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
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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
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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**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:Introduction to Strength of materials
Week 2	Lab 2: Brinell Hardness Test
Week 3	Lab 3: Rockwell Hardness Test
Week 4	Lab 4: Vickers Hardness Test
Week 5	Lab 5: Tensile Test
Week 6	Lab 6: Compression Test
Week 7	Lab 7: Torsion Test
Week 8	Lab 8: Creep Test
Week 9	Lab 9: Spring Stiffness
Week 10	Lab 10: Deflection in Cantilever Beam Test

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

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

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 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	**Engineering Analysis**			**Module Delivery**	
Module Type	**B**			☒ 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	<u>Part A</u> 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] <u>Part B</u> 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 (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 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	**Heat Transfer**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RAC 300**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	3		**Semester of Deliver**	5	
Administering Department	PM		**College**	TEMO	
Module Leader	Omar Mohammed yousif		**e-mail**	Omar.m.yousif@ntu.edu.iq	
Module Leader's Acad. Title	Ass.Lecture		**Module Leader's Qualification**	M.S.C.	
Module Tutor	available		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/10/2023 01/2/2024		**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. Introduce the student to the groups used in heat transfer and to know their composition and how they work. 2. Introduce the student Basic Concepts of Heat Transfer, Heat Transfer Mechanisms, Thermal conductivity –convection heat transfer –Radiation heat transfer 3. Introducing the student the main scientific principle in the field of heat transfer and its application in the Refrigeration, Cooling, and air conditioning fields, power plants . 4. Introducing students how calculation Overall Heat Transfer Coefficient 5. Introducing students study the heat conduction through a large plane wall cylinder and sphere as one dimension steady state case and a multilayer plane walls, cylinders, and spheres medium under steady conditions and unsteady conditions . 6. Providing the student with practical and technical experience in calculating the heat transfer from finned surfaces. 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 Introduce the student Basic Concepts convection heat transfer , viscous flow ,inviscid flow ,laminar boundary layer on flat plate . 9. Introducing students study Forced convection –Empirical relations for pipe and flow over flat plate and across tube banks , Empirical relation for free convection on a vertical and horizontal flat plate , vertical and horizontal cylinders . 10. Introduce the student Type of heat exchanger ,The log mean temperature difference Heat exchangers-The overall heat transfer coefficient . 11. Introduce the student Basic Concepts Radiation heat transfer ,physical mechanism ,Radiation Radiation shape factor, relation between shape factors ,heat exchange between non-black bodies, Infinite parallel planes –radiation shields.
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. 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. 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 . 8. The ability to design heat exchangers.
Indicative Contents المحتويات الإرشادية	After studying this chapter, the student is expected to master the following knowledge and skills: . 1-Basic Concepts of Heat Transfer, and Heat Transfer Mechanisms [10 hrs] 2-Steady State One Dimensional Heat Conduction in a Large Plane Wall, and in a Cylinder [15 hrs] 3-Conduction through Multilayer Plane Wall Overall Heat Transfer Coefficient, Critical Radius of Insulation [15 hrs] 4-Unsteady State One Dimensional heat transfer . [5 hrs] 5-Studying the heat transfer from finned surfaces [10 hrs] 6-force and free convection [20 hrs]. 7- design heat exchangers[15 hrs] . 8- Solve problem of Radiation heat transfer [20 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) خلال الفصل للطالب الحمل الدراسي المنتظم	107	**Structured SWL (h/w)** للطالب أسبوعيا الحمل الدراسي المنتظم	7
Unstructured SWL (h/sem) خلال الفصل الحمل الدراسي غير المنتظم للطالب	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 8	LO #1, #3, #5 and #8
	Assignments	3	10% (10)	2, 6 and 12	LO #2, #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, 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	Overall Heat Transfer Coefficient, Critical Radius of Insulation, Thermal Contact Resistance.
Week 4	Heat transfer from finned surfaces.
Week 5	Transient Heat Conduction, (Lumped System Analysis), Two-Dimensional Steady Heat Conduction
Week 6	Fundamentals of convection –viscous flow –inviscid flow –laminar boundary layer on flat plate , The thermal boundary layer –turbulent flow in the tube .
Week 7	Empirical Equations of Forced convection for Laminar and Turbulent Flow on Flat Plate , across cylinders and sphere
Week 8	Empirical Equations of Forced convection for Laminar and Turbulent Flow across cylinders and sphere
Week 9	Empirical Equations of Forced convection for Laminar and Turbulent Flow inside pipes and ducts .
Week 10	Empirical relation for free convection on a vertical and horizontal flat plate , vertical and horizontal cylinders

Week 11	Introduction to Heat Exchangers, Kinds of Heat Exchangers, The Overall Heat Transfer Coefficient
Week 12	Fouling Factor , The Log Mean Temperature Difference Method
Week 13	The Effectiveness of the heat Exchangers, The Performances for Difference Kinds of the Heat Exchangers
Week 14	Heat Radiation, Introduction, Basic Concepts, Characteristics of Radiation, The View Factor Radiation Heat Transfer Between Two Black Surfaces
Week 15	Radiation Heat Transfer Between Two Gray Surfaces, Radiation Shields and The Radiation Effect
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
RAC 300	**Heat Transfer**	**8**	**5**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	**4**	**107**	**93**
Description			
Heat transfer describes the flow of heat (thermal energy) due to temperature differences and the subsequent temperature distribution and changes. The study of transport phenomena concerns the exchange of momentum, energy, and mass in the form of conduction, convection, and radiation. These processes can be described via mathematical formulas. The fundamentals for these formulas are found in the laws for conservation of momentum, energy, and mass in combination with constitutive laws, relations that describe not only the conservation but also the flux of quantities involved in these phenomena. For that purpose, differential equations are used to describe the mentioned laws and constitutive relations in the best way possible. Solving these equations is an effective way to investigate systems and predict their behavior. Heat transfer science is important in engineering application to determination of the rate of heat transfer at specified temperature difference .To estimate the cost ,the feasibility ,and the size of equipment necessary to transfer a specified amount of heat in a given time a detailed heat transfer analysis must be made .The dimensions of boilers, heaters ,refrigerators ,and heat exchangers depend not only on amount of heat to be transmitted but also on the rate at which the heat is to be transferred under given conditions .The successful operation of equipment components such as turbine blades or the walls of combustion chambers depends on the possibility of cooling certain metal parts by continuously removing heat from surface at rapid rate .A heat transfer analysis must also be made in the design of electric machines ,transformers and bearings to avoid conditions that will cause overheating and damage the equipment .These examples show the importance to understand the basic modes of heat transfer . It is necessary to know the three modes of heat transfer: conduction, convection, and radiation, and to qualitatively understand the mechanism of these modes .			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Refrigeration & Air Conditioning**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒**Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RAC 301**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		Three	**Semester of Deliver**		Five
Administering Department		Power Mechanics - Ref. & AC (RAC)	**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	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. Introduce the student to the groups used in refrigeration and to know their composition and how they work. 2. Introduce the student to selecting and connecting all special pipes and accessories. 3. Introducing the student to the parts of the summer and winter air conditioning cycle, their applications, and load estimation thermal in the field of air conditioning. 4. Introducing students to connecting air-conditioning systems in terms of designing cooling pipes and ducts according to 5. System type of air or water cooling. 6. Introducing students to how to design refrigerated rooms. 7. Introducing the student to the ailments that accompany the process of freezing food. 8. Providing the student with practical and technical experience in calculating free loads and choosing the air conditioning system occasion.
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. 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 air conditioning systems. 3. The ability to think to extract engineering solutions to problems related to air conditioning systems. 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 thermal loads in summer and winter. 7. The ability to design the connecting pipes between the air conditioning system and the rooms. 8. The ability to design refrigerated rooms for use in food preservation. 9. The ability to provide comfortable conditions inside the room without problems such as noise and others. 10. The ability to use experiments and obtain and analyze results.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • BUILDING SURVEY space characteristics and heat load sources [10 hrs] air conditioning load estimate, outdoor loads, internal loads [15 hrs] heat transfer topics, single layered wall, multi layered wall [15 hrs]

	• COOLING LOAD ESTIMATION External Heat Gain, Solar Heat gain Glass, Solar transmission window and door, Solar and Transmission Gain- Walls, and Transmission Gain Roofs and Floors. [15 hrs] • HEATING LOAD ESTIMATION HEAT LOSS- GLASS AND DOORS – HEAT LOSS – WALLS,AND ROOFS, HEAT LOSS -FLOORS elements, Heat Transmission Partition [15 hrs] • DUCT DESIGN BERNOULLI EQUATION, HEAD AND PRESSURE, FLUID RESISTANCE, DUCT DESIGN METHODS [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	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**	4	10% (10)	2, 4, 6, 9 and 13	LO #1, #2, #5, #8 and #10
	Assignments	3	10% (10)	3,5 and 12	LO #3, #4, #6, #7 and #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)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction - Building Survey -Space Characteristics And Heat Load Sources -
Week 2	Air Conditioning Load Estimate, Outdoor Loads, Internal Loads, Heat Transfer Topics, Single Layered Wall, Multi Layered Wall, Heat Gain Through Wall, Equivalent Temperature Difference,
Week 3	Cooling Load Estimation, External Heat Gain, Solar Heat Gain Glass, Solar Transmission Window And Door, Solar And Transmission Gain- Walls, Solar And Transmission Gain Roofs And Floors
Week 4	Internal Heat Gain, Heat Transmission Partition, Heat Gain People, Heat Gain Lights, Heat Gain – Appliances, Heat Gain From Electric Motors, And Infiltration:
Week 5	Heating Load Estimation
Week 6	Duct Design, Bernoulli Equation, Head And Pressure, Fluid Resistance, Friction Losses, Dynamic Losses, Duct Design Methods, Equal Friction Method.
Week 7	Fans, Types of Fans, Fan Laws, Fan Characteristic
Week 8	Water Piping Systems Design, Water Piping Classification, Water Piping System Return Arrangements, Pipe Sizing, Water Piping For Cooling Tower System
Week 9	Pumps, Pump Laws, Pump Sizing, Absolute And Gauge Pressure, Pump Performance Curve

Week 10	Frozen-Food Properties, Thermal Properties Of Frozen Food, Ice Fraction ,
Week 11	Enthalpy, Unfrozen Food, Frozen Food
Week 12	Thermal Conductivity
Week 13	Freezing Time Of Food, Plank's Equation
Week 14	Calculation The Internal Dimension Of Freezer Storage
Week 15	Racking Arrangement , Pallets Arrangement
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Calculation the Capacity of Condenser for Heat Pump
Week 2	Lab 2: Calculating the Cooling Effect in The Heat Pump.
Week 3	Lab 3: Effect of The Types of Expansion Devices on The C.O.P. In The Refrigeration System
Week 4	Lab 4: Cooling Tower
Week 5	Lab 5: Calculation of chilled water refrigeration capacity, With studying the sensible cooling process
Week 6	Lab 6: Study the pressure drop in ducting system accessories
Week 7	Lab 7: Actual refrigeration cycle
Week 8	Lab 8: Processes of Air Conditioned
Week 9	Lab 9: Parallel & Series pumps connection, and the relation between the heads and their flow
Week 10	Lab 10: Calculation of Chiller Load water pump on and off
Week 11	Lab 11: Air Cooler
Week 12	Lab 12: Performance of Air Conditioning Unit with Varies Expansion Devices
Week 13	Lab 13: Sensible heating and cooling
Week 14	Lab 14: Dehumidification of air
Week 15	Lab 15: Type of Fan

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	ASHRAE 2017 (FUNDAMENTALS)	Yes
Recommended Texts	Howell, R. H., Coad, W. J., & Sauer, H. J. (2013). Principles of heating, ventilating and air conditioning. Atlanta, Ga.:	No

	American Society of Heating, Refrigerating and Air-Conditioning Engineers	
Websites	www.BookFi.org , www.ashrae.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.

Undergraduate Courses 2023-2024

Code	Course/Module Title	ECTS	Semester
RAC 301	**Refrigeration & Air Conditioning**	**8**	**5**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	**3**	**108**	**92**
Description			
This subject focuses on HVAC & Refrigeration Systems, covering equipment like piping, ducting, fans, pumps, etc. It includes thermal load estimation and food preservation. By the end of the course, students will: Review refrigeration storage considerations. Understand heat transfer for maintaining comfortable conditions in heating systems. Understand heat transfer for maintaining comfortable conditions in cooling systems. Estimate cooling capacity for rooms, buildings, and cooling coils. Describe the functions of an Air Handling Unit (AHU). Discuss the importance of studying air transmission in air conditioning. Learn about airflow, fan laws, and the interaction between fans and ducts. Understand balance points and general rules for duct design. Classify duct and pipe systems. Familiarize with duct and pipe design methods. This course equips students with the necessary knowledge to comprehend and work with HVAC & Refrigeration Systems, enabling them to analyze and design systems effectively.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Drawing of Refrigeration & Air Conditioning Systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RAC 302**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	**Three**		**Semester of Deliver**	**Five**	
Administering Department	**PM**		**College**	**TEMO**	
Module Leader	**Sohaib Hassan Mohammed**		**e-mail**	**sohaib.hassan.1983@ntu.edu.iq**	
Module Leader's Acad. Title	**Assist. 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	1. To develop student skills, learn and understand design theory through application of techniques. 2. To understand the design and maps cooling systems through a specific circuit 3. This course deals with the basic concepts of different refrigeration system designs. 4. This is the main subject of all engineering plans and designs for refrigeration systems 5. To understand the problems and avoid design errors of cooling systems. 6. To conduct a structured engineering analysis of the systems design process.
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. Learn how to make an engineering diagram of cooling systems. 2. Summarize the design process, the parts of the system, before the implementation process. 3. Discuss the interaction and participation of students in the process of drawing and designing the parts of the system. 4. Give a description of the scheme and design of the main parts of the system. 5. Identify the main parts of the system before starting the design process. 6. Discuss planning processes and details of the design process. 7. Discuss the details of the design process and draw up the drawing plans of the refrigeration systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. It is possible to classify the engineering work for the process of designing refrigeration and air conditioning systems. through the following paragraphs: A- Before the design process, the student makes a manual diagram that shows the shape of each part of the system so that the student can understand the work that he will do [15 hrs]. B- After completing the drawing of the work plan for the design, the student designs each part of the system separately so that the scheme becomes understandable to the student [15 hrs]. C- The student implements the plan on the engineering drawing program specialized in the design process in order to complete the student's vision of the work he is doing [30hrs]. D- When the system design process is fully completed, the student executing the design applies it practically to the building for which it is designed

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**48**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**152**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	10
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**				
	Assignments	4	20% (20)	3, 6, 9 and 12	LO #3, #5, #6 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 Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction - Procedure of architectural drawing.
Week 2	Design and drawing of parts system with accessories of compression refrigeration cycle.
Week 3	Air-handling unit drawing.
Week 4	Cooling tower drawing with accessories.
Week 5	Plan drawing of chilled water.
Week 6	Drawing of suitable control system with air handling unit.
Week 7	Duct design.
Week 8	Intersection in ducts.
Week 9	Plan drawing of a building with duct as a single line.
Week 10	Plan drawing of a building with duct as two lines.
Week 11	Plan drawing of a building with duct with grilles and diffusers.
Week 12	Valves drawing with their symbols.
Week 13	Piping system drawing single pipe, double pipe.
Week 14	**Pipe design of compression refrigeration cycle.**
Week 15	**Water pipe design of compression refrigeration cycle.**
Week 16	**Preparatory week before the final Exam.**

Delivery Plan (Weekly 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	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
RAC 302	Drawing of Refrigeration & Air Conditioning Systems	8	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
0	3	48	152

Description

The course "Drawing of Refrigeration & Air Conditioning Systems" focuses on providing students with the necessary skills to effectively create technical drawings and diagrams related to refrigeration and air conditioning systems. Through this course, students will learn the principles of drawing, including projection methods, dimensioning, and annotations.

The course covers various topics such as drawing components of refrigeration and air conditioning systems, including compressors, condensers, evaporators, and refrigerant lines. Students will also learn about drawing ventilation systems, ductwork, and air distribution components.

Additionally, the course emphasizes the use of computer-aided design (CAD) software and tools for creating accurate and professional drawings. Students will gain practical experience in creating detailed and precise drawings that adhere to industry standards and practices.

