Al-Farahidi University
جامعة الفراهيدي

جامعة الفراهيدي
قسم هندسة تقنيات التبريد والتكييف

First Cycle – Bachelor's Degree (B.Sc.) – Air Conditioning and Refrigeration

بكالوريوس – هندسة تقنيات التكييف والتبريد (الدورة الأولى)

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Mathematics			**Module Delivery**	
Module Type	C			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	AFU14010				
ECTS Credits	8				
SWL (hr/sem)	240				
Module Level	1		**Semester of Delivery**	1	
Administering Department	AFU14		**College**	TEC	
Module Leader	Huda Mohammed		**e-mail**	hudasabbar86@gmail.com	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PH.D.	
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name	Dr. Samir Ali		**e-mail**	alraiee2002@yahoo.com	
Scientific Committee Approval Date	20/06/2023		**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 Aims أهداف المادة الدراسية	Teaching the student the basic and advanced principles of calculus and its applications to develop the students mental abilities to solve problems and make use of available information in the other scientific materials.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	To apply the knowledge of mathematics, science and engineering fundamentals.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	87	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	153	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	10
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	240		

Module Evaluation تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (15)	5, 10	LO #1, 2, 7 and 9
	Assignments	4	10% (15)	2, 8	LO # 3, 4, 5 and 6
	Projects / Lab.	0	0	0	
	Report	2	10% (10)	7,14	LO # 5, 6 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	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	Determinants, properties,Grammar's rule, application of determinant
Week 2	Vectors, vectors in space, unit vector,Scalar product, vector product
Week 3	Trigonometric functions& relation,Graphing of functions, Trigonometric equations
Week 4	Function of limits, Algebraic limit,Trigonometric limit, Infinity as limit
Week 5	Derivative rule, Algebraic& Trigonometric derivative ,Chain rule, velocity& acceleration
Week 6	Inverse trigonometric functions& its derivative , Logarithm& Exponential functions& its derivative
Week 7	Hyperbolic functions& its derivative, Inverse hyperbolic functions& its derivative
Week 8	Integration, integrals of trigonometric& inverse functions , Integrals of logarithm& Exponential functions
Week 9	Integrals of logarithm& Exponential functions, Integrals of hyperbolic functions& its derivative,L'Hopitals's rules
Week 10	Integration methods; Integration by parts,Integration by partial fraction
Week 11	Integration by trigonometric substitution,Integration of ax2 + bx + c
Week 12	Application of Integration,Area under the curve& between two curves
Week 13	Surface area generated,Length of the curve
Week 14	Volume generated by rotation of curve,Simple differential equations
Week 15	Simpson rule for area,Trapezoidal rule for area, applications

Week 16	Preparatory week before the final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Advanced *Engineering Mathematics*	Yes
Recommended Texts	Calculus	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Engineering Drawing			**Module Delivery**	
Module Type	C			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	AFU14011				
ECTS Credits	6				
SWL (hr/sem)	180				
Module Level	1		**Semester of Delivery**	1	
Administering Department	AFU14		**College**	TEC	
Module Leader	Salem Farman Salman		**e-mail**	dr_AL.izi@yahoo.com	
Module Leader's Acad. Title	Assistant Prof		**Module Leader's Qualification**	PH.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr. Samir Ali		**e-mail**	alraiee2002@yahoo.com	
Scientific Committee Approval Date	20/6/2023		**Version Number**	1	

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 Aims أهداف المادة الدراسية	1. This module describes the skills, knowledge, and attitude required to apply technical drawing. At the end of this module, learners will be able to Introduce technical drawings, apply principles of drawing, and project views. 2. to make the students know how to draw (Engineering Drawing) by using AUTOCAD program. 3. This course deals with the basic concept of Engineering Drawing. 4. Define the Engineering Drawing - The Tools used in Engineering Drawing - Types of drawing sheets, types of lines. 5. Learning 2D interface in AutoCAD. 6. Learning 3D interface in AutoCAD.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Define the Engineering Drawing - The Tools used in Engineering Drawing - Types of drawing sheets, types of lines 2-Introduction to AutoCAD and learning how to use the program interface 3-Learning how to use Draw toolbar and its content 4-Learning how to use modify toolbar and its content 5-Learning how to use dimension toolbar and its content and draw 2D exercises 6-Theory of projection, Theory of projection 1st angle 7-Theory of projection 3rd angle 7-Drawing the three projection views 8-Theory of Section and Drawing the three Section views 9-Learning 3D interface in AutoCAD and 3D tools, 3D exercises
Indicative Contents المحتويات الإرشادية	indicative contents include the following: <u>Part A:</u> The Purpose of Engineering Drawings An engineering drawing is a subcategory of technical drawings. The purpose is to convey all the information necessary for manufacturing a product or a part. Engineering drawings use standardized language and symbols. This makes understanding the drawings simple with little to no personal interpretation possibilities. <u>Part B:</u> understanding AutoCAD

