة والوقاية، والتدريب والتثقيف، وإدارة الحوادث والطوارئ، والتشريعات والمعايير الخاصة بالسلامة. يهدف العلماء والمهنيون في هذا المجال إلى تعزيز ثقافة السلامة ورفع الوعي بأهمية السلامة المهنية بين العاملين وصناعة الأعمال بشكل عام. تعد السلامة المهنية جزءًا أساسيًا من الإدارة الفعالة للمخاطر وتساهم في تحسين الأداء العام والجودة ورفاهية العاملين في بيئة العمل.

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	**RE 300**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	3		**Semester of Deliver**	5	
Administering Department	PM		**College**	TEMO	
Module Leader	Ayad Suleiman Abdullah		**e-mail**	Ayad.selman@ntu.edu.iq	
Module Leader's Acad. Title	Lecture		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/6/2023		**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	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 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. 4. Introducing students how calculation Over all Heat Transfer Coefficient 5. Introducing students study the heat conduction through a large plane wall and cylinder as one dimension steady state case. 6. Introducing students to how he calculation therate of heat transfer through a multilayer plane walls, cylinders, and spheres medium under steady conditions and surface temperatures difference. 7. Introducing the student to Investigate the steady state one dimensional heat conduction in a cylinder and sphere, and estimate the critical radius of insulation for them 8. Providing the student with practical and technical experience in calculating the heat transfer from finned surfaces.
Module Learning Outcomes	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Show the student's ability to use knowledge to prepare scientific and applied research. 2. The ability to use electronic programs to solve the problems of heat transfer.

مخرجات التعلم للمادة الدراسية	3. The ability to think to extract engineering solutions to problems related to heat transfer. 4. The ability to keep pace with scientific and technical modernity. 5. Teaching leadership skills, the value of commitment, love of work and devotion to it. 6. The ability to calculate the rate of heat transfer. 7. The ability to calculate the heat transfer from finned surfaces.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Basic Concepts of Heat Transfer, and Heat Transfer Mechanisms [10 hrs] Steady State One Dimensional Heat Conduction in a Large Plane Wall, and in a Cylinder [15 hrs] Conduction through Multilayer Plane Wall Over-all Heat Transfer Coefficient [15 hrs] Critical Radius of Insulation. [10 hrs] Thermal Contact Resistance [15 hrs] Studying the heat transfer from finned surfaces [15 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	107	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	92	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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**	5	10% (10)	2, 4 ,7 and 10, 14	LO #1, #3 and #6, #7
	Assignments	4	10% (10)	3, 6 and 9, 12	LO #2, #4 and #5
	Projects / Lab.	15	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, Basic Concepts of Heat Transfer, Heat Transfer Mechanisms
Week 2	Steady State One Dimensional Heat Conduction in a Large Plane Wall, and in a Cylinder. Conduction through Multilayer Plane Wall, and Cylinder.
Week 3	Over all Heat Transfer Coefficient, Critical Radius of Insulation, Thermal Contact Resistance.
Week 4	The Fins
Week 5	Transient Heat Conduction, (Lumped System Analysis), Two-Dimensional Steady Heat Conduction
Week 6	Introduction to Heat Transfer by Convection, Review to the Fluid Flow
Week 7	Non-Dimensional Group Numbers Analysis, Non- Dimensional Convection Method
Week 8	Analytical Solution for Heat Convection Heat Transfer for Laminar And Turbulent Flow, One Dimensional Steady State Force Convection Heat Transfer on Flat Plate
Week 9	Empirical Equations for Forced Convection Heat Transfer (Laminar and Turbulent Flow), Natural Convection Heat Transfer
Week 10	Empirical Equations for Natural Convection Heat Transfer, Introduction to Heat Exchangers, Kinds of Heat Exchangers, The Overall Heat Transfer Coefficient,
Week 11	Fouling Factor , The Log Mean Temperature Difference Method, The Effectiveness of the heat Exchangers, The Performances for Difference Kinds of the Heat Exchangers
Week 12	Heat Radiation, Introduction, Basic Concepts, Characteristics of Radiation, The View Factor Radiation Heat Transfer Between Two Black Surfaces
Week 13	Radiation Heat Transfer Between Two Gray Surfaces, Radiation Shields and The Radiation Effect
Week 14	MASS TRANSFER, boiling, condensing, evaporation
Week 15	Mass Convection, Mass Diffusion
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Temperature measurements
Week 2	Lab 2: Thermal conductivity.
Week 3	Lab 3: Calibration of thermo-couple
Week 4	Lab 4: Flow across tube banks
Week 5	Lab 5: Heat exchangers
Week 6	Lab 6: Critical Heat Flux
Week 7	Lab 7: Heat Transfer through the Lagged Pipe
Week 8	Lab 8: Thermal Conductivity of Insulating Powder
Week 9	Lab 9 Heat Transfer from a Pin-Fin Apparatus
Week 10	Lab 10: Heat Transfer through Composite Wall
Week 11	Lab 11: Heat Transfer in Forced Convection
Week 12	Lab 12: Parallel Flow / Counter Flow Heat Exchanger
Week 13	Lab 13: Heat Transfer in Natural Convection
Week 14	Lab 14: Thermal Conductivity of Metal Rod
Week 15	Lab 15: Emissivity Measurement Apparatus