By the end of the course, students will be equipped with the necessary skills to produce clear and comprehensive drawings of refrigeration and air conditioning systems, enabling them to effectively communicate design ideas and contribute to the field of HVAC engineering.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Machine Design**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 301**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	Three		**Semester of Delivery**	Six	
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	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	AM203	**Semester**	Four
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 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	
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	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	**Computer Applications**			**Module Delivery**	
Module Type	**Basic**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 302**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		**3**	**Semester of Deliver**		**6**
Administering Department		**PM**	**College**	**TEMO**	
Module Leader	**Dr. Thamir Aun AL Deen M. Sheet Almula**		**e-mail**	**thamir_own@ntu.edu.iq** **thamir_own@yahoo.com**	
Module Leader's Acad. Title		**Lecturer**	**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. To develop students' fundamental knowledge for modeling the mechanical different parts in 2D & 3D. 2. To develop students' fundamental knowledge of insight into drawing the mechanical different parts in 2D & 3D. 3. To understand the basic principles of simulation and creating mechanical parts systems in 2D & 3D using developed design software. 4. This course deals with the basic concept of mechanical drawing. 5. Identify and describe the icons components of a typical insertion of different mechanical parts into different mechanical structures. 6. To explain different important mechanical parts involved in mechanical systems processes. 7. To develop students' fundamental knowledge of analyzing and calculating the important strength of materials factor that is very significant in manufacturing of designed mechanical parts in 2D & 3D.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define mechanical parts and identify their applications. 2. Define and calculate mechanical parts using developed design software. 3. Recognize how to use the icons components of a typical insertion of different mechanical parts. 4. Analyze the important strength of materials factor that is very significant in manufacturing of designed mechanical parts in 2D & 3D. 5. Describe the significance of the accurate successful 2D & 3D designation of mechanical parts in the manufacturing. 6. Identify the employing of the successful 2D & 3D designation way of the mechanical parts in the manufacturing.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Define and show significance, of [Fasteners {Nuts, Screws, Washer}; {Shaft generators: Cylinder, Wrench, thread, gear, chamfer and filet}; {Shaft Component: Roller Bearing, (Key: Parallel and Woodruff Key), Seals}; {Drill Bushing: Assembly Drawing}; { Springs: Compression, Extension and Torsion}; {Deflection Line}; {moment of inertia}]. [10 hours] Calculation and analysis of [Fasteners {Nuts, Screws, Washer}; {Shaft generators: Cylinder, Wrench, thread, gear, chamfer and filet}; {Shaft Component: Roller Bearing, (Key: Parallel and Woodruff Key), Seals}; {Drill Bushing: Assembly Drawing}; {Springs: Compression, Extension and Torsion}; {Deflection Line}; {moment of inertia}]. [10 hours]

	Create, design and inert of [Fasteners {Nuts, Screws, Washer}; {Shaft generators: Cylinder, Wrench, thread, gear, chamfer and fillet}; {Shaft Component: Roller Bearing, (Key: Parallel and Woodruff Key), Seals}; {Drill Bushing: Assembly Drawing}; {Springs: Compression, Extension and Torsion}; {Deflection Line}; {moment of inertia}]. [10 hours]

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (15)	3, 9 and14	LO #1,#3 and #5
	Assignments	2	5% (5)	4 and 15	LO #2 and #6
	Projects / Lab.	14	20% (20)	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	Fasteners: - Nuts - Screws - Washer
Week 2	Shaft generators
Week 3	Cylinder
Week 4	Wrench
Week 5	Thread
Week 6	Gears
Week 7	Chamfer and Fillet
Week 8	Shaft Component
Week 9	Roller Bearing and Bearing calculations
Week 10	Key: Parallel , Woodruff Key
Week 11	Seals
Week 12	Drill Bushing
Week 13	Assembly Drawing
Week 14	Springs: - Compression - Extension - Torsion
Week 15	Moment of Inertia; Deflection Line
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Fasteners: (Nuts, Screws, Washer)
Week 2	Lab 2: Shaft generators.
Week 3	Lab 3: Cylinder.
Week 4	Lab 4: Wrench.
Week 5	Lab 5: Thread.
Week 6	Lab 6: Gears.
Week 7	Lab 7: Chamfer and Fillet.
Week 8	Lab 8: Shaft Component
Week 9	Lab 9: Roller Bearing and Bearing calculations.
Week 10	Lab 10: Key: Parallel, Woodruff Key.
Week 11	Lab 11: Seals.
Week 12	Lab 12: Drill Bushing
Week 13	Lab 13: Assembly Drawing
Week 14	Lab 14: Springs: Compression, Extension and Torsion
Week 15	Lab 15: Moment of Inertia; Deflection Line

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

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

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

Module 1

Code	**Course/Module Title**	**ECTS**	**Semester**
PM 302	Computer Applications	4	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	3	63	37
Description			
The Computer Applications in this level provides students with a comprehensive fundamental knowledge for modeling the mechanical different parts in 2D & 3D. And make them understanding the definition, significance, calculation, analysis, create, design and inert of [Fasteners {Nuts, Screws, Washer}; {Shaft generators: Cylinder, Wrench, thread, gear, chamfer and fillet}; {Shaft Component: Roller Bearing, (Key: Parallel and Woodruff Key), Seals}; {Drill Bushing: Assembly Drawing}; {Springs: Compression, Extension and Torsion}; {Deflection Line}; {moment of inertia}]. As well as identifying and description the icons components of a typical insertion of different mechanical parts into different mechanical structures. Also enhancing and developing the student's capability for following the right steps in mechanical design and analysis the different mechanical parts into different mechanical structures with simulating the strength of material important parameters for accurate design performing.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Electrical and Electronic Engineering**			**Module Delivery**	
Module Type	**Basic**			**☒ Theory**	
Module Code	**PM 303**			**☐ Lecture**	
ECTS Credits	**6**			**☐ Tutorial**	
SWL (hr/sem)	**150**			**☒ Practical**	
				☐ Seminar	
Module Level	**3**	**Semester of Deliver**	**6**		
Administering Department	**PM and AM**	**College**			
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**		
Module Leader's Acad. Title	**Assist. Prof**	**Module Leader's Qualification**	**M.Sc**		
Module Tutor	**Prof. Dr. Haitham M. Wadullah**	**e-mail**	**Dr.haitham@ntu.edu.iq**		
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** Building a foundation for studying electrical calculations in both AC and DC circuits, and familiarizing students with the various theories used in these calculations **.2** Gaining a comprehensive understanding of electrical principles and concepts, such as voltage, current, resistance, and power. This knowledge will be applied to the analysis of electrical circuits and systems

	Developing practical skills in electrical measurements and testing by using various instruments and equipment. Students will learn how to accurately measure electrical parameters, interpret the results, and troubleshoot electrical systems **.3** Applying the acquired knowledge to the operation and maintenance of electrical machines, including motors and generators. Students will also explore the fundamentals of power systems, including power generation, transmission, and distribution. **.4**
Module Learning Outcomes	Mastery of electrical circuit theory: Students will acquire a comprehensive understanding of the fundamental principles of electrical circuit theory, encompassing key concepts such as voltage, current, resistance, and power. They will be proficient in applying this knowledge to analyze and solve basic electrical circuits. **.1** Proficiency in electrical measurements and testing: Students will develop expertise in utilizing electrical instruments and equipment for precise measurements and thorough testing of electrical parameters. They will learn to interpret measurement outcomes accurately and effectively troubleshoot electrical systems to identify and rectify faults. **.2** Application of electrical machines and power systems: Students will explore the principles and workings of electrical machines, including motors and generators, gaining insight into their applications and performance characteristics. Additionally, they will develop a foundational understanding of power systems, encompassing power generation, transmission, and distribution aspects, enabling them to comprehend the broader context of electrical engineering. **.3**
Indicative Contents	Part A: Fundamentals of Electrical Principles, Measurements, and Instruments [20 hours] Introduction to Electrical Machines, Power Systems, Safety, and Direct Current Circuits [20 hours] Revision Session and Quiz [1.5 hours] Part B: 4. Alternating Current Circuits, Circuit Theory, and Analogue Electronics [20 hours] Control Systems, Renewable Energy, Troubleshooting, and Maintenance [10 hours] Revision Session and Quiz [1.5 hours] Revised Description: Part A of the course focuses on building a strong foundation in electrical engineering. Students will start by understanding the basic principles of

	electricity, along with electrical measurements and the use of instruments. They will then explore electrical machines, power systems, and safety considerations in the context of direct current circuits. A revision session and quiz will help reinforce the learned concepts.

Learning and Teaching Strategies	
Strategies	**.1** Active Participation: Actively participate in class discussions to engage with the subject matter and deepen your understanding. **.2** Problem-Solving Skills: Develop and enhance your problem-solving skills, as they are essential in Electrical and Electronic Engineering. **.3** Practical Application: Gain hands-on experience through laboratory sessions and projects, allowing you to apply theoretical concepts to real-world scenarios. **.4** Collaborative Learning: Foster collaborative learning by actively engaging in group discussions and study sessions with your peers. **.5** Utilize Learning Resources: Make effective use of various resources such as textbooks, online tutorials, video lectures, and educational websites to supplement your learning and broaden your knowledge. **.6** Time Management: Manage your time effectively by creating a study schedule and dedicating specific time slots for studying Electrical and Electronic Engineering. **.7** Regular Review and Recap: Continuously review previously covered topics to reinforce your understanding and ensure long-term retention of the learned material.

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

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

Delivery Plan (Weekly Lab. Syllabus)

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

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	**.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
AM 303	**Electrical and Electronic Engineering**	**6**	**3**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**2**	**78**	**72**

Description

Electrical and Electronic Engineering is a dynamic and rapidly evolving field that focuses on the study, design, and application of electrical systems, devices, and technologies. This discipline plays a critical role in shaping the modern world, as it encompasses a wide range of areas, including power generation and distribution, communication systems, electronics, control systems, and renewable energy.

In Electrical and Electronic Engineering, students delve into the fundamental principles of electricity, circuits, and electromagnetism. They learn how to analyze and design electrical systems, apply mathematical and scientific principles to solve complex problems, and utilize advanced tools and software for simulation and modeling.

The field emphasizes hands-on experience through laboratory work, where students gain practical skills in building, testing, and troubleshooting electrical circuits and devices. They also explore emerging technologies, such as renewable energy sources and sustainable power systems, to address the growing demand for cleaner and more efficient energy solutions.

Through their studies, students develop a strong foundation in engineering principles, critical thinking, problem-solving, and project management. They become adept at designing, implementing, and maintaining electrical and electronic systems that are safe, reliable, and sustainable. Graduates of Electrical and Electronic Engineering programs find diverse career opportunities in industries such as power generation, telecommunications, electronics, automation, and research and development.

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Numerical Analysis**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 304**				
ECTS Credits	**6.00**				
SWL (hr/sem)	**150**				
Module Level	**3**	**Semester of Deliver**		**6**	
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 numerical concepts and techniques used in numerical 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 Numerical 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 Numerical Analysis tasks, demonstrating competence in utilizing computational tools for problem-solving.
Indicative Contents المحتويات الإرشادية	<u>Part A</u> Introduction, Mathematical Analysis, Numerical Differentiation and Integration **[20 hr.]** Numerical Solutions of Ordinary Differential Equations, Systems of Linear Equations **[20 hr.]** Revision problem classes and quiz **[3 hrs]** <u>Part B</u> Eigenvalues and Eigenvectors**,** Numerical Methods in Probability and Statistics**,** Numerical Methods for Control Systems **[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 Numerical Analysis. This includes grasping the Numerical techniques and numerical methods commonly used in the field. 2. Practice problem-solving: Numerical 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 Numerical 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 Numerical Analysis; numerical analysis and its applications in engineering, Sources of error in numerical computations
Week 2	Numerical Methods for Solving Equations; Bisection method, Newton-Raphson method, Secant method
Week 3	Interpolation and Approximation; Polynomial interpolation, Lagrange interpolation, Least squares approximation
Week 4	Numerical Differentiation and Integration; Forward, backward, and central difference approximations, Trapezoidal rule, Simpson's rule
Week 5	Numerical Solutions of Ordinary Differential Equations; Euler's method, Runge-Kutta methods, Multistep methods
Week 6	Systems of Linear Equations; Direct methods: Gaussian elimination, LU decomposition, Iterative methods: Jacobi method, Gauss-Seidel method=
Week 7	Eigenvalues and Eigenvectors; Power method, QR method
Week 8	Numerical Solutions of Partial Differential Equations; Finite difference methods, Finite element methods
Week 9	Numerical Optimization; Unconstrained optimization: Golden section search, Newton's method, Constrained optimization: Linear programming, quadratic programming
Week 10	Numerical Methods for Data Analysis; Curve fitting, Statistical regression
Week 11	Numerical Methods in Probability and Statistics; Monte Carlo simulation, Numerical integration of probability density functions
Week 12	Numerical Methods for Signal Processing; Discrete Fourier transform, Fast Fourier transform
Week 13	Numerical Methods for Image Processing; Image enhancement techniques, Image restoration methods
Week 14	Numerical Methods for Control Systems; Numerical simulation of control, systems, Model predictive control
Week 15	Review and Project Presentations
Week 16	Preparatory week before the final Exam

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

Week 1	Lab 1: Introduction to Numerical Analysis and MATLAB.
Week 2	Lab 2: Numerical Methods
Week 3	Lab 3: Interpolation and Curve Fitting
Week 4	Lab 4: Numerical Integration
Week 5	Lab 5: Numerical Solutions of Ordinary Differential Equations
Week 6	Lab 6: Systems of Linear Equations
Week 7	Lab 7: Numerical Solutions of Partial Differential Equations; Finite difference methods, Finite element methods

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. "Numerical Analysis" by R. L. Burden and J. D. Faires: This book covers fundamental numerical methods and their applications in a concise and accessible manner. 2. "Numerical Methods for Engineers" by S. C. Chapra and R. P. Canale: This textbook focuses on the practical aspects of numerical analysis and provides a wide range of examples and exercises.	**No**
Recommended Texts	1. "Numerical Analysis: Mathematics of Scientific Computing" by D. Kincaid and W. Cheney: This book emphasizes the mathematical foundations of numerical methods and includes rigorous analysis of algorithms. 2. "Numerical Recipes: The Art of Scientific Computing" by W. H. Press et al.: This popular book provides a comprehensive collection of numerical algorithms, along with code implementation in various programming languages.	**No**
Websites	1. (https://www.mathworks.com/) 2. (http://www.numericalmethods.eng.usf.edu/) 3. (https://www.engineering.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.				

Module 1

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

Numerical Analysis is a field of study that focuses on developing and analyzing algorithms for solving mathematical problems using numerical methods. It involves the use of computational techniques to approximate solutions to complex mathematical equations and problems that are difficult or impossible to solve analytically.

In this course, students will learn fundamental numerical algorithms and techniques such as interpolation, numerical integration, numerical solution of differential equations, and numerical linear algebra. They will gain a solid understanding of the theoretical principles behind these methods and develop practical skills in implementing them using programming languages such as MATLAB.

Through theoretical lectures, practical exercises, and computer-based assignments, students will learn how to analyze the accuracy and efficiency of numerical methods, and how to choose appropriate algorithms for specific problem scenarios. This course will equip students with the necessary tools to solve a wide range of engineering and scientific problems that involve complex mathematical computations.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Maintenance of Refrigeration & Air Conditioning Systems**		**Module Delivery**		
Module Type	**Core**		☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**		
Module Code	**RAC 303**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	1		**Semester of Delivery**	6	
Administering Department	PM		**College**	TEMO	
Module Leader	Suhab Hassan Prepared by Bahgat hassan		**e-mail**	ntu.edu.iq	
Module Leader's Acad. Title	.subject Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**e-mail**	Sohaib.hassan.1983@ntu.edu.iq	
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. **The student recognizes the necessary experience to operate**. 2. **The student recognizes the necessary experience to operate maintenance of Heating Ventilating**) 3. **The student recognizes the necessary experience to operate Air Conditioning equipment.** 4. **The student recognizes the necessary experience from theoretical and practical lectures**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 2. Knowledge of all public and public safety laws, regulations, legislation, and rules. 3. The ability to know and use refrigeration and air conditioning tools and equipment in the correct and safe manner. 4. The ability to solve problems related to refrigeration and air conditioning systems 5. Full understanding of refrigeration and air conditioning systems, and the ability to install, maintain, and repair them.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A -</u> Introduction to tool, material and instrument, external maintenance and charging domestic refrigerator, electrical circuit of window air condition, maintenance Automobile air conditioning**,** Split units. [15hrs] Maintenance of fans, inspection of fan-coil unit, Maintenance of reciprocating cooling water equipment, Maintenance of centrifugal cooling water equipment , Maintenance of the tower packages [15 hrs] Maintenance of water pumps Maintenance of the boiler, Maintenance of air washer units [10 hrs] Practical visitation to workshop of domestic cooling equipment**.** [6hrs] <u>Part B –</u> Fundamentals . To understand inspection of the electrical components,, cleaning of the tower, Maintenance of mixing boxes [15 hrs] Remote Split units, inspection, operation, maintenance, Different inspections on electrical circuit for automobile air conditioning equipment, Replacing the components of window air-conditioner [7 hrs]

	maintenance of electrical circuits, installing with domestic equipment, evacuating and charging [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	122	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	3 and 12	LO #1, #2 and #10, #11
	Assignments	-	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	3	20% (20)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	3hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Tools, materials and instruments employed for inspection and measurement
Week 2	Maintenance of domestic refrigerator
Week 3	Water cooler, electrical and mechanical circuits, maintenance of electrical circuits, installing with domestic equipment.
Week 4	Windows air-conditioner, mechanical components, maintenance of electrical circuit.
Week 5	Automobile air conditioning equipment, cleaning and maintenance
Week 6	Split units (single phase and three phases), mechanical components, maintenance and replacing mechanical components
Week 7	Maintenance of fans, fan motors and heating and cooling coils, filters and maintenance of air handling equipment
Week 8	Maintenance of reciprocating cooling water equipment that used reciprocating for air conditioning purposes.
Week 9	Maintenance of absorption refrigeration equipment.
Week 10	Inspection of electrical circuit, cleaning of contact points for conductors, inspection and regulation of controls.
Week 11	Maintenance of the tower packages, replacing the circulation packages, replacing belts, justice belts and cleaning the water
Week 12	Maintenance of water pumps,disassembly of pump and maintenance of internal components, maintenance of electrical motor.
Week 13	Maintenance all parts of central air g conditioning equipment (starter, cleaning of shields, increasing the current for each motor).
Week 14	Maintenance of air washer units and evaporative cooling units
Week 15	Practical visitation to workshop of domestic cooling equipment.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Maintenance of domestic refrigerator
Week 2	Maintenance of Windows air-conditioner
Week 3	Maintenance of Automobile air conditioning equipment
Week 4	Maintenance of fans
Week 5	Maintenance of the cooling tower
Week 6	Maintenance of Split units
Week 7	Maintenance of air washer units