	AutoCAD interface and Its usage like centers around drawing with electronic equivalents of real-life drafting tools. The added support of digital precision helps with measurements and calculations, 3D components, and data sharing. Part C: 2D Drawings Using lines to make 2D drawings, apply dimensions rules, design 2d shapes and drawing projections and sectioning views. Part D: 3D drawings 3D CAD, or three-dimensional computer-aided design, is technology for design and technical documentation, which replaces manual drafting with an automated process.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to courage 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 type of simple experiments involving some sampling activities that are interesting to the students. YouTube channel for the teacher includes lessons to help the students in their studying https://www.youtube.com/channel/UCiUmlY4CLQn5ycY4von1P5g

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	88	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
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	180		

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

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Define the Engineering Drawing, tools, types of drawing sheets, and types of lines
Week 2	Introduction to AutoCAD and learning how to use the program interface
Week 3	Learning how to use Draw toolbar and its content
Week 4	Learning how to use Draw toolbar and its content
Week 5	Learning how to use modify toolbar and its content
Week 6	Learning how to use dimension toolbar and its content and draw 2D exercises
Week 7	Theory of projection, Theory of projection 1st angle
Week 8	Find the 3rd project view from 2 views
Week 9	Theory of projection 3rd angle
Week 10	Drawing the three projection views
Week 11	Theory of Section
Week 12	Drawing the three Section views
Week 13	Learning 3D interface in AutoCAD
Week 14	3D tools, 3D exercises
Week 15	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	ملزمة الرسم الهندسي الخاصه بالكلية التقنية الهندسية بغداد/ قسم هندسة تقنيات المواد	Yes
Recommended Texts	K. Venkata Reddy "Textbook of Engineering Drawing second edition" 2008	No
Websites	https://www.autodesk.com/	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Workshops			**Module Delivery**	
Module Type	C			☐ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	AFU14012				
ECTS Credits	8				
SWL (hr/sem)	240				
Module Level	1		**Semester of Delivery**	1	
Administering Department	AFU14		**College**	TEC	
Module Leader	Waleed Khalid+ Ibrahim Amar		**e-mail**	Waleed 175 mohammed@gmail.com hemoo979797@gmail.com	
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	**Dr. Samir Ali**		**e-mail**	alraiee2002@yahoo.com	
Scientific Committee Approval Date	10/06/2023		**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 Aims أهداف المادة الدراسية	The main object of this unit is to identify the students on the gain of the manual skills by preceding the operations and manufacturing processes, and doing the maintenance by using different manual tools and measuring instruments

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the engineering mechanics module, students should be able to: preceding the operations and manufacturing processes, and doing the maintenance by using different manual tools and measuring instruments
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Foundry workshop: 2. Casting of metals and their importance - Purpose of using castings in industry - Contents of the foundry unit - Industrial safety reserves in the foundry - Forming a sand mold for a one-piece model - Sands of molds and hearts: types, sources and properties - Additives, mixing processes and adjusting ingredients - Use of sand mixer - Handling of improvised sand - Sand handling devices - forming sand molds by manual method for a one-piece model - forming a sand mold. 3. Sand mold for a one-piece model with defining the estuaries and elevators - Metal smelting and pouring into the mold - Extracting and cleaning the castings - Forming a mold using the pulp box and drying it in the drying oven - Forming a sand mold for a simple two-piece model with a dog. 4. Forming a sandy mold like the previous one with melting the metal and pouring it into a mold and taking out the casting and cleaning it - Metal melting furnaces: types, qualities, uses (rotary kiln, stirrers and stationary) - Reviewing and examining the castings - Determining the apparent defects and their causes - Reviewing the dimensions of the castings and ensuring that they conform to the required dimensions. 5. Furnaces: types, methods of measurement, how a Vernier works to read altimeters with depths - the process of marking (shenk) - base surfaces - the number used - backing materials - marking thorns - just vertebrae - mens of guilt and guilt notation - right angle - pointing flowers - scale heights and depths 6. Files and the cold process: types and specifications of files - mechanized and their types - methods of attaching artifacts to them - uses of files - the method of cleaning the initiator - the cold process - an exercise on the process of marking and simple filings. 7. Saw cutting: hand saw, saw weapon, saw weapon installation, conditions to be met in the sawing process - an exercise on the sawing process. 8. Lathe: specifications, use, accessories and installation methods - forming the lathe - types of lathe pens and the use of measuring tools. 9. Turning operations: flat turning, straightening, simple graded work with the use of measuring tools. 10. Lathe the internal and external loot in different ways with an explanation of the laws of each method - doing an exercise for the external loot and another for the internal loot. 11. Welding workshop: 12. Occupational safety and security needs - gas welding - equipment used and how to install and control it - other auxiliary tools - used gases and their specifications - welding safety, types and measurements - other auxiliary materials - welding equipment - types of flames, method of ignition and control of the required flame - works - rinsing and cleaning the basins to be welded.