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	. Heat transfer By : J.P. Holman, Heat and mass transfer By: YunusA.Gengel,	Yes
Recommended Texts	. Fundamentals of heat and mass transfer By: Incropera	yes
Websites	https://www. Heat transfer handbook By: Bijan	

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.

Undergraduate Courses 2023-2024

Code	Course/Module Title	ECTS	Semester
(RE 300)	Heat Transfer	8	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	93	107
Description			

Knowing the students, the main scientific principle in the field of heat transfer and its application in the Refrigeration, Cooling, and air conditioning fields.
After this course the students will be able to:

1. Knowing the student, the main scientific principle in the field of heat transfer and its mechanisms
2. Study the heat conduction through a large plane wall and cylinder as one-dimension steady state case. This chapter deals with the theoretical and mathematical aspects of heat conduction.
3. Investigate the steady state one dimensional heat conduction in a cylinder and sphere, and estimate the critical radius of insulation for them.
4. Studying the effect of thermal resistance to heat conduction through multilayer at the interface of two layers.
5. Studying the transient heat conduction
6. Studying numerically the two-dimensional steady heat conduction
7. Study the mechanism of heat transfer through a fluid in the presence of bulk fluid motion.
8. Study the Non-Dimensional Group Numbers which are in used in the convection heat transfer.
9. External and internal forced convection heat transfer introduced with the used of empirical equation instead of the complicity of the analytical solution.
10. Natural convection heat transfer introduced as empirical equations.
11. Studding the methods of the exchange heat between two fluids that are at different temperatures while keeping them from mixing with each other.
12. Studding the effect of conduction, convection and radiation heat transfer within the heat exchangers collected in one overall heat transfer coefficient, and studding the effect of fouling.
13. Studding the effect of radiation heat transfer, which is involves the emission of the internal energy of the object.
14. Studding the principle of radiation heat transfer.
15. Studding the radiation heat transfer between two black surfaces, and radiation heat transfer between two gray surfaces

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 300**				
ECTS Credits	**6.00**				
SWL (hr/sem)	**150**				
Module Level		**3**	**Semester of Deliver**		**5**
Administering Department		**PM**	**College**	**TEMO**	
Module Leader	**Dr. Haitham M. Wadullah**		**e-mail**	**Dr.haitham@ntu.edu.iq**	
Module Leader's Acad. Title		**Prof.**	**Module Leader's Qualification**		**Ph.D.**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		**01/6/2023**	**Version Number**		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**NO**	**Semester**	
Co-requisites module	**NO**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Develop a solid foundation in mathematical concepts and techniques used in engineering analysis. 2. Understand the principles and applications of numerical methods for solving engineering problems. 3. Gain proficiency in using software tools and programming languages for numerical analysis. 4. Acquire the skills to analyze and interpret numerical results to make informed engineering decisions. 5. Apply mathematical modeling techniques to solve real-world engineering problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The intended subject specific learning outcomes. On successfully completing the module students will be able to: 1. Acquire a comprehensive understanding of the fundamental principles and concepts underlying a broad range of basic methods used in engineering analysis. 2. Demonstrate proficiency in applying a variety of established techniques and effectively utilizing computational tools to solve engineering problems. 3. Apply the acquired knowledge and skills in basic numerical approximation to address complex problems in diverse contexts, demonstrating the ability to critically assess and select appropriate tools and techniques. 4. Effectively employ MATLAB commands and functions to implement and execute engineering analysis tasks, demonstrating competence in utilizing computational tools for problem-solving.
Indicative Contents المحتويات الإرشادية	Part A Introduction, Mathematical Analysis, Function Analysis and Complex Function Analysis **[20 hr.]** Mathematical Modeling, Logistic Regression Analysis, Probability and Statistics Analysis and Advanced Probability and Statistics Analysis **[20 hr.]** Revision problem classes and quiz [3 hrs] Part B Linear and Nonlinear Regression Analysis, Optimization Analysis and Optimal Control and Nonlinear Optimization Analysis **[20 hr.]**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	1. Establish a solid foundation: Start by thoroughly understanding the fundamental concepts and principles of engineering analysis. This includes grasping the mathematical techniques and numerical methods commonly used in the field. 2. Practice problem-solving: Engineering analysis involves solving complex problems. Regularly practice solving a variety of problems to enhance your problem-solving skills and develop a deeper understanding of the subject matter. 3. Utilize resources: Take advantage of textbooks, online resources, and reference materials specific to engineering analysis. These resources can provide additional explanations, examples, and practice problems to reinforce your understanding.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (hr/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**4**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (hr/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**6**
Total SWL (h/sem)	**150**		