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	HVAC and Refrigeration Preventive Maintenance 1st Edition	No
Recommended Texts	Fundamentals 0f engineering thermodynamics, Michael J. Moran and Howard N. Shapiro, Fifth adition	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
RAC 303	Maintenance of Refrigeration & Air Conditioning Systems	8	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	122
Description			
A course on Maintenance of Refrigeration & Air Conditioning Systems s the following sections: 1. Introducing students to defined the tools, materials and instruments 2. To understand the Maintenance of domestic refrigerator 3. To help the student to maintenance Windows air-conditioner 4. To explain to maintenance disassembly compressor of automobile air conditioning equipment 5. To maintenance Remote Split units 6 To maintenance fans of motors 7. Maintenance of water pumps 8 To explain the student to clean and Maintenance of cooling towers			

MODULE DESCRIPTION FORM
نموذج وصف المادة الدراسية

Module Information					
Module Title	**Methodology of Scientific Research**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**NTU 400**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		**4**	**Semester of Deliver**		**7**
Administering Department		**PM**	**College**	**TEMO**	
Module Leader	**Haitham M. Wadullah**		**e-mail**	**Dr.haitham@ntu.edu.iq**	
Module Leader's Acad. Title		**Professor**	**Module Leader's Qualification**		**Ph.D.**
Module Tutor	**Tariq Al-Khalidi (اسم المرشد)**		**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			
Prerequisite module	**None**	**Semester**	
Co-requisites module	**None**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1. To Understand the significance of scientific research and its role in advancing knowledge. 2. To Identify the key characteristics of scientific research. 3. This course deals with the basic concept of Formulate research questions and objectives. 4. This is the basic subject for all ethical considerations in scientific research 5. Recognize the importance of conducting a literature review in research. 6. Familiarize with quantitative and qualitative data collection methods. 7. Understand the principles of experimental design.
Module Learning Outcomes	1. Understand the nature and significance of scientific research. Identify the characteristics and principles of scientific research. Demonstrate an awareness of ethical considerations in scientific research. 2. Recognize between various research designs. 3. List the various Formulate clear research questions and objectives 4. Summarize what is literature review to identify relevant research articles. 5. Discuss and evaluate the credibility and relevance of research articles. 6. Design experiments that maximize internal and external validity. 7. Determine the appropriate sample size for a survey based on research objectives. 8. Demonstrate proficiency in employing different approaches to qualitative research. 9. Recognize and apply ethical principles and guidelines in research involving human subjects 10. Communicate research results in a clear and concise manner to different audiences. 11. Formulate a clear and concise research problem statement.
Indicative Contents	Indicative content includes the following. Part A - Definition and significance of scientific research [5 hrs.] Part B- Research Problem Formulation [5 hrs.] Part C- Research Design and Methodology [5 hrs.] Part D- Literature Review [5 hrs.] Part E- Data Collection and Measurement [5 hrs.] Part F- Homework and Discussion [7 hrs.]

Learning and Teaching Strategies	
Strategies	Studying the Methodology of Scientific Research requires a combination of active learning strategies and focused study techniques, such as; **Read the Course Materials, Engage in Discussions, Take Detailed Notes, Practice with Examples, Review and Summarize, Create Visual Aids, and Work on Exercises and Assignments**

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	**(68/15)= 5**
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**	**2**	**10% (10)**	**5 and 10**	**LO #1, #2 and#9 #10, #11**
	Assignments	**2**	**10% (10)**	**2 and 12**	**LO #3, #4 and #6, #7**
	Projects / Lab.	**1**	**10% (10)**	**Continuous**	**All**
	Report	**1**	**10% (10)**	**13**	**LO #5,#8**
Summative assessment	**Midterm Exam**	**2hr.**	**10% (10)**	**7**	**LO #1 - #7**
	Final Exam	**2hr.**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to Scientific Research
Week 2	Research Design
Week 3	Literature Review
Week 4	Data Collection Methods
Week 5	Data Analysis
Week 6	Experimental Design
Week 7	Survey Design and Sampling
Week 8	Qualitative Research Methods
Week 9	Ethics in Scientific Research
Week 10	Data Interpretation and Presentation
Week 11	Peer Review and Publication Process
Week 12	Research Proposal Writing
Week 13	Project Management and Time Planning
Week 14	Presentations and Research Conferences
Week 15	Research Ethics Review and Course Wrap-up
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	**No**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. "Research Design: Qualitative, Quantitative, and Mixed Methods Approaches" by John W. Creswell and J. David Creswell 2. "The Craft of Research" by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams 3. "Research Methodology: A Step-by-Step Guide for Beginners" by Ranjit Kumar	**Yes**
Recommended Texts	Academic Databases: Utilize academic databases such as PubMed, Google Scholar, JSTOR, and IEEE Xplore to search for research papers in the methodology of scientific research. Use relevant keywords such as "research methodology," "scientific research design," or specific methodologies you are interested in (e.g., "qualitative research methods," "experimental design").	**No**
Websites	**(www.socialresearchmethods.net)** **(www.researchmethodology.org)** **(www.qualres.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
NTU 400	**Methodology of Scientific Research**	**4**	**7**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**0**	**32**	**68**

Description

The description for the Methodology of Scientific Research is:

The Methodology of Scientific Research refers to the systematic and rigorous approach employed in conducting scientific investigations and acquiring knowledge. It encompasses the principles, techniques, and procedures used to design, implement, and analyze scientific studies. This field of study focuses on the various methods and tools employed in gathering and interpreting data, ensuring the reliability and validity of research findings. Methodology of Scientific Research involves making informed decisions regarding research design, selecting appropriate data collection methods, and applying statistical techniques for data analysis. It also includes ethical considerations in research, such as protecting participants' rights and ensuring research integrity. A solid understanding of the Methodology of Scientific Research is essential for researchers and scientists to generate credible and reliable results, contribute to the advancement of knowledge, and address complex research questions in diverse disciplines.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Thermal Power Plants**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 400**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	PM		**College**	TEMO	
Module Leader	Bahjat Hassan alyas		**e-mail**	Bahjat.me@ntu.edu.iq	
Module Leader's Acad. Title	. Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**e-mail**	Bahjat.me@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	None	**Semester**	
Co-requisites module	None	**Semester**	

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

Module Objectives أهداف المادة الدراسية	1. Power plant engineering deals with the study of energy, , its sources and utilization of energy for power generation. 2. The power is generated by prime movers (example Hydraulic turbines, steam turbines, diesel engines) 3. Large amount of power is generated using prime movers in a site or layout called power plants, where all the equipment and machineries required for power generation is located 4. Energy may be defined as the capacity to do work. Energy exists in various forms, such as Mechanical Energy, thermal energy, electrical energy, solar energy etc 5. Energy may be defined as the capacity to do work. Energy exists in various forms, such as Mechanical Energy, thermal energy, electrical energy, solar energy etc
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Explain about the plant steam cycles 2. To make the students understanding Binary cycle working on mercury and steam, combine condenser 3. To make the students understanding Combustion and Fuels 4. Enables the students to learn Steam Condensers, Kinds, Direct Contact Condensers, Surface Condenser 5. To make the students understanding all about the Steam Nozzles, Applications 6. To explain the Pumps, Kinds of Pumps 7. Explain the operation of Pumps in series and Parallel, Centrifugal pumps 8. To help student how to calculate Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency 9. To help students understanding how to solve the water treatment and testing in boiler
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A -</u> Introduction to power cycle, Carnot cycle, Rankin cycle ideal and actual, Rankin cycle with reheat. [15 hrs] Open feedwater heater and close feedwater heaters, binary cycle, combine cycle[15 hrs] Steam condenser are direct and indirect contact, the efficiency of steam condenser [10 hrs]

	Fuel and combustion, and how to calculate the air to fuel ratio [15 hrs] Calculate the heat of combustion [6hrs] Part B – Fundamentals . To understand the diagram of nozzle converge- diverge nozzles, Applications v [15 hrs] System Characteristics, Pumps Characteristics, Matching Pumps to System Characteristics. [7 hrs] Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency. Water Treatment and Testing [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	97	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10% (10)	3,6 and 9, 14	LO #2, #3 and #7, #8
	Assignments	5	10% (10)	1, 5, 7 and 12, 15	LO #1, #4 ,#5and #6, #9
	Projects / Lab.	7	20% (20)	Continuous	All
	Report				
Summative assessment	Midterm Exam	3hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introductions ,Plant steam cycles, main cycles
Week 2	reheat cycle , Regenerative cycle, open feed water heater
Week 3	closed feed water heaters , combine cycles
Week 4	Binary cycle working on mercury and steam, combine condenser
Week 5	Combustion and Fuels
Week 6	Correct Air/Fuel Ratio
Week 7	Steam Condensers, Kinds
Week 8	Direct Contact Condensers, Surface Condenser
Week 9	Design and Manufacturing, Efficiency of the Condensers
Week 10	Steam Nozzles, Applications
Week 11	The Pumps, Kinds of Pumps,
Week 12	System Characteristics, Pumps Characteristics, Matching Pumps to System Characteristics
Week 13	Operation of Pumps in series and Parallel, Centrifugal pumps
Week 14	Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency
Week 15	Water Treatment and Testing

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction of boiler
Week 2	Boiler feed water repeated for times with variable inputs
Week 3	To calculate the efficiency of steam condenser
Week 4	Air to fuel ratio of combustion
Week 5	To calculation the power of pumps kinds
Week 6	The steam nozzle repeated for times with variable inputs
Week 7	Water treatment in boiler

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

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (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 400	Thermal Power Plants	7	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	97

Description

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

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

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

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

4. To explain steam condenser explain the types of condensers

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

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

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

8. How to use the combustion charts.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Refrigeration Systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RAC 401**				
ECTS Credits	**7**				
SWL (hr/sem)	175				
Module Level		**Four**	**Semester of Deliver**		**Seven**
Administering Department		PM	**College**	TEMO	
Module Leader	Hareth Maher Abd		**e-mail**	harethmaher@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Prof.	**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	1. To enhance the student's knowledge of the various refrigeration systems. 2. To understand the working principle of various refrigeration systems. 3. Understanding how to choose the best refrigeration system for each application. 4. To emphasize the students' understanding of the fundamentals and analyses of refrigeration systems that use vapor compression. 5. To be able to compute the overall heat transfer coefficients, heat transfer, and pressure drop for the fluid flow in heat exchanger tubes and shells. 6. To emphasize the students' knowledge of the analysis and calculation of various refrigeration systems. 7. To comprehend the liquefaction of gasses and cryogenic refrigeration
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 the air refrigeration system works and how it can compute its performance. 2. Discuss the absorption refrigeration systems' work and analyses. 3. To emphasize the students' knowledge of the principles and analysis of steam jet refrigeration. 4. Describe the components of the heat pipe and illustrate how it works. 5. Describe the components of the Vortex tube and illustrate how it works. 6. Recognize how the performance of each component is influenced by other components when change is occur in the operation condition 7. Identify the correct use of materials and equipment components in the various systems. 8. Evaluate the amount of liquefied air mass ratio under different methods of the cooling system.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Types of Refrigeration Systems [20 hrs] Expansion devices [15 hrs] Steam jet refrigeration [10 hrs] Absorption System Types and Characteristics [15 hrs] Air refrigeration system [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	82	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	3,8 and 12	LO #1, #2,#3,#4,and #6,#7
	Assignments	3	10% (10)	6,9 and 14	LO #6,#7and #8
	Projects / Lab.	15	20% (20)	Continuous	All
	Report	0	0% (0)	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	Condensers and evaporator types as heat exchangers.
Week 2	Determine the condenser capacity, heat transfer rate, condensing coefficient, and fouling factor.
Week 3	Evaporators, Boiling in the shell, boiling inside the tube, and frosting.
Week 4	Expansion devices: Purpose and types of expansion devices, capillary tube, selection of capillary tube.
Week 5	Absorption refrigeration system: relation between vapor compression and absorption refrigeration units, the absorption refrigeration system, temperature, and concentration properties of LiBr-water solution, calculations of mass flow rates in the absorption cycle, enthalpy of LiBr-water solutions, thermal analysis of simple cycle,
Week 6	Absorption cycle with heat exchanger, crystallization, capacity control, aqua-ammonia system.
Week 7-8	Steam jet refrigeration: system components, working, and analysis of steam jet refrigeration system and determine the coefficient of performance of the system.
Week 9	Cryogenic and liquefaction of gasses: Cryogenic, Joule-Thomson effect, air liquefaction by Hopson system (Joule-Thomson expansion) and Claude system.
Week 10	Compound Vapour Compression System and cascade system.
Week 11	Vortex tube: Types and working principle.
Week 12	Heat Pipe: Types and working principle.
Week 13	Air refrigeration system: the working principle of the cycle
Week 14	Air refrigeration system calculation.
Week 15	**The preparatory week before the final Exam.**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Types of condensers and evaporators that are used in the lab. and how to calculate the area of the condenser
Week 2	Find the Log Mean Temperature Difference (LMTD) through the condenser unit.
Week 3	Calculate the overall heat transfer coefficient of the condenser (U).
Week 4	know the difference between the kinds of expansion devices that are used in the lab and study the effect of capillary tubes diameter on refrigerator performance by using refrigerant R134a
Week 5	Test the thermoelectric refrigerator under different power inputs.

Week 6	Measure theoretically and experimentally the amount of make-up water and the performance of the cooling tower
Week 7	know how the absorption Refrigerator system works and calculate the maximum coefficient of performance of the system.
Week 8	Understand the ESS program and how to use it in different refrigeration systems calculations.
Week 9	Use the ESS program to calculate the performance of compound compression with a water intercooler
Week 10	Use the ESS program to calculate the performance of compound compression with Liquid Refrigerant Intercooler
Week 11	Use the ESS program to calculate the performance of compound compression with Flash Gas Intercooler
Week 12	Use the ESS program to calculate the performance of compound compression with multi evaporator Systems that operate at the same temperature
Week 13	Use the ESS program to calculate the performance of compound compression with multi evaporator Systems using multiple expansion valves and back pressure valves system
Week 14	Use the ESS program to calculate the performance of compound compression with multi-evaporator systems using Individual expansion valve and back pressure valves system
Week 15	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- Refrigeration and Air Conditioning by W. F. Stoecker and J. W. Jones 2- A textbook of Refrigeration and Air Conditioning by R. S. Khurmi and J. K. Gupta	Yes
Recommended Texts	ASHRAE Handbook -- Fundamentals SI Edition by ASHRAE	Yes
Websites	http://www.learnhvac.org/	

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

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

Code	Course/Module Title	ECTS	Semester
RAC 401	Refrigeration Systems	7	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	3	93	82
Description			
This model aims to enhance the student's knowledge of the principles of vapor compression refrigeration systems and their analysis, also studying types of refrigeration units and cryogenic refrigeration. As well as the refrigeration system is a group of components used for cooling and sometimes heating. In most cases, it involves the use of a thermodynamic cycle in which there is a flow of heat from one place to another. In simpler terms, it's a system that can cool and maintain temperatures within a given range. It's usually mechanical but can also be achieved by using simple means such as using water or any other liquid to lower the temperature. In this course, we will learn about different types of refrigeration systems and their functions. This will teach us how refrigerators work.			