	13. Practical exercises for welding opposite surfaces, perpendicular surfaces, inclined surfaces and circuit welding, longitudinal and transverse cutting - cutting: circle, irregular shapes - electric arc welding - equipment used. 14. Welding equipment - Practical training on the use of electric arc welding of different surfaces - Point and tape welding - Equipment used in each type - Types of electrodes and their installation method - Practical training on the use of each type. 15. Welding using argon gas - doing welding exercises using argon gas. 16. Gas cutting operations - equipment used - precautions to be provided. 17. Assembly exercises using various different cutting and welding equipment.

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, and hand-in assignments while at the same time refining and expanding their critical thinking skills through the written exam, Case studies, Quizzes, seminars, Practical testing, and Online testing. and this will be achieved through classes and interactive tutorials.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	١١٦	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٨
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	١٢٤	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٨
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	٢٤٠		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	٦	٤٠% (40)	3,6,9,12	LO #1,2,…..10
	Report/Lab	14	60% (60)	All	LO # 8
	Seminar				
Summative assessment	**Midterm Exam**				
	Final Exam				
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي العملي	
	Material Covered
Week 1	Casting of metals and their importance - Purpose of using castings in industry - Contents of the foundry unit - Industrial safety reserves in the foundry - Forming a sand mold for a one-piece model - Sands of molds and hearts: types, sources and properties - Additives, mixing processes and adjusting ingredients - Use of sand mixer - Handling of improvised sand - Sand handling devices - forming sand molds by manual method for a one-piece model - forming a sand mold.
Week 2	Sand mold for a one-piece model with defining the estuaries and elevators - Metal smelting and pouring into the mold - Extracting and cleaning the castings - Forming a mold using the pulp box and drying it in the drying oven - Forming a sand mold for a simple two-piece model with a dog.
Week 3	Forming a sandy mold like the previous one with melting the metal and pouring it into a mold and taking out the casting and cleaning it - Metal melting furnaces: types, qualities, uses (rotary kiln, stirrers and stationary) - Reviewing and examining the castings - Determining the apparent defects and their causes - Reviewing the dimensions of the castings and ensuring that they conform to the required dimensions.
Week 4	Files and the cold process: types and specifications of files - mechanized and their types - methods of attaching artifacts to them - uses of files - the method of cleaning the initiator - the cold process - an exercise on the process of marking and simple filings.
Week 5	Saw cutting: hand saw, saw weapon, saw weapon installation, conditions to be met in the sawing process - an exercise on the sawing process.
Week 6	Lathe: specifications, use, accessories and installation methods - forming the lathe - types of lathe pens and the use of measuring tools.
Week 7	Turning operations: flat turning, straightening, simple graded work with the use of measuring tools.
Week 8	Lathe the internal and external loot in different ways with an explanation of the laws of each method - doing an exercise for the external loot and another for the internal loot.
Week 9	Occupational safety and security needs - gas welding - equipment used and how to install and control it - other auxiliary tools - used gases and their specifications - welding safety, types and measurements - other auxiliary materials - welding equipment - types of flames, method of ignition and control of the required flame - works - rinsing and cleaning the basins to be welded.
Week 10	Practical exercises for welding opposite surfaces, perpendicular surfaces, inclined surfaces and circuit welding, longitudinal and transverse cutting - cutting: circle, irregular shapes - electric arc welding - equipment used.
Week 11	Welding equipment - Practical training on the use of electric arc welding of different surfaces - Point and tape welding - Equipment used in each type - Types of electrodes and their installation method - Practical training on the use of each type.
Week 12	Welding using argon gas - doing welding exercises using argon gas.
Week 13	Gas cutting operations - equipment used - precautions to be provided.
Week 14	Assembly exercises using various different cutting and welding equipment.