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	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	
Week	**Material Covered**
Week 1	Introduction to Engineering Analysis; Fundamental concepts in engineering analysis Tools and techniques of engineering analysis
Week 2	Mathematical Analysis; Differential equations and their applications in engineering, Differentiation and integration
Week 3	Function Analysis; Algebraic and transcendental functions, Trigonometric and exponential functions
Week 4	Complex Function Analysis; Complex numbers and operations, Analysis of complex functions
Week 5	Mathematical Modeling; Mathematical models of growth, Mathematical models of regression
Week 6	Logistic Regression Analysis; Logistic regression analysis, Applications in engineering

Week 7	Probability and Statistics Analysis; Probability and statistics concepts, Data analysis and probability distributions
Week 8	Advanced Probability and Statistics Analysis; Joint and conditional probability analysis, Advanced statistics analysis and non-normal distributions
Week 9	Linear Regression Analysis; Simple linear regression analysis, Multiple linear regression analysis
Week 10	Nonlinear Regression Analysis; Nonlinear regression analysis, Applications in engineering
Week 11	Optimization Analysis and Optimal Control; Optimization analysis and optimal control problems, Applications in engineering
Week 12	Nonlinear Optimization Analysis; Nonlinear optimization analysis, Applications in engineering
Week 13	Review 1
	Quiz
Week 14	Review 2
Week 15	Review 3
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Engineering Analysis and MATLAB.
Week 2	Lab 2: Numerical Methods for Root Finding
Week 3	Lab 3: Interpolation and Curve Fitting
Week 4	Lab 4: Numerical Integration
Week 5	Lab 5: Numerical Solutions of Ordinary Differential Equations (ODEs)

Week 6	Lab 6: Systems of Linear Equations
Week 7	Lab 7: Partial Differential Equations (PDEs)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. "Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale 2. "Numerical Analysis" by Timothy Sauer 3. "Numerical Methods in Engineering with MATLAB" by Jaan Kiusalaas	**No**
Recommended Texts	1. "Applied Numerical Methods with MATLAB for Engineers and Scientists" by Steven C. Chapra 2. "Numerical Methods: Design, Analysis, and Computer Implementation of Algorithms" by Anne Greenbaum and Timothy P. Chartier	**No**
Websites	3. (https://www.mathworks.com/) 4. (http://www.numericalmethods.eng.usf.edu/) 5. (https://www.engineering.com/)	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group	**A** - Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors

(50 - 100)	**C** - Good	جيد	70 – 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 – 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 – 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	45 – 49	More work required but credit awarded
	F – Fail	راسب	0 – 44	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

Module 1

Code	Course/Module Title	ECTS	Semester
PM 300	Engineering Analysis	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/ sem)**
2	2	63	87
Description			

Engineering Analysis is a field of study that focuses on the application of mathematical and computational methods to solve complex engineering problems. It involves the use of various mathematical techniques, numerical methods, and computer simulations to analyze and interpret data, make informed decisions, and optimize engineering designs and processes.

In Engineering Analysis, students learn fundamental principles and concepts of mathematics, including calculus, linear algebra, and differential equations. They develop skills in using numerical methods, such as interpolation, numerical integration, and numerical solution of differential equations, to solve engineering problems.