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	**RAC 402**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	four		**Semester of Delivery**	Seven	
Administering Department	PM		**College**	TEMO	
Module Leader	Asmaa taha hussen		**e-mail**	asmaa.taha@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**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 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 introductions in 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 how to calculate gas Turbines, Impulse Turbine.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - 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 [15 hrs] Part B – 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	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	3,9,10 and 12	LO #1, #2,#3,#4,#5#6 and #7
	Assignments	6	10% (10)	2,4,5,8 ,10 and 14	LO #2, #3,#4,#5, and #6, #7
	Projects / Lab.	11	20% (20)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	3hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**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	
Week	**Material Covered**
Week 1	**Estimating the useful heat or heat gain using solar water heater**
Week 2	**Estimating the useful heat or heat gain using solar air heater**
Week 3	**Estimating the amount of Distilled water using solar distillation unit**
Week 4	**Estimating the useful heat or heat gain using solar chimeny device**
Week 5	**Kaplan turbine rig test**
Week 6	**Pelton turbine rig test**
Week 7	**zero-head turbine**
Week 8	**Open channel with zero head flow turbine rig test (ocaen wave generator)**

Week 9	**Photovoltaic power generation rig-part 1**
Week 10	**biomass energy**
Week 11	**power cell experiment**

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
RAC 402	Introduction to Renewable Energy	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	2	63	87

Description

A course on Introduction to renewable energy. 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	**Principles of Air Conditioning Systems Design**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RAC 403**				
ECTS Credits	**6**				
SWL (hr/sem)	150				
Module Level		**Four**	**Semester of Deliver**		**Seven**
Administering Department		PM	**College**	TEMO	
Module Leader	Omar Sadoon Khaleel		**e-mail**	omarsadoon@ntu.edu.iq	
Module Leader's Acad. Title		Assist. Lecturer	**Module Leader's Qualification**		M.Sc.
Module Tutor	Name (if available)		**e-mail**	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 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 types of air conditioning systems. 2. To understand how to select the best A/C system for each application. 3. To understand the basic processes for refrigeration and air conditioning systems. 4. To understand the air properties and how to use a psychrometric chart to draw each process. 5. To understand types of air distribution within each zone. 6. To understand advanced air duct design. 7. To understand how to select the best air diffuser with all accessories.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Demonstrate the ability to do technical work in a variety of heating, cooling, and refrigeration fields. 2. Identify and describe various components in a typical air-conditioning system. 3. Identify and demonstrate correct use of tools, materials, and equipment used in the trade. 4. Evaluate a motor in a hermetic compressor to determine if it is electrically sound and safe to start. 5. Follow the circuit of a typical electric air-conditioning system. 6. Take wet-bulb and dry-bulb temperature readings and determine relative humidity from the psychometrics chart. 7. Use information to determine the level of comfort from the ASHRAE generalized comfort chart.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Types of Air Condition System** [20 hrs] **Advanced Air Duct Design** [15 hrs] **Air Distribution** [10 hrs] **Fan Types and Characteristics** [15 hrs] **Air Filtration** [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	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
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 #3,#4and #5, #6
	Assignments	2	10% (10)	2 and 14	LO #4 and, #7
	Projects / Lab.	15	20% (20)	Continuous	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 - Air conditioning systems, Types of air conditioning systems for building.
Week 2	All - air systems, single duct, types, advantages and disadvantages. Single zone system, variable volume, advantages and disadvantages.
Week 3	Air handling unit advantages and disadvantages, Fan coil units advantages and disadvantages.
Week 4	Dual duct systems, multiple zone, advantages and disadvantages.
Week 5	Air - water systems, characteristics and advantages and disadvantages for each type and comparison with other systems, approaches of components selections. Induction systems, advantages and disadvantages
Week 6	All - water systems, performance, designs and applications. Useful pictures for each A/C system.
Week 7	Method of design air duct, Air duct system resistance.
Week 8	Static and dynamic pressure losses calculations, Fan total pressure estimate.
Week 9	Air distributed inside the room, Air distributes requirements inside the rooms.
Week 10	Ventilation apertures, How to select the air diffuser, Types of air diffuser with picture.
Week 11	Fans design and its selection, Fans types and its calculations.
Week 12	Selection of fans for design, Fan's laws.
Week 13	Filter types and its employment.
Week 14	Air impurities, How to select the air filter.
Week 15	HEPA filter with application, Modern air filter.
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 with specification
Week 3	Lab 3: Estimation static pressure losses in the flexible duct
Week 4	Lab 4: Estimation total pressure losses in the flexible duct
Week 5	Lab 5: Estimation static pressure losses in the smooth duct
Week 6	Lab 6: Estimation total pressure losses in the smooth duct
Week 7	Lab 7: Comparison of static pressure losses within different duct metal
Week 8	Lab 8: Comparison of dynamic pressure losses within different duct metal
Week 9	Lab 9: Comparison of total pressure losses within different duct metal
Week10	Lab 10: Estimation the static pressure losses within sharp and smooth elbow fitting
Week 11	Lab 11: Estimation the dynamic pressure losses within sharp and smooth elbow fitting
Week 12	Lab 12: Estimation the total pressure losses within sharp and smooth elbow fitting
Week 13	Lab 13: Effect of air velocity on the static pressure losses
Week 14	Lab 14: Effect of air velocity on the dynamic pressure losses
Week 15	Lab 15: Effect of air velocity on the total pressure losses

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	ASHRAE Fundamentals Handbook for air conditioning and Refrigeration, SI,1997.	Yes
Recommended Texts	Handbook of Air Conditioning System Design /Carrier Air Conditioning Co. by Carrier Air Conditioning Pty. Ltd	Yes
Websites	http://www.learnhvac.org/	

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
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	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
RAC 403	Principles of Air Conditioning Systems Design	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	2	78	72

Description

The Principles of Air Conditioning Systems Design course provides a comprehensive understanding of the design principles and methodologies involved in creating efficient and effective air conditioning systems. Students will learn about the fundamentals of thermodynamics, heat transfer, psychometrics, and fluid mechanics as they relate to air conditioning. The course covers topics such as load calculations, equipment selection, duct design, refrigeration cycles, system components, and control strategies. Students will gain practical experience through hands-on design projects, simulations, and analysis of real-world case studies. The course also emphasizes energy efficiency, sustainability, indoor air quality, and environmental considerations in air conditioning design. By the end of the course, students will have the knowledge and skills to design air conditioning systems that meet the comfort requirements of various applications while minimizing energy consumption and environmental impact. This course prepares students for careers in HVAC engineering, building design, and sustainable construction.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Aided Design**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 401**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		Four	**Semester of Delivery**		8
Administering Department		PM	**College**	TEMO	
Module Leader	Hasan abdulellah Abdulla		**e-mail**	hasan.alsarraf@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		01/06/2023	**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. 3D Modeling: AutoCAD supports the creation of 3D models by extruding 2D shapes or using more advanced modeling techniques like surface modeling or solid modeling. Users can create complex 3D objects and perform operations such as blending, chamfering, or shelling. This course deals with the basic concept of the computer in mechanical drawing. 2. Annotation and Documentation: AutoCAD allows users to add text, dimensions, and annotations to their designs, enabling clear communication and documentation of design intent. 3. Collaboration: AutoCAD provides features for sharing and collaborating on designs. Multiple users can work on the same drawing simultaneously, and the software offers tools for managing revisions and tracking changes. To be able to communicate with other mechanical engineering professionals regardless their spoken language. 4. Customization: AutoCAD can be customized to suit individual workflows and preferences. Users can create and apply custom templates, create macros and scripts, and extend the functionality of the software through programming interfaces. 5. For ANSYS application Gain a solid understanding of the principles and fundamentals of finite element analysis, including the concept of discretization, meshing, and the finite element method. 6. earn Simulation Workflow: Develop the skills necessary to perform a complete simulation workflow, including pre-processing tasks like geometry creation, mesh generation, and defining boundary conditions, as well as post-processing tasks for interpreting and analyzing results. 7. Perform Structural Analysis: Gain competence in setting up and running structural analysis simulations in ANSYS. Learn how to define materials, apply loads and boundary conditions, and interpret results for stress, strain, deformation, and other structural behavior. 8. Conduct Thermal Analysis: Acquire knowledge and skills to perform thermal analysis using ANSYS. Understand how to define thermal loads, boundary conditions, and material properties for analyzing heat transfer, temperature distribution, and thermal behavior.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 2. 3D Modeling Skills: Students will acquire the ability to create 3D models using AutoCAD. They will learn different techniques for creating 3D objects, such as extrusion, lofting, and sweeping. 3. Design Visualization: Students will learn how to effectively visualize and present their designs using AutoCAD. They will explore techniques for creating realistic renderings and animations to showcase their 3D models.

	4. Problem Solving and Critical Thinking: Through working on design projects and exercises, students will enhance their problem-solving and critical thinking skills. 5. Professional Standards and Practices: Students will gain knowledge of industry standards and best practices for using AutoCAD. They will learn about drawing standards, file organization, and proper techniques for creating professional-quality drawings. 6. The module learning outcomes of studying ANSYS application can vary depending on the level and focus of the course, gain a comprehensive understanding of the simulation workflow, including pre-processing, solving, and post-processing stages. 7. Technical Skills: Develop proficiency in using ANSYS software, including its user interface, tools, and commands. Acquire practical skills in geometry creation, mesh generation, material assignment, and defining boundary conditions in conditions in ANSYS. 8. Analysis and Interpretation: Gain the ability to analyze and interpret simulation results obtained from ANSYS. Understand how to assess the structural behavior, deformation, stress, strain, temperature distribution, fluid flow parameters, and electromagnetic fields. 9. Develop problem-solving skills by identifying and troubleshooting issues that may arise during simulations. Learn optimization techniques to improve designs and achieve desired performance or efficiency. Apply ANSYS to solve practical engineering problems and make informed design decisions based on simulation results.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. AutoCAD application 1-Advanced Drawing Techniques: ● Working with advanced object construction methods (polylines, splines, etc.) ● Modifying complex objects (fillet, chamfer, etc.) ● Creating and editing hatches and gradients. ● Using grips and grip editing techniques. 2- 3D Modeling: ● Introduction to 3D modeling concepts ● Creating 3D objects (extrude, revolve, sweep, etc.) ● Modifying and manipulating 3D objects ● Applying materials and textures to 3D models ● Rendering and creating realistic 3D presentations 3- Project Work: ● Applying learned skills to complete design projects ● Integrating multiple concepts and techniques in practical applications ● Problem-solving and critical thinking in design scenarios

	ANSYS application 1 -Introduction to ANSYS: ● Overview of ANSYS software suite and its capabilities ● Understanding the ANSYS user interface and navigation ● Introduction to the ANSYS Workbench environment 2- Pre-processing: ● Geometry creation and manipulation using ANSYS Design Modeler or other CAD tools ● Mesh generation techniques, including element types, mesh controls, and quality assessment ● Material assignment and definition of material properties 3- Structural Analysis: ● Static structural analysis: applying loads and constraints, solving linear and nonlinear problems ● Modal analysis: natural frequencies, mode shapes, and vibration analysis ● Buckling analysis: evaluation of critical buckling loads and modes

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching both AutoCAD and ANSYS by providing knowledge the various menus, toolbars, and commands available. This will help student to navigate the software more efficiently and locate the necessary tools for multiple tasks. Take advantage of online tutorials and documentation provided by Autodesk and ANSYS. These resources often include step-by-step guides, video tutorials, and examples that can help the student to understand the software's features and functionalities. Work through these resources to gain hands-on experience and reinforce learning. Dedicate regular time to practice using AutoCAD and ANSYS. Create simple drawings or models, and gradually progress to more complex projects. The more the student practice, the more comfortable and adept the student to become at right way to using the software effectively.

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, 8 and 12	LO #1, #2, #4, #7 and #8
	Assignments	6	10% (10)	4, 6, 7, 9, 11 and 13	LO #3, #5, #6 and #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)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to AutoCAD -3D, workspace, visual style, 3d views, view ports, right hand rule, world coordinate and user coordinate systems and types of coordinate systems.
Week 2	examples on box, wedge and cylinder 3D solids (box, wedge and cylinder). examples on cone and tours 3D solids (cone and tours). examples on sphere and pyramid 3D solids (sphere and pyramid).
Week 3	Basic solid editing (union, subtract and intersect) with examples.
Week 4	Fillet and chamfer with applied examples. 3D operations (3d move and 3d rotate) with examples.

Week 5	3D operations (3d align and 3d mirror) with examples. 3D operations (3d array and slice) with examples.
Week 6	User coordinate system (origin, face and objects) with examples.
Week 7	Advanced 3d commands (extrude and loft)
Week 8	Advanced 3d commands (revolve, sweep) with examples.
Week 9	Advanced 3d commands (press pull and section plane) with examples. Advanced solid editing/face (extrude, move, rotate and offest).
Week 10	Advanced solid editing/face (taper, delete, copy, color, material, undo and exit). Advanced solid editing/edge (copy and color).
Week 11	Advanced solid editing/body (imprint, separate, shell, clean and check). Surface (box, cone, dome , mesh, pyramid and sphere)
Week 12	Introduction to ANSYS :Overview of ANSYS software and its applications, Familiarization with the ANSYS user interface , Creating a simple 2D model and performing basic analysis.
Week 13	Geometry Creation: Creating complex geometries using ANSYS Design Modeler Importing CAD models and cleaning up geometry Applying mesh controls and generating mesh for analysis
Week 14	Static Structural Analysis: Introduction to static structural analysis, Applying boundary conditions (constraints and loads).Running a structural analysis and interpreting results
Week 15	Modal Analysis : Understanding modal analysis and its significance Setting up modal analysis in ANSYS , Extracting natural frequencies and mode shapes
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	examples on coordinate systems, examples on box, wedge and cylinder
Week 2	examples on cone and tours, examples on sphere and pyramid
Week 3	examples on fillet and chamfer examples on 3d move and 3d rotate examples on 3d align and 3d mirror
Week 4	examples on 3d array and slice applied examples on ucs examples on extrude and loft

Week 5	examples on 3d surface Surface (box, cone, dome and mesh. Press pull and section plane examples on revolve and sweep
Week 6	Creating a simple 2D ANSYS model and performing basic analysis.
Week 7	Creating complex geometries using ANSYS Design Modeler

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
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	F – Fail	راسب	(0-44)	Considerable amount of work required

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

Code	Course/Module Title	ECTS	Semester
PM 401	Computer Aided Design	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	3	63	87
Description			
Studying AutoCAD and ANSYS applications provides students with essential skills for computer-aided design (CAD) and engineering analysis. AutoCAD, a leading CAD software, enables students to create precise 2D and 3D models, facilitating the design process for various industries such as architecture, engineering, and manufacturing. Through AutoCAD, students learn to transform conceptual ideas into detailed and accurate digital representations, enhancing their spatial visualization and technical drawing abilities. On the other hand, ANSYS, a powerful simulation software suite, equips students with the tools to analyze and optimize engineering designs. By studying ANSYS, students can perform structural, thermal, fluid dynamics, and electromagnetics analyses, enabling them to evaluate design performance, predict behavior, and make informed engineering decisions. Together, mastering AutoCAD and ANSYS empowers students to effectively design and analyze complex systems, enhancing their problem-solving skills and preparing them for careers in engineering and related fields.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Control systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**PM 402**			☐ **Lecture**	
ECTS Credits	**6**			☐ **Tutorial**	
SWL (hr/sem)	**150**			☒ **Practical**	
				☐ **Seminar**	
Module Level	**4**	**Semester of Deliver**		**8**	
Administering Department	**PM**	**College**	**TEMO**		
Module Leader	**Prof. Dr. 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**	**Dr.haitham@ntu.edu.iq**		
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. Understanding Measurement Principles: Gain knowledge of measurement principles, including device selection, calibration, and measurement limitations. 2. Familiarity with Control Systems: Learn the basics of control systems, including feedback, closed-loop control, and the role of sensors, actuators, and controllers. 3. Application of Measurement Techniques: Develop practical skills in using measurement techniques and instruments to collect and analyze data in engineering systems. 4. System Analysis and Optimization: Acquire the ability to analyze measurement and control systems, identify performance issues, and implement optimization strategies for enhanced system performance.
Module Learning Outcomes	1. Understand Measurement Principles: Develop a solid understanding of the fundamental principles of measurement, including accuracy, precision, and uncertainty. Gain the ability to choose appropriate measurement devices and methods for different engineering applications.

	2. Analyze and Design Control Systems: Acquire the skills to analyze and design control systems, including feedback loops, controllers, and actuators. Grasp concepts such as stability, transient response, and steady-state error in control systems. 3. Apply Measurement Techniques: Gain practical expertise in applying measurement techniques and instruments to collect and analyze data in engineering systems. Utilize statistical methods to effectively analyze and interpret measurement data. 4. Troubleshoot and Optimize Systems: Develop the ability to troubleshoot and optimize engineering systems by identifying and rectifying measurement and control issues. Learn techniques for system optimization to enhance performance and efficiency.
Indicative Contents	Part A: Fundamentals of measurement systems, General Measurement System, Error and uncertainty analysis and Static characteristics of measurement system elements [25 hours] Introduction to control system, Power circuit elements, Principles of electric control and Plc basics [25 hours] Revision Session and Quiz [2 hours] Part B: 4. tutorial of symbols, equipment's and Counters, timers, introduction to inverter [25 hours] PLC system structure, Basic ladder logic Timers, Counters & Comparators [25 hours] Up Counter (CTU), Down Counter (CTD), Latch and Unlatch Logic Memory Concept in Allen Bradley PLC, and Hardware of PLC circuit, review of PLC ladder. [25 hours] Revision Session and Quiz [2 hours] Revised Description: Part A of the Engineering Measurement and Control Systems course provides students with a solid understanding of the fundamental principles in this field. The module begins by covering the basics of measurement, including different measurement techniques and the use of instruments. Students will then delve into the topic of control systems and explore considerations related to Programmable Logic Controllers (PLCs). To reinforce the learned concepts, a revision session and quiz will be conducted, allowing students to review and assess their understanding. This module serves as a crucial foundation for further studies in the field of Engineering Measurement and Control Systems.