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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Engineering Materials			Module Delivery	
Module Type	C			☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	AFU14013				
ECTS Credits	5				
SWL (hr/sem)	150				
Module Level	1		Semester of Delivery	1	
Administering Department	AFU14		College	TEC	
Module Leader	Dr. Amass Ali		e-mail	Abasseltememi@yahoo.com	
Module Leader's Acad. Title	Lecturer		Module Leader's Qualification	Ph.D	
Module Tutor			e-mail		
Peer Reviewer Name	Dr. Samir Ali		e-mail	alraiee2002@yahoo.com	
Scientific Committee Approval Date	20 / 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 Aims أهداف المادة الدراسية	1. Explain the atomic structure and types of primary and secondary atomic and molecular bonding. 2. Explain the crystal structures and geometry and classify different classes of space lattices in crystalline solids. 3. Perform different types of mechanical testing for evaluation of mechanical properties of material. 4. Extract information of materials behavior from phase diagram. 5. Identify the structures, properties and applications of the main engineering materials (metals, alloys, polymers, ceramics and composites. 6. Explain corrosion mechanisms and types of corrosions and methods of corrosion prevention. 7. Explain the Nano materials.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The student able to: 1. Mechanical Properties, stress-strain curve, elasticity, plasticity, ductility, young modulus, tensile stress, yield stress, bricking stress, true and engineering stress-strain diagram). 2. Knowledge of Ionic bond, inter-atomic distance attraction forces between atoms, coordination number, covalent bond, and Metallic bond. 3. Knowledge the Crystal structure, unit cell, types of unit cells simple cubic, Face centered cubic, body centered cubic, atomic packing factor, Previous lattice, Miller index, . 4. To Understanding the Phase diagrams 5. To know the types of Engineering Materials 6. To know Corrosion, Definition, why it happens, Type of corrosion, Dry and wet corrosion. Eight Form of corrosion. Mechanism of crevice corrosion 7. To know Methods of prevention and protection.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1-Crystalline and non Crystalline Materials, Metallic crystal structures crystallographic directions ,crystallographic planes-Types of crystal structure, Packing factor.Bonds ,metallic bond ,ionic bonds ,covalent bond ,vander waals bond , hydrogen bond (12 hr) - Defects ,point defects ,dislocations ,linear defects ,planar defects (3hr) -Mechanical properties ,Hardness (Brinell hardness ,Vickers hardness , Rockwell hardness) Tensile test, Impact test, Creep test, Fatigue test. (15 hr) -Ferrous and nonferrous alloys in air conditioning and refrigeration equipment's Copper alloys , Aluminum alloys (3hr) -Solidi faction. Solid solution - Phase –diagrams for binary alloys, Complete solubility in both liquid and solid state, Complete solubility in liquid state and complete

	insolubility in solid state, Complete solubility in liquid state and limited solubility in solid state, Iron –carbon systems , Types of iron- carbon systems (12 hr) - Corrosion and corrosion prevention(3hr) -Applications of Nano materials, types ,manufactures of Nano materials.(3hr)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Quizzes, reports, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**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)	3,6, 9,12	
	Assignments	2	10% (10)	6, 12	
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	14	
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	
	Final Exam	2hr	50% (50)	15	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to engineering material science and needs of engineering materials study
Week 2	Classification of materials
Week 3	Ionic bond, inter-atomic distance attraction forces between atoms, coordination number, covalent bond, and Metallic bond.
Week 4	Crystal structure system ,examples and diagrams with definitions
Week 5	Previous lattice, packing factor
Week 6	Definition of alloys, binary alloys, phase diagrams (equilibrium thermal diagrams), eutectic; solid solution
Week 7	solid solution and combination type diagram, Iron-carbon face diagram
Week 8	Iron-carbon cooling curve, phases, reactions, and multi phases
Week 9	Types of thermal equilibrium diagrams
Week 10	Mechanical test and some types
Week 11	Corrosion and types of corrosion
Week 12	Composite material
Week 13	Powder methodology
Week 14	Nano materials
Week 15	Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- William D. Callister, Jr.and David G. Rethwisch, Materials Science and EngineeringAn Introduction, 2007 John Wiley & Sons, Inc. 2- Jones, D.A., “Principal and Protection of Corrosion”, PrenticeHall	Yes