Students also gain proficiency in using computational tools and software, such as MATLAB, to perform mathematical modeling, data analysis, and simulations. They learn to analyze and interpret the results obtained from numerical calculations and simulations, and apply these findings to real-world engineering applications.

Engineering Analysis plays a crucial role in various engineering disciplines, including mechanical engineering, civil engineering, electrical engineering, and aerospace engineering. It provides engineers with the tools and techniques to analyze and optimize designs, predict system behavior, and make informed engineering decisions.

By studying Engineering Analysis, students develop critical thinking skills, problem-solving abilities, and a strong foundation in mathematical and computational methods, which are essential for success in the field of engineering.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Introduction to Renewable Energy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**RE 301**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	AM		**College**	TEMO	
Module Leader	Firas Aziz Ali		**e-mail**	firasaziz@ntu.edu.iq	
Module Leader's Acad. Title	. Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**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	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 combine 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. Explain about the types of renewable energy resources 2. To make the students understand the working of turbines , and pumps. 3. To make the students understand the operational principle of renewable energy resources. 4. To make the students understanding all about the geothermal, biomass energies 5. To explain the Pumps, Kinds of Pumps 6. Explain the operation of Pumps in series and Parallel, Centrifugal pumps 7. To help students to calculate gas Turbines, Impulse Turbine.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A -</u> Introduction to renewable energy resources, solar energy, wind energy. [15 hrs] Introduction to renewable energy resources, Hydro-electric power plants [15 hrs] Geothermal energy power plants technology [10 hrs] Biomass energy, different resources of biomass materials [15hrs] <u>Part B –</u> Fundamentals - To understand the modern technologies of renewable energy [15 hrs] - Ability to design different types of turbines and compressors [7 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	137	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	9.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
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	20% (20)	3,5,8,9,10 and 12	LO #1, #2,#4,#5 and #6,#7
	Assignments	4	10% (10)	2,4,7and14	LO #3,#4,#6,#7
	Projects / Lab.	5	10% (10)	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	**Traditional energy resources**
Week 2	**Renewable energy, definition and Resources**
Week 3	**Solar energy, solar constant, and Solar radiation at earth`s surface**
Week 4	**Solar angles and solar time**
Week 5	**Global Radiation (Beam and Diffuse) Radiation Components**
Week 6	**Flat plate Solar collector**
Week 7	**Evacuated Tube Collector**
Week 8	**Applications of solar Energy**
Week 9	**Hydro-electric power plant**
Week 10	**Types of Hydraulic Turbines**
Week 11	**Introduction to Wind turbines**
Week 12	**Classification of Wind Turbines**
Week 13	**Introduction to Geothermal Energy**
Week 14	**Ocean Energy Conversion Technologies (Waves, Currents, and Tides)**
Week 15	**Biomass Energy Resources**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction solar radiation measurement instruments
Week 2	Estimating the useful heat or heat gain using solar water heater
Week 3	Estimating the useful heat or heat gain using solar air heater
Week 4	Estimating the amount of Distilled water using solar distillation unit
Week 5	Estimating the useful heat or heat gain using solar chimeny device
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Solar Engineering of Thermal Processes 3rd Edition, 2006	No
Recommended Texts	Solar Energy Engineering Processes and Systems Second Edition, 2014	No
Websites	https://www.linquip.com/ Linquip Content Management 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 301	Introduction to Renewable Energy	8	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	63	137
Description			
A course on Thermal Power Plants . Includes the following sections: 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 6. demonstrate an understanding and familiarity with the State policies, financing and utility-led programs in CT.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Machine Design**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 301**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	PM		**College**	TEMO	
Module Leader	Hussein Mohammed Ali		**e-mail**	E-mail	
Module Leader's Acad. Title	Assist.Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	PM 203	**Semester**	4
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 aim of the module is to enhance students' knowledge and understanding of the mathematics and scientific principles related to mechanics, materials, manufacturing and design processes, and to develop their ability to apply this knowledge in a number of topics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module students should be able to: 1. Demonstrate knowledge and understanding of the mathematics and scientific principles related to the analysis of machine elements, components, and systems. 2. Design and realize a physical system or component to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. 3. Manage the engineering design process, identify, formulate, and solve engineering problems and evaluate outcomes. 4. Demonstrate an ability to communicate effectively and work well on team-based engineering projects. 5. Identify and manage cost drivers applied to the design and selection of components and systems constrained by a brief. 6. Work with technical uncertainty to develop technical solutions. 7. Understand the impact of design decisions on scale up production potential of products and manufacturing unit costs. 8. Conduct a critical analysis of existing product designs taking into account product life cycle considerations. 9. Understand the importance of engineering drawings, especially general assembly and detailed component drawings, as a formal means to communicate technical requirements for assembly and process designs. 10. Present a case for a chosen assembly and process designs for a given product formally and persuasively, including the use of British Standards.
Indicative Contents المحتويات الإرشادية	Indicative Contents: 1. Introduction to Machine Design 2. Definition and scope of machine design 3. Importance of machine design in engineering 4. Factors influencing machine design 5. Overview of the design process