Learning and Teaching Strategies	
Strategies	1. Active Participation: Actively engage in class discussions, ask questions, and contribute to group activities. This will help you better understand the concepts and reinforce your learning. 2. Practical Application: Apply the theoretical knowledge to real-world examples and projects. Participate in laboratory sessions and hands-on activities to gain practical experience in measurement and control systems. 3. Problem-Solving Approach: Develop strong problem-solving skills by practicing solving different types of measurement and control problems. Work on assignments and projects that require critical thinking and analytical skills

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

Module Evaluation					
As		**Time/Number**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**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)	
Week	**Material Covered**
Week 1	Fundamentals of measurement systems - Definition of measurement and instrumentation - Significance of measurement
Week 2	General Measurement System - Functions of instrument in measurements - Calibration and standards
Week 3	Error and uncertainty analysis - Errors in Measurements - Accuracy and precision - Sources of errors
Week 4	Static characteristics of measurement system elements - Characteristics of instruments - Static characteristics of measuring system - Environmental effects
Week 5	Introduction to control system - Types of Control System - Block Diagrams
Week 6	Introduction to Block Diagrams - Block Diagram Reduction Rules
Week 7	Power circuit elements Circuit breaker Overload Relay
Week 8	Contactor
Week 9	Principles of electric control, components, elements, sensors, electric relays, controlled devices (final elements) , switches, power & control circuits , planning (mapping)..
Week 10	Plc basics, tutorial of symbols, equipment's
Week 11	Counters, timers, introduction to inverter
Week 12	PLC system structure, Basic ladder logic Timers, Counters & Comparators
Week 13	Up Counter (CTU) , Down Counter (CTD)
Week 14	Latch and Unlatch Logic Memory Concept in Allen Bradley PLC
Week 15	Hardware of PLC circuit, review of PLC ladder
Week 16	Final Examination

Delivery Plan (Weekly Lab. Syllabus)	
Week	**Material Covered**
Week 1	Over view on the control workshop , tools, and measuring devices
Week 2	Knowledge of connection & operation of the measuring devices for temperature, pressure, humidity, fluid flow.
Week 3	Built electric circuit (power & control) for domestic refrigerator or freezer and checking before operating the circuit.
Week 4	Built electric circuit (power & control) for domestic water cooler and checking before operating the circuit.
Week 5	Built electric circuit (power & control) for domestic window type A/C for cooling and checking before operating the circuit.
Week 6	Built electric circuit (power & control) for domestic window type A/C for cooling & heating, and checking before operating the circuit.
Week 7	Built electric circuit (power & control) for domestic defrost refrigerator and checking before operating the circuit.
Week 8	Built electric circuit (power & control) for domestic clothes washer and checking before operating the circuit.
Week 9	Check and calibration of thermal expansion valve.
Week 11	Check and calibration for the contacts of the electric contactor & thermal switch.
Week 12	Built a control circuit for motor power circuit (ON-OFF) start and stop from one location.
Week 13	Built a control circuit for motor power circuit (ON-OFF) start and stop from two deferent locations.
Week 14	Built a control circuit for motor power circuit (star-delta) rotate in one direction, and other in two directions.
Week 15	Practical study of the PLC gets.

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. "Measurement and Control Basics" by Thomas A. Hughes 2. "Principles of Measurement Systems" by John P. Bentley 3. "Industrial Instrumentation and Control Systems" by William C. Dunn 4. "Process Control: A Practical Approach" by Myke King	yes
Recommended Texts	1. "Instrumentation and Control Systems Documentation" by Fred A. Meier 2. "Control Systems Engineering" by Norman S. Nise 3. "Automatic Control Systems" by Benjamin C. Kuo and Farid Golnaraghi 4. "Modern Control Engineering" by Katsuhiko Ogata 5. "Instrumentation for Process Measurement and Control" by Norman A. Anderson 6. "Introduction to Control System Technology" by Robert N. Bates	yes
Websites	1. National Instruments: www.ni.com 2. Automation.com: www.automation.com 3. ControlGlobal: www.controlglobal.com 4. ISA - International Society of Automation: www.isa.org 5. Omega Engineering: www.omega.com 6. Emerson Automation Solutions: www.emerson.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.

Module 1

Code	Course/Module Title	ECTS	Semester
PM 402	**Control systems**	**6**	**4**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**3**	**78**	**72**
Description			

Control systems involve the application of various techniques and technologies to measure, monitor, and control physical variables and processes in industrial, engineering, and scientific applications. This field encompasses the design, implementation, and optimization of systems that ensure accurate and reliable measurements, as well as effective control of processes.

Measurement and Control Systems play a crucial role in industries such as manufacturing, power generation, automation, and instrumentation. They involve sensors, transducers, data acquisition systems, signal processing techniques, and control algorithms. These systems enable precise measurement of variables like temperature, pressure, flow rate, and level, and utilize control strategies to regulate and optimize processes.

Understanding Measurement and Control Systems requires knowledge of sensors, data acquisition methods, signal conditioning, measurement principles, control theory, and instrumentation. Professionals in this field need to analyze system behavior, design control algorithms, implement hardware and software components, and troubleshoot issues.

This field is constantly evolving with advancements in technology, such as the integration of Internet of Things (IoT), machine learning, and cloud computing. Measurement and Control Systems are vital for ensuring efficiency, safety, and reliability in various industries, making it a critical area of study for engineers and scientists.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Design of Air Conditioning Systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RAC 404**				
ECTS Credits	**6**				
SWL (hr/sem)	150				
Module Level	**Four**		**Semester of Deliver**		**Eight**
Administering Department	PM		**College**	TEMO	
Module Leader	Omar Sadoon Khaleel		**e-mail**	omarsadoon@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Lecturer		**Module Leader's Qualification**		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 types of air conditioning system. 2. To understand how to select best A/C system for each application. 3. To understand the basic processes for refrigeration and air conditioning system. 4. To understand the air properties and how to use psychometric chart with draw each process. 5. To understand types of air distribution within each zone. 6. To understand advanced air duct design. 7. To understand how to selection best air diffuser with all accessories.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Demonstrate the ability to do technical work in a variety of heating, cooling, and refrigeration fields. 2. Identify and describe various components in a typical air-conditioning system. 3. Identify and demonstrate correct use of tools, materials, and equipment used in the trade. 4. Evaluate a motor in a hermetic compressor to determine if it is electrically sound and safe to start. 5. Follow the circuit of a typical electric air-conditioning system. 6. Take wet-bulb and dry-bulb temperature readings and determine relative humidity from the psychometrics chart. 7. Use information to determine the level of comfort from the ASHRAE generalized comfort chart.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Psychometric Process and Advanced applications** [15 hrs] **Water air condition system design** [15 hrs] **Evaporative cooling applications** [10 hrs] **Noise and source** [10 hrs] **Mini Project: Design mini project for different air conditioning systems** [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	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
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,#3,#4 and #5, #6
	Assignments	2	10% (10)	2 and 14	LO #4 and #7
	Projects / Lab.	15	20% (20)	Continuous	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	Fast review about process that student took in second stage.
Week 2	Explain psychometrics chart.
Week 3	Humidification methods.
Week 4	Dehumidification methods.
Week 5	Advanced applications.
Week 6	Main components of water air conditioning system with benefits
Week 7	Types of water air conditioning system, Explain advantages and disadvantages of water air conditioning system
Week 8	Water effects, Water pipe diameter design, Types of pump connection.
Week 9	Pump capacity and head calculation. Static loss calculates. Dynamic loss calculates.
Week 10	Reduce loss within pipe. Problems.
Week 11	Study the evaporative cooling system. How the system work.
Week 12	Performance of evaporative system. Advantages and disadvantages. Application.
Week 13	Definition of Sound. Basic of noise. Study the source of noise.
Week 14	Noise criteria and how to reduce it by using silencers, Types of silencer.
Week 15	Design mini project for different air conditioning systems
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Application of air Psychrometric chart
Week 2	Sensible heating and cooling
Week 3	Central cooling with dehumidification
Week 4	Effect of fresh air on central cooling with dehumidification
Week 5	Central heating with humidification
Week 6	Effect of fresh air on central heating with humidification
Week 7	Performance of forward centrifugal fan
Week 8	Performance of Radial centrifugal fan
Week 9	Performance of backward centrifugal fan
Week10	Comparison between types of centrifugal fan performance
Week 11	Effect of variable cold water velocity (single fan coil unit) on outlet air properties
Week 12	Effect of variable cold water velocity (double fan coil unit) on outlet air properties
Week 13	Comparison of single and double effect of fan coil unit on outlet air properties
Week 14	Lab 14: Effect of air velocity on the dynamic pressure losses
Week 15	Lab 15: Effect of air velocity on the total pressure losses

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	G.F. Hundy , "Refrigeration and Air Conditioning",2010. P. L. Ballaney, "Refrigeration and Air Conditioning ".	Yes
Recommended Texts	A Bhatia, HVAC Made Easy: A Guide of Heating and Cooling Load Estimation, PDH online course M196 (4PDH).	Yes
Websites	https://www.youtube.com/watch?v=OvVCCljuluY	

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
RAC 404	Design of Air Conditioning Systems	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	2	78	72

Description

The Design of Air Conditioning Systems course offers a comprehensive exploration of designing efficient and effective air conditioning systems for various applications. Students will learn about the principles of thermodynamics, heat transfer, and psychometrics to understand the fundamental concepts underlying air conditioning. The course covers topics such as load calculations, equipment selection, duct design, refrigeration cycles, and control systems. Students will gain hands-on experience through design projects and simulations, allowing them to apply their knowledge to real-world scenarios. The course also addresses energy efficiency, sustainability, indoor air quality, and environmental considerations in air conditioning design. Upon completion, students will possess the skills and knowledge necessary to design and optimize air conditioning systems that provide optimal comfort, energy efficiency, and environmental sustainability. This course prepares students for careers in HVAC engineering, building design, and energy management.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering and Industrial Management**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**TEMO 400**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	four		**Semester of Deliver**	Eight	
Administering Department	PM		**College**	TEMO	
Module Leader	Omar Abdulhadi Mustafa		**e-mail**	Omeralhayaly1@ntu.edu.iq	
Module Leader's Acad. Title	Lecture		**Module Leader's Qualification**	Ph.D.	
Module Tutor	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. Introduce the student to the methods of management and the appropriation each of them in different fields work. 2. Introduce the student to exercise the different methods of the management on the mini groups to elevate his ability in management. 3. Enhance the student skills in management by giving the typical solution on the assumed problem. 4. Introducing students to different types of feasibility study and how can do assessment each of them. 5. Introducing students to make the network planning for the different engineering processes. 6. Introducing the student to the administrative and production organization of industrial enterprises. 7. Introducing the student to Break-Even Analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enable the student to use knowledge to manage the different purposes organizations. 2. Enable engineers to use modern programs to solve the technical problems in organizations where they managed. 3. Enable engineers to layout the administrative and production organization of industrial enterprises. 4. Enable engineers to layout the network planning for the different engineering processes and finding the typical path of the minimum duration that offers the best quality of the production. 5. Enable engineers to study the feasibility of the industrial processes which leads to successful of the production. 6. Enable engineers to calculate the Break-Even of any production or trading process and calculating the duration of that case. 7. Enhance the student skills in management by giving the typical solution on the assumed problem.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ● BUILDING SURVEY Introduction to the management [10 hrs] Modern methods of the management [15 hrs] Feasibility study [15 hrs] ● BREAK-EVEN ESTIMATION The necessity of calculations of the break-even point and its duration. [15 hrs] ● FEASIBILITY STUDY The necessity of the different field feasibility study [15 hrs]

	• Administrative and production organization of industrial enterprises The meaning of the administrative and production organization of industrial enterprises and how can make the most appropriate administrative layout [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 management exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
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	20% (20)	3, 5 and 10	LO #1, #2 and #5
	Assignments	3	20% (20)	4, 8 and 12	LO #3, #4, #6 and #7
	Report				
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO #1 - #7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction – definition and examples related to the industrial engineering management - Functions of management
Week 2	Establish Goals and Objectives.
Week 3	Feasibility Study, Technical feasibility, Economic feasibility
Week 4	Feasibility Study, Schedule feasibility, Operational feasibility.
Week 5	Analyzing Costs vs. Benefits, Calculating Present Value, Net Present Value (NPV), Internal Rate of Return (IRR).
Week 6	Break-Even Analysis, Break-point calculations.
Week 7	Administrative and production organization of industrial enterprises, Linear structure, Consulting structure, Functional structure.
Week 8	Introduction in Network planning.
Week 9	Network planning, calculation of the critical path, float time, meaning of the early start, early finish, late start and late finish.
Week 10	Network planning, Program Evaluation and Review Technique (PERT).
Week 11	Quality Control and production inspection method
Week 12	Industrial costs and controllable cost techniques
Week 13	Maintenance
Week 14	Replacement
Week 15	Self-assessment control

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	د. عادل عبد المالك " الهندسة الصناعية "– دار الكتب للطباعة والنشر - جامعة البصرة - الطبعة الأولى 200	Yes
Recommended Texts	د. خليل العاني ، د. إسماعيل إبراهيم القزاز ، د. عادل عبد المالك آوريال " إدارة الجودة الشاملة ومتطلبات الأيزو 2000:9001 " الطبعة الأولى 2001 ، مطبعة الأشقر- بغداد	No
Websites	1. https://www.workamajig.com/blog/critical-path-method 2. https://www.editorialmanager.com/cherd/default2.aspx?pg=AuthorshipVerification.aspx&docid=50317&authorID=%7b0854344E-1B2D-43DE-9697-4095BA17131E%7d&msid=%7bC7C1D8B5-7EF8-4FDD-B449-5CE3CD0A947A%7d 3. https://www.investopedia.com/terms/q/quality-control.asp	

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 400	**Engineering and Industrial Management**	**6**	**8**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**1**	**48**	**102**

Description

The subject aims to encourage students' participation in the management 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 assumptions involving some sampling activities that are interesting to the students.

The results of this module study will leads to:

1. Enable the student to use knowledge to manage the different purposes organizations.
2. Enable engineers to layout the administrative and production organization of industrial enterprises.
3. Enable engineers to layout the network planning for the different engineering processes and finding the typical path of the minimum duration that offers the best quality of the production.
4. Enable engineers to study the feasibility of the industrial processes which leads to successful of the production.
5. Enhance the student skills in management by giving the typical solution on the assumed problem.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Methodology of Scientific Research**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**NTU 400**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**4**	**Semester of Deliver**	**7**		
Administering Department	**PM**	**College**	**TEMO**		
Module Leader	**Haitham M. Wadullah**	**e-mail**	**Dr.haitham@ntu.edu.iq**		
Module Leader's Acad. Title	**Professor**	**Module Leader's Qualification**	**Ph.D.**		
Module Tutor	**Tariq Al-Khalidi (اسم المرشد)**	**e-mail**			
Peer Reviewer Name		**e-mail**			
Scientific Committee Approval Date	**01/6/2023**	**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** To Understand the significance of scientific research and its role in advancing knowledge. **.2** To Identify the key characteristics of scientific research. **.3** This course deals with the basic concept of Formulate research questions and objectives. **.4** This is the basic subject for all ethical considerations in scientific research **.5** Recognize the importance of conducting a literature review in research. **.6** Familiarize with quantitative and qualitative data collection methods. **.7** Understand the principles of experimental design.
Module Learning Outcomes	**.1** Understand the nature and significance of scientific research. Identify the characteristics and principles of scientific research. Demonstrate an awareness of ethical considerations in scientific research. **.2** Recognize between various research designs. **.3** List the various Formulate clear research questions and objectives **.4** Summarize what is literature review to identify relevant research articles. **.5** Discuss and evaluate the credibility and relevance of research articles. **.6** Design experiments that maximize internal and external validity. **.7** Determine the appropriate sample size for a survey based on research objectives. **.8** Demonstrate proficiency in employing different approaches to qualitative research. **.9** Recognize and apply ethical principles and guidelines in research involving human subjects **.10** Communicate research results in a clear and concise manner to different audiences. **.11** Formulate a clear and concise research problem statement.
Indicative Contents	Indicative content includes the following. Part A - Definition and significance of scientific research [5 hrs.] Part B- Research Problem Formulation [5 hrs.] Part C- Research Design and Methodology [5 hrs.] Part D- Literature Review [5 hrs.] Part E- Data Collection and Measurement [5 hrs.] Part F- Homework and Discussion [7 hrs.]