Recommended Texts	1-W. Bolton, R. A. Higgins. Materials for Engineers and Technicians, 2014. 2-Mechanical Properties of Materials, David Roylance 2008. 3-Williiam Bolton, Engineering Materials,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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	English 1			**Module Delivery**	
Module Type	S			☐ **Theory** ☒ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	AFU14014				
ECTS Credits	3				
SWL (hr/sem)	90				
Module Level	1		**Semester of Delivery**	1	
Administering Department	AFU14		**College**	TEC	
Module Leader	Dr Samir Ali		**e-mail**	alraiee2002@yahoo.com	
Module Leader's Acad. Title	Assist Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr Samir Ali		**e-mail**	alraiee2002@yahoo.com	
Scientific Committee Approval Date	20/6/2023		**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 Aims أهداف المادة الدراسية	The goal is to study English language and gain knowledge of it as benefit engineers in general, and to develop speaking skills and understand its basic rules taking the way to the acquisition of the ability to use technical key words in their work and the capability of communicating with other engineers correctly
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Developing speaking skills and understanding its basic rules to take the way to the acquisition of the ability to use technical keywords in their work and the capability of communicating with other engineers correctly .
Indicative Contents المحتويات الإرشادية	Through the prepared curriculum, the student acquires the ability to understand grammar English language through weekly lectures and classes in a gradual and sequential manner for a period of four years, starting from the first stage, such as interrogative, negative, formation of sentences, parts of speech, and others.

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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٥٩	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٣١	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	٩٠		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	20% (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	Parts of speech, vocabulary and comprehension
Week 2	Verb to be, present simple, vocabulary and comprehension.
Week 3	Possessive adjective, possessives, verb to have, verb to do, vocabulary and comprehension.
Week 4	Definite Indefinite articles, pronouns, subject, object,
Week 5	This and that, expletive there, prepositions, vocabulary and comprehension
Week 6	Plurals, , expressions of quantity, , vocabulary and comprehension
Week 7	Simple past, modal verbs, auxiliary verbs,
Week 8	Question words, asking questions, vocabulary and comprehension.
Week 9	Negative and interrogative, I would like and I like, vocabulary and comprehension.
Week 10	Writing a composition, punctuation, vocabulary and comprehension.
Week 11	Present continues, vocabulary and comprehension
Week 12	Types of questions, (yes -no) questions and (wh) questions
Week 13	Simple past, vocabulary and comprehension
Week 14	Simple past, revision
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Headway plus for beginners	Yes
Recommended Texts	Any Grammar and comprehension for technical learning	No
Websites	1- https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering 2- https://link.springer.com/book/10.1007/978-981-10-8624-3 3- https://progressivecollege.ie/courses/early-learning-and-care-qqi-level-5-major-award/?gad=1&gclid=EAIaIQobChMI_Nqu2tqA_wIVZ4VoCR2O0woLEAAYASAAEgI9WvD_BwE	

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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Matlab			**Module Delivery**	
Module Type	E			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC106				
ECTS Credits	4				
SWL (hr/sem)	120				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Mechanical Power Eng. Dep.		**College**	TCB	
Module Leader	Sura Ghanim Hussein		**e-mail**	sura@mtu.edu.iq	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	None		**e-mail**	None	
Peer Reviewer Name	Name		**e-mail**	None	
Scientific Committee Approval Date	20/06/2023		**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 Aims	To make the student able to process, program, and solve arithmetic and engineering problems using Matlab
Module Learning Outcomes	1. To apply the knowledge about Matlab. 2. To enable students solve scientific and mathematical problems, write codes, design projects and process images.
Indicative Contents	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	88	**Structured SWL (h/w)**	6
Unstructured SWL (h/sem)	32	**Unstructured SWL (h/w)**	2
Total SWL (h/sem)	120		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20% (20)	3,5,6,10	LO #1,2,…..10
	Assignments	2	10% (10)	7, 8	LO # 8
	Seminar	1	10% (10)	11	LO # 11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	12	LO # 1-12
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري محتوى كل اسبوع يجب ان يغطي الوقت المحدد	
	Material Covered
Week 1	Introduction to Matlab
Week 2	Mathematical Functions
Week 3	Vectors & Matrices
Week 4	Vectors & Matrices
Week 5	Introduction to Programming in MATLAB
Week 6	Control flow
Week 7	Control flow
Week 8	Debugging
Week 9	Mathematical Equations
Week 10	Graph Plot
Week 11	GUI
Week 12	GUI
Week 13	Image Processing
Week 14	Simulink
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Matlab and Mathematical Functions
Week 2	Lab 2: Vectors & Matrices
Week 3	Lab 3: Control flow
Week 4	Lab 4: Mathematical Equations
Week 5	Lab 5: GUI
Week 6	Lab 6: Image Processing
Week 7	Lab 7: Simulink