	11. 6. Engineering Materials and their Selection 7. Properties of engineering materials (mechanical, thermal, electrical, etc.) 8. Material selection criteria for machine design 9. Commonly used materials in machine design (metals, polymers, composites) 10. Material testing and characterization 11. Design Considerations and Constraints 12. Functional requirements and specifications 13. Safety factors and design margins 14. Power Transmission Systems 15. Introduction to power transmission 16. Belt and chain drives 17. Gear drives and gear trains

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy for this module is to encourage students to actively participate in exercises and improve their critical thinking skills. We will achieve this through interactive classes, tutorials, and simple experiments that involve sampling activities students find interesting. The goal is to engage students, stimulate their curiosity, and help them develop their ability to think critically and analyze information effectively. By incorporating hands-on activities and encouraging collaboration, students will have the opportunity to apply what they've learned in practical ways. These strategies aim to create an enjoyable and inclusive learning environment that empowers students to become active learners and think critically about the subject matter.

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	(78/15)= 5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	(72/15)= 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**	5	15% (15)	2, 4, 6, 9 and 12	LO #1, #2, #3, #6 and #10,
	Assignments	4	15% (15)	3, 5, 7 and 11	LO #4, #5, #7,#8 and #9
	Projects / Lab.	2	10% (10)	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	Introduction to Machine Design
Week 2	Selection of Materials in Machine Design
Week 3	Design of Piston

Week 4	Design of Cylinder
Week 5	Design of Connecting Rod
Week 6	Design of Crankshaft
Week 7	Design of Belts
Week 8	Design of springs
Week 9	Power Transmitted by a Shaft
Week 10	Design of Flywheel
Week 11	Design of clutch
Week 12	Design of Bearings
Week 13	Design Consideration for a Gear Drive
Week 14	Design of Gears
Week 15	Gear Trains
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to SolidWorks
Week 2	Lab 2: Design of Piston by SolidWorks
Week 3	Lab 3: Design of Connecting Rod by SolidWorks
Week 4	Lab 4: Design of Crank Shaft by SolidWorks
Week 5	Lab 5: Design of Belts by SolidWorks
Week 6	Lab 6: Design of Flywheel by SolidWorks
Week 7	Lab 7: Design of springs by SolidWorks

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Machine Design, R.S.Khurmi and J.K. Gupta.	Yes

Recommended Texts	Budynas, R., Nisbett, J.K., Shigley's Mechanical Engineering Design,McGraw-Hill	No
Websites	https://www.coursera.org/learn/machine-design1	

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 301	Machine Design	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	78	72

Description

Machine design is a complex and intricate process that involves carefully selecting the appropriate materials, shapes, sizes, and arrangements of mechanical components to ensure optimal performance of the intended machine. It encompasses both the creation of innovative new machines and the improvement of existing ones.

In this comprehensive module, students will delve into the world of machine design, acquiring a deep understanding of the mathematical and scientific principles underlying mechanics, materials science, manufacturing techniques, and design processes. They will explore various topics and gain the ability to apply their knowledge and skills in practical scenarios.