Learning and Teaching Strategies	
Strategies	Studying the Methodology of Scientific Research requires a combination of active learning strategies and focused study techniques, such as; **Read the Course Materials, Engage in Discussions, Take Detailed Notes, Practice with Examples, Review and Summarize, Create Visual Aids, and Work on Exercises and Assignments**

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	**(68/15)= 5**
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**	**2**	**10% (10)**	**5 and 10**	**LO #1, #2 and#9 #10, #11**
	Assignments	**2**	**10% (10)**	**2 and 12**	**LO #3, #4 and #6, #7**
	Projects / Lab.	**1**	**10% (10)**	**Continuous**	**All**
	Report	**1**	**10% (10)**	**13**	**LO #5,#8**
Summative assessment	**Midterm Exam**	**2hr.**	**10% (10)**	**7**	**LO #1 - #7**
	Final Exam	**2hr.**	**50% (50)**	**16**	**All**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to Scientific Research
Week 2	Research Design
Week 3	Literature Review
Week 4	Data Collection Methods
Week 5	Data Analysis
Week 6	Experimental Design
Week 7	Survey Design and Sampling
Week 8	Qualitative Research Methods
Week 9	Ethics in Scientific Research
Week 10	Data Interpretation and Presentation
Week 11	Peer Review and Publication Process
Week 12	Research Proposal Writing
Week 13	Project Management and Time Planning
Week 14	Presentations and Research Conferences
Week 15	Research Ethics Review and Course Wrap-up
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	**No**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. "Research Design: Qualitative, Quantitative, and Mixed Methods Approaches" by John W. Creswell and J. David Creswell 2. "The Craft of Research" by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams 3. "Research Methodology: A Step-by-Step Guide for Beginners" by Ranjit Kumar	**Yes**
Recommended Texts	Academic Databases: Utilize academic databases such as PubMed, Google Scholar, JSTOR, and IEEE Xplore to search for research papers in the methodology of scientific research. Use relevant keywords such as "research methodology," "scientific research design," or specific methodologies you are interested in (e.g., "qualitative research methods," "experimental design").	**No**
Websites	**(www.socialresearchmethods.net)** **(www.researchmethodology.org)** **(www.qualres.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
NTU 400	**Methodology of Scientific Research**	**4**	**7**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	**0**	**32**	**68**
Description			

The description for the Methodology of Scientific Research is:

The Methodology of Scientific Research refers to the systematic and rigorous approach employed in conducting scientific investigations and acquiring knowledge. It encompasses the principles, techniques, and procedures used to design, implement, and analyze scientific studies. This field of study focuses on the various methods and tools employed in gathering and interpreting data, ensuring the reliability and validity of research findings. Methodology of Scientific Research involves making informed decisions regarding research design, selecting appropriate data collection methods, and applying statistical techniques for data analysis. It also includes ethical considerations in research, such as protecting participants' rights and ensuring research integrity. A solid understanding of the Methodology of Scientific Research is essential for researchers and scientists to generate credible and reliable results, contribute to the advancement of knowledge, and address complex research questions in diverse disciplines.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Thermal Power Plants**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PM 400**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	PM		**College**	TEMO	
Module Leader	Bahjat Hassan alyas		**e-mail**	Bahjat.me@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**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. Power plant engineering deals with the study of energy, , its sources and utilization of energy for power generation. 2. The power is generated by prime movers (example Hydraulic turbines, steam turbines, diesel engines) 3. Large amount of power is generated using prime movers in a site or layout called power plants, where all the equipment and machineries required for power generation is located 4. Energy may be defined as the capacity to do work. Energy exists in various forms, such as Mechanical Energy, thermal energy, electrical energy, solar energy etc 5. Energy may be defined as the capacity to do work. Energy exists in various forms, such as Mechanical Energy, thermal energy, electrical energy, solar energy etc
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Explain about the plant steam cycles 2. To make the students understanding Binary cycle working on mercury and steam, combine condenser 3. To make the students understanding Combustion and Fuels 4. Enables the students to learn Steam Condensers, Kinds, Direct Contact Condensers, Surface Condenser 5. To make the students understanding all about the Steam Nozzles, Applications 6. To explain the Pumps, Kinds of Pumps 7. Explain the operation of Pumps in series and Parallel, Centrifugal pumps 8. To help student how to calculate Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency 9. To help students understanding how to solve the water treatment and testing in boiler
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Introduction to power cycle, Carnot cycle, Rankin cycle ideal and actual, Rankin cycle with reheat. [15 hrs] Open feedwater heater and close feedwater heaters, binary cycle, combine cycle[15 hrs] Steam condenser are direct and indirect contact, the efficiency of steam condenser [10 hrs]

	Fuel and combustion, and how to calculate the air to fuel ratio [15 hrs] Calculate the heat of combustion [6hrs] Part B – Fundamentals . To understand the diagram of nozzle converge- diverge nozzles, Applications v [15 hrs] System Characteristics, Pumps Characteristics, Matching Pumps to System Characteristics. [7 hrs] Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency. Water Treatment and Testing [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	97	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10% (10)	3,6 and 9, 14	LO #2, #3 and #7, #8
	Assignments	5	10% (10)	1, 5, 7 and 12, 15	LO #1, #4 ,#5and #6, #9
	Projects / Lab.	7	20% (20)	Continuous	All
	Report				
Summative assessment	Midterm Exam	3hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introductions ,Plant steam cycles, main cycles
Week 2	reheat cycle , Regenerative cycle, open feed water heater
Week 3	closed feed water heaters , combine cycles
Week 4	Binary cycle working on mercury and steam, combine condenser
Week 5	Combustion and Fuels
Week 6	Correct Air/Fuel Ratio
Week 7	Steam Condensers, Kinds
Week 8	Direct Contact Condensers, Surface Condenser
Week 9	Design and Manufacturing, Efficiency of the Condensers
Week 10	Steam Nozzles, Applications
Week 11	The Pumps, Kinds of Pumps,
Week 12	System Characteristics, Pumps Characteristics, Matching Pumps to System Characteristics
Week 13	Operation of Pumps in series and Parallel, Centrifugal pumps
Week 14	Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency
Week 15	Water Treatment and Testing

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction of boiler
Week 2	Boiler feed water repeated for times with variable inputs
Week 3	To calculate the efficiency of steam condenser
Week 4	Air to fuel ratio of combustion
Week 5	To calculation the power of pumps kinds
Week 6	The steam nozzle repeated for times with variable inputs
Week 7	Water treatment in boiler

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

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (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 400	Thermal Power Plants	7	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	78	97

Description

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

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

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

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

4. To explain steam condenser explain the types of condensers

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

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

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

8. How to use the combustion charts.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Solar Photovoltaic Conversion**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RE 401**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	PM		**College**	TEMO	
Module Leader	Bashar Abdullah Hamad		**e-mail**	bashar.hamad@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name	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	This course of photovoltaic energy systems will focus on the fundamentals of solar energy conversion, photovoltaic, and environmental impacts, and cover topics including shading, energy storage, and emerging PV technologies. Stand-alone PV system components. Designing stand-alone PV systems and sizing. Analysis of the efficiency of solar cells. PV power system. Grid-connected PV.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. Upon completion of this course, the student will be ... 1. Able to describe markets and applications for photovoltaic systems. 2. Able to identify safety hazards of photovoltaic systems. 3. Able to identify practices and protective equipment used for PV systems installation and maintenance. 4. Able to define and demonstrate solar energy fundamentals 5. Able to conduct site assessments and planning for PV systems installations 6. Able to explain the characteristics of different PV system configurations 7. Able to explain and calculate PV module parameters using module specifications 8. Able to explain the differences between various PV technologies. 9. Able to describe the purpose and operation of PV balance-of-system (BOS) components 10. Able to calculate photovoltaic array and BOS component sizing 11. Able to conduct PV systems electrical design/integration per National Electrical Code (NEC) requirements 12. Able to conduct photovoltaic system mechanical design/integration 13. Able to calculate and analyze photovoltaic system performance 14. Able to understand proper installation and troubleshooting procedures
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - **Introduction to Photovoltaic Energy Conversion Energy from Solar Photovoltaic (PV) Conversion, Solar PV Modules, Solar PV Systems, Advantages and Challenges of Solar Photovoltaic Energy Conversion.** **Solar Cells ,** How Solar Cells are Better than any Conventional Sources of Electricity? , What is a Solar Cell?, How Solar Cell Generates Electricity? , Parameters of Solar Cells , Solar Cell Technologies , Factors Affecting Electricity Generated by a Solar Cell [15 hrs] **Solar PV Modules, What is a Solar PV Module? Ratings of PV Module, Standard PV Module Parameters, I-V and P-V Characteristics of SPV Module** **Solar PV Module Arrays, Connection of Modules in Series, Estimating Number of PV Modules Required in Series and Their Total Power, Connection of Modules in Parallel Combination** [15 hrs] **PV Module Shading** **- Causes and effects of shading in PV systems** **- Bypass diodes for mitigating shading effects** [6hrs]

	Part B – **Applications of Batteries in Solar PV Systems, Why to Connect Batteries Together? Estimating Number of Batteries Required in Series** **Charge Controller, MPPT and Inverters, Need for BoS, Power Converters and Their Efficiency, AC to DC Converters** **Solar PV System Design and Integration, Types of Solar PV Systems, Standalone SPV System, Grid-connected SPV System, Hybrid SPV Systems** [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	97	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	2, 4 and 9 ,14	LO #1, #3and #8, #9, #13
	Assignments	5	10% (10)	3, 5, 7 and 8, 15	LO #2, #4 and #6, #7, #11, #14
	Projects / Lab.	6	15% (15)	Continuous	All
	Report	1	5% (5)	14	LO #5, #10, #12
Summative assessment	**Midterm Exam**	3hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to Photovoltaic Energy Conversion Energy from Solar Photovoltaic (PV) Conversion, Solar PV Modules, Solar PV Systems, Advantages and Challenges of Solar Photovoltaic Energy Conversion**
Week 2	**Fundamentals of Semiconductor Materials** **- Introduction to semiconductor materials** **- Properties of semiconductors** **- Formation of P-N junctions and basic operation of diodes**
Week 3	**Solar Cells ,** How Solar Cells are Better than any Conventional Sources of Electricity? , What is a Solar Cell?, How Solar Cell Generates Electricity? , Parameters of Solar Cells , Solar Cell Technologies , Factors Affecting Electricity Generated by a Solar Cell
Week 4	**Solar PV Modules, What is a Solar PV Module? Ratings of PV Module, Standard PV Module Parameters, I-V and P-V Characteristics of SPV Module, How Many Cells in Module? , Estimating or Designing Wattage of a PV Module , Factors Affecting Electricity Generated by a Solar PV Module**
Week 5	**Solar PV Module Arrays, Connection of Modules in Series, Estimating Number of PV Modules Required in Series and Their Total Power, Connection of Modules in Parallel Combination**
Week 6	**Connected in Parallel and Their Total Power, Connection of Modules in Series and Parallel (Mixed Combination), Estimation Number of Modules to be Connected in Series and Parallel and Their Total Power**

Week 7	**PV Module Shading** **- Causes and effects of shading in PV systems** **- Bypass diodes for mitigating shading effects** **- Strategies for minimizing shading effects**
Week 8	**Basics of Batteries, Some Basics about Batteries, How Does a Battery Work? Types of Batteries, Parameters of Batteries**
Week 9	**Applications of Batteries in Solar PV Systems, Why to Connect Batteries Together? Estimating Number of Batteries Required in Series, Estimating Total Energy Stored in Series Connected Battery Array**
Week 10	**Estimating Maximum Power from Series Connected Batteries, Parallel Connection, Estimating Number of Batteries Required in Parallel**
Week 11	**Charge Controller, MPPT and Inverters, Need for BoS, Power Converters and Their Efficiency, AC to DC Converters**
Week 12	**DC to AC Converter (Inverters), DC to DC Power Converters, Charge Controllers**
Week 13	**Solar PV System Design and Integration, Types of Solar PV Systems, Standalone SPV System, Grid-connected SPV System, Hybrid SPV Systems**
Week 14	**Grid-connected Solar PV Power Systems, Introduction to Grid-connected PV Systems, Grid-connected PV Systems for Small Power Applications, Grid-connected PV Systems for Large Power Applications,**
Week 15	**Configuration of Grid-connected Solar PV Systems, Grid-connected PV System Design for Small Power Applications, Steps of System Design**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Effect of solar radiation changing on V_{OC} and I_{SC} measurements
Week 2	Characteristics of a Single Solar Cell
Week 3	Series Connections of Solar Cells
Week 4	Effect of PV Module Shading and Bypass diode Series Connections of Solar Cells
Week 5	Parallel Connections of Solar Cells
Week 6	Characteristics of a Single Solar Cell with solar radiation changing
Week 7	

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Solanki, Chetan Singh. *Solar photovoltaic technology and systems: a manual for technicians, trainers and engineers*. PHI Learning Pvt. Ltd., 2013	No
Recommended Texts	Shepherd, William, and David William Shepherd. *Energy studies*. World Scientific Publishing Company, 2014.	No
Websites		

Grading Scheme
مخطط الدرجات

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

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

Code	Course/Module Title	ECTS	Semester
RE 401	Solar Photovoltaic Conversion	7	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	3	78	97

Description

The Solar Photovoltaic Conversion course offers a comprehensive study of the principles and technologies involved in converting solar energy into electricity using photovoltaic (PV) systems. This course explores the design, operation, and optimization of PV systems for various applications.

Students will delve into the physics of solar energy conversion, including the behavior of semiconductor materials and the working principles of solar cells. They will learn about the different types of PV technologies, such as crystalline silicon, thin-film, and emerging solar cell technologies. The course will cover topics including PV system components, system sizing, performance analysis, and integration into the electrical grid.

Students will gain hands-on experience through laboratory exercises and simulations, enabling them to design and evaluate PV systems for residential, commercial, and utility-scale applications. They will also explore topics like solar resource assessment, system economics, and the environmental impacts of PV systems.

By the end of the course, students will have a solid understanding of solar photovoltaic conversion and the ability to design, analyze, and optimize PV systems. They will be well-prepared for careers in the renewable energy industry, as PV system designers, project managers, or researchers in the field of solar energy.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Renewable Energy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**RE 402**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	PM		**College**	TEMO	
Module Leader	Firas Aziz Ali		**e-mail**	firasaziz@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**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	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	1.demonstrate an ability to use critical thinking and problem-solving skills to evaluate business energy use and how and when to apply renewable energy solutions 2. demonstrate an understanding of, and assess the obstacles associated with implementation of renewable energy systems 3. evaluate the advantages, limitations and potential of various clean energy sources for buildings and businesses 4. demonstrate an understanding and familiarity with engineering and financial aspects of projects 5. demonstrate an understanding and familiarity with the regulatory aspects of renewable energy projects
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Energy Sources and Environmental Effects [15 hrs] Solar Photovoltaics: o Solar Power Systems - Electrical o Solar Power Systems - Thermal [15 hrs] Wind Power Fundamentals o Wind Power Systems o Wind Turbine Control [15 hrs] Biomass Technologies, Geothermal Power Generation [6hrs] Part B – Fundamentals to understand the class project based on technology to be selected Generators [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	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
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 8	LO #1, #2 and #5
	Assignments	2	10% (10)	3 and 14	LO #3 and #4
	Projects / Lab.	14	20% (20)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	3hr	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	**Renewable energy, definition and Resources**
Week 2	**Solar energy, solar constant, and Solar radiation at earth`s surface**
Week 3	**Solar energy, solar constant, and Solar radiation at earth`s surface**
Week 4	**Global Radiation (Beam and Diffuse) Radiation Components**
Week 5	**Absorbed Solar Energy**
Week 6	**Concentrating collectors, part A**
Week 7	**Concentrating collectors, part B**
Week 8	**Solar Space Heating Systems**
Week 9	**Solar Space Cooling Systems**
Week 10	**Hydro-electric power plant**
Week 11	**Types of Hydraulic Turbines**
Week 12	**Introduction to Wind turbines**
Week 13	**Classification of Wind Turbines**
Week 14	**Introduction to Geothermal Energy**
Week 15	**Ocean Energy Conversion Technologies (Waves, Currents, and Tides)**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	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 chimney device
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Renewable Energy: Law, Policy and Practice (American Casebook Series) 2nd Edition,2021	No
Recommended Texts	Solar Energy Engineering Processes and Systems Second Edition, 2014	No
Websites	https://www.linquip.com/ Linquip Content 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 402	Renewable Energy	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	3	78	72

Description

A course on Renewable energy . Includes the following sections:

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

Module Information معلومات المادة الدراسية					
Module Title	**Design of Thermal System**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	RE 403				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	PM		**College**	TEMO	
Module Leader	Nabeel Abdulrazzaq		**e-mail**	Nabil84m@ntu.edu.iq	
Module Leader's Acad. Title	Lec.		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**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 fundamentals of thermodynamics and heat transfer principles. 2. Analyze different types of thermal systems and their components. 3. Evaluate the performance and efficiency of thermal systems. 4. Learn about heat exchangers and their design considerations. 5. Explore various energy sources and their utilization in thermal systems.

	6. Understand the principal design of pipe system. 7. Learn about renewable energy systems and their integration into thermal systems. 8. Explore the design considerations for solar thermal system. 9. Study the control and optimization of thermal systems for improved performance. 10. Analyze the environmental impact and sustainability aspects of thermal system design. 11. Develop skills in designing and sizing components of thermal systems, such as pumps, compressors, and turbines.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Comprehensive knowledge of thermodynamics and heat transfer principles. 2. Understanding of different types of thermal systems and their components. 3. Ability to analyze and evaluate the performance and efficiency of thermal systems. 4. Proficiency in designing and sizing components of thermal systems, such as pipe system heat exchangers, and pumps. 5. Familiarity with various methods of heat transfer, including conduction, convection, and radiation. 6. Knowledge of fluid mechanics principles and their application in thermal systems. 7. Ability to design and optimize thermal systems for improved performance and energy efficiency. 8. Understanding of solar thermal system and thermal energy storage systems and their design considerations. 9. Proficiency in using computational tools and software for modeling and simulation of thermal systems. 10. Awareness of safety considerations and regulations relevant to thermal system design. 11. Ability to analyze case studies of real-world thermal systems and their design challenges. 12. Understanding of the environmental impact and sustainability aspects of thermal system design. 13. Development of critical thinking and problem-solving skills in the context of thermal system design. 14. Ability to communicate and present technical information related to thermal system design effectively.

Indicative Contents
المحتويات الإرشادية
	1. Introduction to Thermal Systems Design
	  ○ Overview of thermal systems and their significance
	  ○ Introduction to design methodologies and considerations
	2. Performance Analysis and Optimization
	  ○ Efficiency calculations and performance metrics
	  ○ Parametric analysis and optimization techniques
	  ○ Economic and environmental considerations
	3. Computational Tools and Simulation

	○ Introduction to software for thermal system modeling ○ Simulation of thermal systems and performance analysis 4. Case Studies and Design Projects ○ Analysis of real-world thermal systems and design challenges ○ Group projects involving the design of thermal systems 5. Sustainability and Environmental Impact ○ Environmental considerations in thermal system design ○ Energy conservation strategies and sustainable practices 6. Communication and Presentation Skills ○ Technical report writing ○ Oral presentation skills and effective communication

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Traditional lectures can be used to introduce new concepts, explain theoretical principles, and provide an overall framework for the course content. Instructors can utilize visual aids, demonstrations, and examples to enhance understanding. 2. Problem-solving sessions: Conducting problem-solving sessions allows students to apply the concepts learned in lectures to solve real-world problems related to thermal system design. Instructors can present a variety of problem scenarios and guide students through the problem-solving process. 3. Case studies: Presenting case studies of actual thermal systems and their design challenges can help students understand the practical application of the concepts learned. Analyzing and discussing case studies can enhance critical thinking and problem-solving skills. 4. Group projects: Assigning group projects related to the design of thermal systems encourages collaboration and teamwork among students. These projects can involve designing and analyzing thermal systems, conducting simulations, or presenting feasibility studies. 5. Computer simulations: Utilizing computational tools and software for modeling and simulation of thermal systems enables students to analyze system performance, optimize designs, and simulate different operating conditions. 6. Field trips and industry visits: Organizing field trips or visits to thermal system facilities, power plants, or HVAC installations offers students a chance to observe and understand the practical implementation of thermal system design principles. 7. Discussions and debates: Engaging students in discussions and debates on controversial or emerging topics related to thermal system design

	can foster critical thinking, encourage different perspectives, and enhance communication skills. 8. Multimedia resources: Incorporating multimedia resources such as videos, animations, interactive simulations, and online resources can enhance student engagement and facilitate self-paced learning. 9. Assessments and feedback: Regular assessments, quizzes, exams, and assignments allow instructors to evaluate students' understanding and progress. Providing timely feedback helps students identify areas for improvement and reinforces learning.

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1 - #10
	Assignments	6	20% (10)	2,4,6,8,10 and 12	LO #1 - #12
	Projects	1	5% (5)	Continuous	All
	Siminar	1	5% (5)	Will be decided later	LO #13, #14 and #15
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 Thermal Systems Design
	Overview of thermodynamics, fluid mechanics, and heat transfer principles
Week 2	Pipe sizing and hydraulic calculations: Flow rates, pressure drop, and pipe diameter selection
Week 3	Pump selection and performance analysis: Centrifugal pumps, pump curves, and system head calculations
Week4	Pipe material selection and characteristics
	Pipe layout and routing considerations
Week 5	Solar thermal system design principles
	Solar collectors and system components
Week 6	Solar thermal system sizing and performance analysis
	Integration of solar thermal systems in thermal designs
Week 7	Heat exchanger fundamentals and types
	Design considerations for heat exchangers
Week 8	Heat exchanger sizing and performance analysis
	Heat exchanger selection and optimization
Week 9	Cost estimation in thermal system design
Week 10	Economic analysis and evaluation methods
Week11	Computational tools and software for thermal system simulation
	Introduction to simulation software (e.g., MATLAB, ANSYS, Starccm)
Week12	Simulation of thermal systems using software tools
	Performance analysis and optimization through simulations
Week13	Advanced optimization techniques for thermal system design
	Parameter optimization and sensitivity analysis
Week14	Case studies: Real-world applications and design challenges
Week15	Analysis and discussion of case studies related to thermal system design
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Design of Thermal Systems" by Wilbert F. Stoecker and J. W. Jones	Yes
Recommended Texts	□ "Thermal Systems Design" by W. P. Jones □ "Thermal Systems Engineering: Thermodynamics, Fluid Mechanics, and Heat Transfer" by Michael J. Moran, Howard N. Shapiro, Bruce R. Munson, and David P. DeWitt	No
Websites	NA	

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 403	**Thermal Systems Design**	**6**	**7**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**1**	**63**	**87**

The Design of Thermal Systems course is a comprehensive exploration of the principles and practices involved in creating efficient and effective thermal systems. This course delves into the design considerations and methodologies necessary for designing systems that involve heat transfer, thermodynamics, fluid mechanics, and energy conversion.

Students will learn how to analyze and optimize thermal systems by examining factors such as heat generation, heat transfer mechanisms, and energy efficiency. They will study the design of components like heat exchangers, boilers, turbines, compressors, and refrigeration systems. Through case studies, simulations, and hands-on projects, students will gain practical experience in sizing, performance analysis, and material selection for thermal systems.

Furthermore, the course will cover system integration, control strategies, and the assessment of environmental impacts. Students will develop the skills to address real-world challenges in various industries, including power generation, HVAC, automotive, and aerospace.

By the end of the course, students will possess the knowledge and tools needed to design and optimize thermal systems, making them well-equipped for careers as thermal system engineers, energy consultants, or researchers in the field of thermal sciences

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Aided Design**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**PM 401**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	PM		**College**	TEMO	
Module Leader	Hasan abdulellah Abdulla		**e-mail**	hasan.alsarraf@ntu.edu.iq	
Module Leader's Acad. Title	Ass. Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**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. 3D Modeling: AutoCAD supports the creation of 3D models by extruding 2D shapes or using more advanced modeling techniques like surface modeling or solid modeling. Users can create complex 3D objects and perform operations such as blending, chamfering, or shelling. This course deals with the basic concept of the computer in mechanical drawing. 2. Annotation and Documentation: AutoCAD allows users to add text, dimensions, and annotations to their designs, enabling clear communication and documentation of design intent. 3. Collaboration: AutoCAD provides features for sharing and collaborating on designs. Multiple users can work on the same drawing simultaneously, and the software offers tools for managing revisions and tracking changes. To be able to communicate with other mechanical engineering professionals regardless their spoken language. 4. Customization: AutoCAD can be customized to suit individual workflows and preferences. Users can create and apply custom templates, create macros and scripts, and extend the functionality of the software through programming interfaces. 5. For ANSYS application Gain a solid understanding of the principles and fundamentals of finite element analysis, including the concept of discretization, meshing, and the finite element method. 6. earn Simulation Workflow: Develop the skills necessary to perform a complete simulation workflow, including pre-processing tasks like geometry creation, mesh generation, and defining boundary conditions, as well as post-processing tasks for interpreting and analyzing results. 7. Perform Structural Analysis: Gain competence in setting up and running structural analysis simulations in ANSYS. Learn how to define materials, apply loads and boundary conditions, and interpret results for stress, strain, deformation, and other structural behavior. 8. Conduct Thermal Analysis: Acquire knowledge and skills to perform thermal analysis using ANSYS. Understand how to define thermal loads, boundary conditions, and material properties for analyzing heat transfer, temperature distribution, and thermal behavior.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 2. 3D Modeling Skills: Students will acquire the ability to create 3D models using AutoCAD. They will learn different techniques for creating 3D objects, such as extrusion, lofting, and sweeping. 3. Design Visualization: Students will learn how to effectively visualize and present their designs using AutoCAD. They will explore techniques for creating realistic renderings and animations to showcase their 3D models.

	4. Problem Solving and Critical Thinking: Through working on design projects and exercises, students will enhance their problem-solving and critical thinking skills. 5. Professional Standards and Practices: Students will gain knowledge of industry standards and best practices for using AutoCAD. They will learn about drawing standards, file organization, and proper techniques for creating professional-quality drawings. 6. The module learning outcomes of studying ANSYS application can vary depending on the level and focus of the course, gain a comprehensive understanding of the simulation workflow, including pre-processing, solving, and post-processing stages. 7. Technical Skills: Develop proficiency in using ANSYS software, including its user interface, tools, and commands. Acquire practical skills in geometry creation, mesh generation, material assignment, and defining boundary conditions in conditions in ANSYS. 8. Analysis and Interpretation: Gain the ability to analyze and interpret simulation results obtained from ANSYS. Understand how to assess the structural behavior, deformation, stress, strain, temperature distribution, fluid flow parameters, and electromagnetic fields. 9. Develop problem-solving skills by identifying and troubleshooting issues that may arise during simulations. Learn optimization techniques to improve designs and achieve desired performance or efficiency. Apply ANSYS to solve practical engineering problems and make informed design decisions based on simulation results.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. AutoCAD application 1-Advanced Drawing Techniques: ● Working with advanced object construction methods (polylines, splines, etc.) ● Modifying complex objects (fillet, chamfer, etc.) ● Creating and editing hatches and gradients. ● Using grips and grip editing techniques. 2- 3D Modeling: ● Introduction to 3D modeling concepts ● Creating 3D objects (extrude, revolve, sweep, etc.) ● Modifying and manipulating 3D objects ● Applying materials and textures to 3D models ● Rendering and creating realistic 3D presentations 3- Project Work: ● Applying learned skills to complete design projects ● Integrating multiple concepts and techniques in practical applications ● Problem-solving and critical thinking in design scenarios

	ANSYS application 1 -Introduction to ANSYS: ● Overview of ANSYS software suite and its capabilities ● Understanding the ANSYS user interface and navigation ● Introduction to the ANSYS Workbench environment 2- Pre-processing: ● Geometry creation and manipulation using ANSYS Design Modeler or other CAD tools ● Mesh generation techniques, including element types, mesh controls, and quality assessment ● Material assignment and definition of material properties 3- Structural Analysis: ● Static structural analysis: applying loads and constraints, solving linear and nonlinear problems ● Modal analysis: natural frequencies, mode shapes, and vibration analysis ● Buckling analysis: evaluation of critical buckling loads and modes

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching both AutoCAD and ANSYS by providing knowledge the various menus, toolbars, and commands available. This will help student to navigate the software more efficiently and locate the necessary tools for multiple tasks. Take advantage of online tutorials and documentation provided by Autodesk and ANSYS. These resources often include step-by-step guides, video tutorials, and examples that can help the student to understand the software's features and functionalities. Work through these resources to gain hands-on experience and reinforce learning. Dedicate regular time to practice using AutoCAD and ANSYS. Create simple drawings or models, and gradually progress to more complex projects. The more the student practice, the more comfortable and adept the student to become at right way to using the software effectively.

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, 8 and 12	LO #1, #2, #4, #7 and #8
	Assignments	6	10% (10)	4, 6, 7, 9, 11 and 13	LO #3, #5, #6 and #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) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to AutoCAD -3D, workspace, visual style, 3d views, view ports, right hand rule, world coordinate and user coordinate systems and types of coordinate systems.
Week 2	examples on box, wedge and cylinder 3D solids (box, wedge and cylinder). examples on cone and tours 3D solids (cone and tours). examples on sphere and pyramid 3D solids (sphere and pyramid).
Week 3	Basic solid editing (union, subtract and intersect) with examples.
Week 4	Fillet and chamfer with applied examples. 3D operations (3d move and 3d rotate) with examples.
Week 5	3D operations (3d align and 3d mirror) with examples.

	3D operations (3d array and slice) with examples.
Week 6	User coordinate system (origin, face and objects) with examples.
Week 7	Advanced 3d commands (extrude and loft)
Week 8	Advanced 3d commands (revolve, sweep) with examples.
Week 9	Advanced 3d commands (press pull and section plane) with examples. Advanced solid editing/face (extrude, move, rotate and offest).
Week 10	Advanced solid editing/face (taper, delete, copy, color, material, undo and exit). Advanced solid editing/edge (copy and color).
Week 11	Advanced solid editing/body (imprint, separate, shell, clean and check). Surface (box, cone, dome , mesh, pyramid and sphere)
Week 12	Introduction to ANSYS :Overview of ANSYS software and its applications, Familiarization with the ANSYS user interface , Creating a simple 2D model and performing basic analysis.
Week 13	Geometry Creation: Creating complex geometries using ANSYS Design Modeler Importing CAD models and cleaning up geometry Applying mesh controls and generating mesh for analysis
Week 14	Static Structural Analysis: Introduction to static structural analysis, Applying boundary conditions (constraints and loads).Running a structural analysis and interpreting results
Week 15	Modal Analysis : Understanding modal analysis and its significance Setting up modal analysis in ANSYS , Extracting natural frequencies and mode shapes
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	examples on coordinate systems, examples on box, wedge and cylinder
Week 2	examples on cone and tours, examples on sphere and pyramid
Week 3	examples on fillet and chamfer examples on 3d move and 3d rotate examples on 3d align and 3d mirror
Week 4	examples on 3d array and slice applied examples on ucs examples on extrude and loft
Week 5	examples on 3d surface Surface (box, cone, dome and mesh. Press pull and section plane examples on revolve and sweep
Week 6	Creating a simple 2D ANSYS model and performing basic analysis.
Week 7	Creating complex geometries using ANSYS Design Modeler

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 401	Computer Aided Design	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	3	63	87

Description

Studying AutoCAD and ANSYS applications provides students with essential skills for computer-aided design (CAD) and engineering analysis. AutoCAD, a leading CAD software, enables students to create precise 2D and 3D models, facilitating the design process for various industries such as architecture, engineering, and manufacturing. Through AutoCAD, students learn to transform conceptual ideas into detailed and accurate digital representations, enhancing their spatial visualization and technical drawing abilities. On the other hand, ANSYS, a powerful simulation software suite, equips students with the tools to analyze and optimize engineering designs. By studying ANSYS, students can perform structural, thermal, fluid dynamics, and electromagnetics analyses, enabling them to evaluate design performance, predict behavior, and make informed engineering decisions. Together, mastering AutoCAD and ANSYS empowers students to effectively design and analyze complex systems, enhancing their problem-solving skills and preparing them for careers in engineering and related fields.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information					
Module Title	**Control systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory**	
Module Code	**PM 402**			☐ **Lecture**	
ECTS Credits	**6**			☐ **Tutorial**	
SWL (hr/sem)	**150**			☒ **Lab**	
				☒ **Seminar**	
Module Level	**4**		**Semester of Deliver**		**8**
Administering Department	**PM**		**College**		
Module Leader	**Prof. Dr. 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. Understanding Measurement Principles: Gain knowledge of measurement principles, including device selection, calibration, and measurement limitations. 2. Familiarity with Control Systems: Learn the basics of control systems, including feedback, closed-loop control, and the role of sensors, actuators, and controllers. 3. Application of Measurement Techniques: Develop practical skills in using measurement techniques and instruments to collect and analyze data in engineering systems. 4. System Analysis and Optimization: Acquire the ability to analyze measurement and control systems, identify performance issues, and implement optimization strategies for enhanced system performance.
Module Learning Outcomes	1. Understand Measurement Principles: Develop a solid understanding of the fundamental principles of measurement, including accuracy, precision, and uncertainty. Gain the ability to choose appropriate measurement devices and methods for different engineering applications.