Through this course, students will develop a strong foundation in conceptualizing, modeling, and analyzing machines, enabling them to tackle real-world challenges in the field. They will gain proficiency in identifying suitable materials, designing robust and efficient mechanical elements, and ensuring the machine meets the required specifications. By honing their expertise in machine design, students will be equipped to contribute to technological advancements and innovation in diverse industries.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Biofuel**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**RE 303**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	**3**		**Semester of Deliver**		**6**
Administering Department	**PM**		**College**	**TEMO**	
Module Leader	**Ammar Hasan Suhail**		**e-mail**	**ammarsuhail@ntu.edu.iq**	
Module Leader's Acad. Title	**Assistant Lecturer**		**Module Leader's Qualification**		**M. sc.**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	**01/6/2023**		**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	1. Provide an overview of existing energy utilization, production and infrastructure. 2. Cover the consequences of our energy choices on the environment. 3. Introduce the impact of energy on food production and delivery. 4. Examine the growing field of biofuels by introducing the basics of renewable biofuel production.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define Biofuel and identify their applications. 2. Define the food which is used in preparation of biofuel. 3. Preparation of bio hydrogen. 4. Preparation of biogas. 5. Preparation of biodiesel. 6. Preparation of bioethanol. 7. Preparation of biobutanol.
Indicative Contents المحتويات الإرشادية	After studying this chapter, the student is expected to master the following knowledge and skills: 1. Biofuel production, microorganisms, biochemical pathway, and biological approaches [10 hrs]. 2. Biohydrogen and biomethanation production [20 hrs]. 3. Biodiesel, bioethanol, and biobutanol [15]. 4. Reactor configuration [5 hrs]. 5. Microbial Electrochemical Technologies [5 hrs]. 6. Energy analysis [5 hrs].

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The biofuel module employs a range of effective learning and teaching strategies. Students engage in theoretical lectures, practical demonstrations, and hands-on laboratory sessions to grasp the underlying principles and gain practical skills. Case studies and real-world scenarios enhance problem-solving abilities, while group projects foster teamwork and communication skills. Continuous assessment methods, including assignments and practical assessments, ensure students' progress and understanding of the subject matter. The module promotes equipping students with the knowledge and skills necessary for success in the field of biofuel.

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	137	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9
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% (10)	3,6,12 and 14	LO #1,#2,#3,#4, #5,#6and#7
	Assignments	4	10% (10)	2,4,7 and 13	LO #2, #3,#4 and #6
	Projects / Lab.	7	15% (10)	Contentious	All
	Report	0	0		
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1-#4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Biofuels
Week 2	Biofuels Production from Renewable Energy Sources
Week 3	Microorganisms Involved in Biofuel Production Processes
Week 4	Biochemical Pathways for the Biofuel Production
Week 5	Molecular Biological Approaches for the Improvement of Biofuels Production
Week 6	Biohydrogen Production by the Dark Fermentation Process
Week 7	Biohydrogen Production by Photobiological Processes
Week 8	Biomethanation.
Week 9	Bioethanol
Week 10	Biobutanol
Week 11	Biodiesel
Week 12	Microbial Electrochemical Technologies and Their Applications
Week 13	Effect of Reactor Configurations on Gaseous Biofuel Production
Week 14	Scale-up and Case Studies of Biofuel Production Processes
Week 15	Energy and Economic Analysis of Biofuel Production Processes
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Fermentation experiment.
Week 2	Lab 2: Anaerobic digestion experiment.
Week 3	Lab 3: Stem Distillation experiment.
Week 4	Lab 4: Adsorption experiment.
Week 5	Lab 5: Gasification experiment.
Week 6	Lab 6: Liquefaction experiment.
Week 7	Lab 7: Trans esterification experiment.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamental of biofuel production processes, Debabrata Das and Jhansi L. Varanasi Taylor & Francis Group, LLC	Yes
Recommended Texts	Biofuel Technology Handbook, Dominik Rutz & Rainer Janssen WIP Renewable Energies	yes
Websites	https://www.aiche.org/topics/energy/biofuels-energy	

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

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

Module 1

Code	Course/Module Title	ECTS	Semester
RE 303	Biofuel	8	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	2	63	137

Description

Biofuels encompass a range of transportation fuels derived from biomass feedstock. These fuels include ethanol, methanol, butanol, biodiesel, hydrogen, and methane, all obtained through different processes. The combustion of biofuels results in reduced greenhouse gas emissions, minimal acid rain components, no oxygen depletion, and decreased environmental pollution.

Manufacturing biofuels involves various methods, including direct thermal, thermochemical, electrochemical, and biological approaches. These methods allow for the conversion of biomass feedstock into usable fuels, contributing to a more sustainable and environmentally friendly energy sector.

By utilizing biofuels, society can mitigate the impact of fossil fuel consumption on climate change and environmental degradation. The development and utilization of biofuels play a vital role in promoting renewable energy sources and reducing reliance on non-renewable fossil fuels.