	2. Analyze and Design Control Systems: Acquire the skills to analyze and design control systems, including feedback loops, controllers, and actuators. Grasp concepts such as stability, transient response, and steady-state error in control systems. 3. Apply Measurement Techniques: Gain practical expertise in applying measurement techniques and instruments to collect and analyze data in engineering systems. Utilize statistical methods to effectively analyze and interpret measurement data. 4. Troubleshoot and Optimize Systems: Develop the ability to troubleshoot and optimize engineering systems by identifying and rectifying measurement and control issues. Learn techniques for system optimization to enhance performance and efficiency.
Indicative Contents	Part A: Fundamentals of measurement systems, General Measurement System, Error and uncertainty analysis and Static characteristics of measurement system elements [25 hours] Introduction to control system, Power circuit elements, Principles of electric control and Plc basics [25 hours] Revision Session and Quiz [2 hours] Part B: 4. tutorial of symbols, equipment's and Counters, timers, introduction to inverter [25 hours] PLC system structure, Basic ladder logic Timers, Counters & Comparators [25 hours] Up Counter (CTU), Down Counter (CTD), Latch and Unlatch Logic Memory Concept in Allen Bradley PLC, and Hardware of PLC circuit, review of PLC ladder. [25 hours] Revision Session and Quiz [2 hours] Revised Description: Part A of the Engineering Measurement and Control Systems course provides students with a solid understanding of the fundamental principles in this field. The module begins by covering the basics of measurement, including different measurement techniques and the use of instruments. Students will then delve into the topic of control systems and explore considerations related to Programmable Logic Controllers (PLCs). To reinforce the learned concepts, a revision session and quiz will be conducted, allowing students to review and assess their understanding. This module serves as a crucial foundation for further studies in the field of Engineering Measurement and Control Systems.

Learning and Teaching Strategies	
Strategies	1. Active Participation: Actively engage in class discussions, ask questions, and contribute to group activities. This will help you better understand the concepts and reinforce your learning. 2. Practical Application: Apply the theoretical knowledge to real-world examples and projects. Participate in laboratory sessions and hands-on activities to gain practical experience in measurement and control systems. 3. Problem-Solving Approach: Develop strong problem-solving skills by practicing solving different types of measurement and control problems. Work on assignments and projects that require critical thinking and analytical skills

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

Module Evaluation					
As		**Time/Number**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**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)	
Week	**Material Covered**
Week 1	Fundamentals of measurement systems - Definition of measurement and instrumentation - Significance of measurement
Week 2	General Measurement System - Functions of instrument in measurements - Calibration and standards
Week 3	Error and uncertainty analysis - Errors in Measurements - Accuracy and precision - Sources of errors
Week 4	Static characteristics of measurement system elements - Characteristics of instruments - Static characteristics of measuring system - Environmental effects
Week 5	Introduction to control system - Types of Control System - Block Diagrams
Week 6	Introduction to Block Diagrams - Block Diagram Reduction Rules
Week 7	Power circuit elements Circuit breaker Overload Relay
Week 8	Contactor
Week 9	Principles of electric control, components, elements, sensors, electric relays, controlled devices (final elements) , switches, power & control circuits , planning (mapping)..
Week 10	Plc basics, tutorial of symbols, equipment's
Week 11	Counters, timers, introduction to inverter
Week 12	PLC system structure, Basic ladder logic Timers, Counters & Comparators
Week 13	Up Counter (CTU) , Down Counter (CTD)
Week 14	Latch and Unlatch Logic Memory Concept in Allen Bradley PLC
Week 15	Hardware of PLC circuit, review of PLC ladder
Week 16	Final Examination

Delivery Plan (Weekly Lab. Syllabus)	
Week	**Material Covered**
Week 1	Over view on the control workshop , tools, and measuring devices
Week 2	Knowledge of connection & operation of the measuring devices for temperature, pressure, humidity, fluid flow.
Week 3	Built electric circuit (power & control) for domestic refrigerator or freezer and checking before operating the circuit.
Week 4	Built electric circuit (power & control) for domestic water cooler and checking before operating the circuit.
Week 5	Built electric circuit (power & control) for domestic window type A/C for cooling and checking before operating the circuit.
Week 6	Built electric circuit (power & control) for domestic window type A/C for cooling & heating, and checking before operating the circuit.
Week 7	Built electric circuit (power & control) for domestic defrost refrigerator and checking before operating the circuit.
Week 8	Built electric circuit (power & control) for domestic clothes washer and checking before operating the circuit.
Week 9	Check and calibration of thermal expansion valve.
Week 11	Check and calibration for the contacts of the electric contactor & thermal switch.
Week 12	Built a control circuit for motor power circuit (ON-OFF) start and stop from one location.
Week 13	Built a control circuit for motor power circuit (ON-OFF) start and stop from two deferent locations.
Week 14	Built a control circuit for motor power circuit (star-delta) rotate in one direction, and other in two directions.
Week 15	Practical study of the PLC gets.

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. "Measurement and Control Basics" by Thomas A. Hughes 2. "Principles of Measurement Systems" by John P. Bentley 3. "Industrial Instrumentation and Control Systems" by William C. Dunn 4. "Process Control: A Practical Approach" by Myke King	yes
Recommended Texts	1. "Instrumentation and Control Systems Documentation" by Fred A. Meier 2. "Control Systems Engineering" by Norman S. Nise 3. "Automatic Control Systems" by Benjamin C. Kuo and Farid Golnaraghi 4. "Modern Control Engineering" by Katsuhiko Ogata	yes

	5. "Instrumentation for Process Measurement and Control" by Norman A. Anderson 6. "Introduction to Control System Technology" by Robert N. Bates	
Websites	1. National Instruments: www.ni.com 2. Automation.com: www.automation.com 3. ControlGlobal: www.controlglobal.com 4. ISA - International Society of Automation: www.isa.org 5. Omega Engineering: www.omega.com 6. Emerson Automation Solutions: www.emerson.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.

Module 1

Code	Course/Module Title	ECTS	Semester
PM 402	**Control systems**	**6**	**8**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**2**	**78**	**72**
Description			

Control systems involve the application of various techniques and technologies to measure, monitor, and control physical variables and processes in industrial, engineering, and scientific applications. This field encompasses the design, implementation, and optimization of systems that ensure accurate and reliable measurements, as well as effective control of processes. Measurement and Control Systems play a crucial role in industries such as manufacturing, power generation, automation, and instrumentation. They involve sensors, transducers, data acquisition systems, signal processing techniques, and control algorithms. These systems enable precise measurement of variables like temperature, pressure, flow rate, and level, and utilize control strategies to regulate and optimize processes.

Understanding Measurement and Control Systems requires knowledge of sensors, data acquisition methods, signal conditioning, measurement principles, control theory, and instrumentation. Professionals in this field need to analyze system behavior, design control algorithms, implement hardware and software components, and troubleshoot issues.

This field is constantly evolving with advancements in technology, such as the integration of Internet of Things (IoT), machine learning, and cloud computing. Measurement and Control Systems are vital for ensuring efficiency, safety, and reliability in various industries, making it a critical area of study for engineers and scientists.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Combustion & Pollution Engineering**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☐**Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RE 404**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Deliver**	8	
Administering Department	PM		**College**	TEMO	
Module Leader	Omar Mohammed yousif		**e-mail**	Omar.m.yousif@ntu.edu.iq	
Module Leader's Acad. Title	Ass.Lecture		**Module Leader's Qualification**	M.S.C.	
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 types of Fuel & combustion process. 2. Introduce the student Basic Concepts of Thermodynamics of combustion , stoichiometric combustion , incomplete combustion , complete combustion , Air fuel ratio *(A/F)*, 3. Introducing students how to calculate adiabatic flame temperature , constant pressure adiabatic flame temperature , constant volume adiabatic flame temperature. 4. Introducing students to study Classifications of engines and Engine performance. 5. Introducing the student to Air-Standard cycles . 6. Introduce the student types of hydrocarbon fuels , Hydrocarbon fuels gasoline , Diesel fuel , Alternate fuels . 7. Introducing students study Octane Number &Cetane Number , Self-Ignition Characteristics of Fuels , Octane Number and Engine Knock 8. Introduce the student Basic Concepts of air pollution, physical and chemical fundamentals . 9. Introduce the student Ambient air quality standards for criteria pollutants , Air pollution standards , Air pollution regulation. 10. To understand Air pollutants classification , Transport and air pollution , Causes of air pollution from Transportation. 11. Introducing students study the Strategies for control of emissions in SI engines; Add on systems to control emissions inside the engine: EGR, crankcase and evaporative emission control
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. 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 combustion process . 3. The ability to think to extract engineering solutions to problems related to combustion and pollution . 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 adiabatic flame temperature . 7. The ability to calculate the Calculation of concentrations of air pollutants in the atmosphere . 8. The ability to control emissions in SI engines .
Indicative Contents	After studying this chapter, the student is expected to master the following knowledge and skills: .

المحتويات الإرشادية	1-Basic Concepts of combustion , and types of combustion [15 hrs] 2- calculations adiabatic flame temperature [10 hrs] 3- Classifications of engines and Engine performance. [15 hrs] 4- Types of hydrocarbon fuels , Hydrocarbon fuels gasoline , Diesel fuel , Alternate fuels . [15 hrs] 5-Studying Octane Number &Cetane Number [10 hrs] 6- air pollution and Air pollution regulation [20 hrs]. 7- Strategies for control of emissions in SI engines [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	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
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20% (20)	2, 6 and 9, 12	LO #1, #5 and #6, #8
	Assignments	3	15% (15)	4, 8 and 14	LO #2, #3 and #7
	Projects / Lab.				
	Report	1	5% (5)	13	LO #4
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	Thermodynamics of combustion, . Review of property relations ,letant heat of vaporization , Ideal gas mixtures ,Fuel & combustion , stoichiometric combustion , incomplete combustion , complete combustion , Air fuel ratio *(A/F)*
Week 2	Excess of air , less of air ,theoretical of air , Equivalence ratio.
Week 3	Application of 1st law of thermodynamic on combustion process, Closed system (non-flow process) , Open system (steady -flow process)
Week 4	adiabatic flame temperature , constant pressure adiabatic flame temperature , constant volume adiabatic flame temperature
Week 5	Classifications of engines, Types of Ignition, Engine Cycle, Basic Design, Air Intake Process, Method of Fuel Input for SI Engines, Fuel Used , Application , Type of Cooling
Week 6	Engine performance , brake power , brake thermal efficiency , brake mean effective pressure , Specific fuel consumption , Mechanical efficiency , Volumetric efficiency
Week 7	Air-Standard cycle , Air-Standard Assumptions , pressure volume diagram , Mean process on p-v diagram , Otto Cycle , Thermal efficiency of the ideal Otto cycle , diesel cycle , Thermal efficiency of the ideal diesel cycle
Week 8	Air-fuel cycle , Air-fuel cycle assumption , constant volume cycle (gasoline engine cycle) , constant pressure cycle (Diesel engine cycle
Week 9	hydrocarbon fuels , Hydrocarbon fuels gasoline , Diesel fuel , Alternate fuels

Week 10	Octane Number &Cetane Number , Self-Ignition Characteristics of Fuels , Octane Number and Engine Knock
Week 11	Introduction to pollution , Ecological Systems and pollution , Toxic pollutants , Environmental factors affecting toxicity , Ambient air quality standards for criteria pollutants , Air pollution standards , Air pollution regulation
Week 12	Air pollutants classification , Transport and air pollution , Causes of air pollution from Transportation
Week 13	Calculation of concentrations of air pollutants in atmosphere , Description of air pollutants , A-Criteria Pollutants , Carbon Monoxide (CO) , Nitrogen Oxides (NO2) , Sulphur Oxides (SO_x) , Particulate Matter (PM-10) , Organic air pollutants (VOCS) , Hydrocarbons (HC) , Ozone (O3) , Lead(Pb)
Week 14	Calculation of concentrations of air pollutants in atmosphere ,
Week 15	Global Climate Change - Greenhouse Gases Toxic Pollutants, Radioactive pollutants, indoor pollutants and Non-Criteria pollutants
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	. Engineering Fundamentals of the Internal Combustion Engine .*By* Willard W. Pulkrabek	Yes
Recommended Texts	AN INTRODUCTION TO COMBUSTION Concepts and Application.BY Stephen R. Turns	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.

Undergraduate Courses 2023-2024

Code	Course/Module Title	ECTS	Semester
RE 404	**Combustion & Pollution Engineering**	**6**	**8**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
3	**2**	**78**	**72**
Description			
The main focus of combustion is the application of the engineering sciences, especially the thermal sciences, to internal combustion engines. The goals are to familiarize Basic Concepts of Thermodynamics of combustion , stoichiometric combustion , incomplete combustion , complete combustion with engine nomenclature, describe how internal combustion engines work, . An internal combustion engine is defined as an engine in which the chemical energy of the fuel is released inside the engine and used directly for mechanical work, as opposed to an external combustion engine in which a separate combustor is used to burn the fuel. the overall performance of internal combustion engines. Major engine cycles, configurations,. The will apply the principles of thermodynamics, combustion, fluid flow, friction, and heat transfer to determine an internal combustion engine's temperature and pressure profiles, work, thermal efficiency, and exhaust emissions. Also The main objectives of pollution is to Introduce Basic Concepts of air pollution, physical and chemical fundamentals and Introducing Ambient air quality standards for criteria pollutants , Air pollution standards , Air pollution regulation. To understand Air pollutants classification , Transport and air pollution , Causes of air pollution from Transportation and Introducing the Strategies for control of emissions in SI engines.			

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering and Industrial Management**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**TEMO 400**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	3		**Semester of Deliver**	5	
Administering Department	PM		**College**	TEMO	
Module Leader	Omar Abdulhadi Mustafa		**e-mail**	Omeralhayaly1@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 methods of management and the appropriation each of them in different fields work. 2. Introduce the student to exercise the different methods of the management on the mini groups to elevate his ability in management. 3. Enhance the student skills in management by giving the typical solution on the assumed problem. 4. Introducing students to different types of feasibility study and how can do assessment each of them. 5. Introducing students to make the network planning for the different engineering processes. 6. Introducing the student to the administrative and production organization of industrial enterprises. 7. Introducing the student to Break-Even Analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enable the student to use knowledge to manage the different purposes organizations. 2. Enable engineers to use modern programs to solve the technical problems in organizations where they managed. 3. Enable engineers to layout the administrative and production organization of industrial enterprises. 4. Enable engineers to layout the network planning for the different engineering processes and finding the typical path of the minimum duration that offers the best quality of the production. 5. Enable engineers to study the feasibility of the industrial processes which leads to successful of the production. 6. Enable engineers to calculate the Break-Even of any production or trading process and calculating the duration of that case. 7. Enhance the student skills in management by giving the typical solution on the assumed problem.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ● BUILDING SURVEY Introduction to the management [10 hrs] Modern methods of the management [15 hrs] Feasibility study [15 hrs] ● BREAK-EVEN ESTIMATION The necessity of calculations of the break-even point and its duration. [15 hrs] ● FEASIBILITY STUDY The necessity of the different field feasibility study [15 hrs] ● Administrative and production organization of industrial enterprises The meaning of the administrative and production organization of industrial enterprises and how can make the most appropriate administrative layout [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 management exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
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	20% (20)	3, 5 and 10	LO #1, #2 and #5
	Assignments	3	20% (20)	4, 8 and 12	LO #3, #4, #6 and #7
	Report				
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO #1 - #7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction – definition and examples related to the industrial engineering management - Functions of management
Week 2	Establish Goals and Objectives.
Week 3	Feasibility Study, Technical feasibility, Economic feasibility
Week 4	Feasibility Study, Schedule feasibility, Operational feasibility.
Week 5	Analyzing Costs vs. Benefits, Calculating Present Value, Net Present Value (NPV), Internal Rate of Return (IRR).
Week 6	Break-Even Analysis, Break-point calculations.
Week 7	Administrative and production organization of industrial enterprises, Linear structure, Consulting structure, Functional structure.
Week 8	Introduction in Network planning.
Week 9	Network planning, calculation of the critical path, float time, meaning of the early start, early finish, late start and late finish.
Week 10	Network planning, Program Evaluation and Review Technique (PERT).
Week 11	Quality Control and production inspection method
Week 12	Industrial costs and controllable cost techniques
Week 13	Maintenance
Week 14	Replacement
Week 15	Self-assessment control

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	د. عادل عبد المالك " الهندسة الصناعية "– دار الكتب للطباعة والنشر - جامعة البصرة - الطبعة الأولى 200	Yes
Recommended Texts	د. خليل العاني ، د. إسماعيل إبراهيم القزاز ، د. عادل عبد المالك آوريال " إدارة الجودة الشاملة ومتطلبات الأيزو 2000:9001 " الطبعة الأولى 2001 ، مطبعة الأشقر- بغداد	No
Websites	1. https://www.workamajig.com/blog/critical-path-method 2. https://www.editorialmanager.com/cherd/default2.aspx?pg=AuthorshipVerification.aspx&docid=50317&authorID=%7b0854344E-1B2D-43DE-9697-4095BA17131E%7d&msid=%7bC7C1D8B5-7EF8-4FDD-B449-5CE3CD0A947A%7d 3. https://www.investopedia.com/terms/q/quality-control.asp	

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
TEMO 400	**Engineering and Industrial Management**	**6**	**8**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**1**	**48**	**102**

Description

The subject aims to encourage students' participation in the management 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 assumptions involving some sampling activities that are interesting to the students.
The results of this module study will leads to:

1. Enable the student to use knowledge to manage the different purposes organizations.
2. Enable engineers to layout the administrative and production organization of industrial enterprises.
3. Enable engineers to layout the network planning for the different engineering processes and finding the typical path of the minimum duration that offers the best quality of the production.
4. Enable engineers to study the feasibility of the industrial processes which leads to successful of the production.
5. Enhance the student skills in management by giving the typical solution on the assumed problem.