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Recommended Texts (Website)	https://www.mathworks.com/products/matlab.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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Electrical Engineering			Module Delivery	
Module Type	C			☐ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	MPAC107				
ECTS Credits	7				
SWL (hr/sem)	210				
Module Level		1	Semester of Delivery		2
Administering Department		Mechanical Power Eng. Dep.	College	TCB	
Module Leader	Fatima Lateef Mohammed		e-mail	fatima_lateef@mtu.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		M.Sc.
Module Tutor	None		e-mail	E-mail	
Peer Reviewer Name		Oday Asam	e-mail	Oday-asam@mtu.edu.iq	
Scientific Committee Approval Date		20/6/2023	Version Number		1

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	NA	**Semester**	
Co-requisites module	NA	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	1. This is the basic subject for all electrical and electronic circuits. 2. This course deals with the basic concept of electrical circuits. 3. To understand voltage, current and power from a given circuit. 4. To develop problem solving skills and understanding of circuit theory through the application of techniques. 5. To understand Kirchhoff's current and voltage Laws problems.
Module Learning Outcomes	Upon completion of the course, students should be able to: 1. Define Ohm's law. 2. List the various terms associated with electrical circuits. 3. Recognize how electricity works in electrical circuits. 4. Describe electrical power, charge, and current. 5. Explain the two Kirchoff's laws used in circuit analysis. 6. Discuss the various properties of resistors, capacitors, and inductors. 7. Discuss the operations of sinusoid and phasors in an electric circuit. 8. Identify the capacitor and inductor phasor relationship with respect to voltage and current.
Indicative Contents	Indicative content includes the following. DC circuits – Current and voltage definitions, Passive sign convention and circuit elements, Combining resistive elements in series and parallel. Kirchhoff's laws and Ohm's law. Anatomy of a circuit, Network reduction. [15 hrs] AC circuits I – Time dependent signals, average and RMS values. Capacitance and inductance, energy storage elements, simple AC steady-state sinusoidal analysis. [15 hrs] AC Circuits II - RL, RC and RLC circuits - Frequency response of RLC circuits, simple filter and band-pass circuits, resonance and Q-factor, use of Bode plots, use of differential equations and their solutions. Time response (natural and step responses). Introduction to second order circuits. [15 hrs] Revision problem classes. [6 hrs] Resistive networks, voltage and current sources, Thevenin equivalent circuits, current and voltage division, input resistance, output resistance, maximum power transfer, RMS and power dissipation, current limiting and over voltage protection. [15 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, participation in the exercises, classes interactive tutorials, Quizzes and Practical testing

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	112	**Structured SWL (h/w)**	8
Unstructured SWL (h/sem)	94	**Unstructured SWL (h/w)**	6
Total SWL (h/sem)	210		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20% (20)	3,5,9,12	LO #1,2,…..10
	Assignments	2	10% (10)	7, 8	LO # 8
	Report/Lab	1	10% (10)	continuous	LO # 11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-12
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Resistance, conductance, effect of temp. on the resistance value
Week 2	Oham's law, series connection, parallel connection, compound connection
Week 3	Voltage and current divider solved examples, kirchhoff's laws
Week 4	Star-delta conversion examples
Week 5	Thevenin's theorem, maximum power transfer
Week 6	Nodal method, superposition
Week 7	Alternating voltage and current

Week 8	Frequency, period, instantaneous value of voltage and current
Week 9	Component of A.C circuit, pure resistance, pure inductance, pure capacitance
Week 10	Series A.C circuit, R,L,C in series
Week 11	Impedance, phase angle, resonance, phase diagram
Week 12	Parallel A.C circuit, R,L,C, Admittance, power factor
Week 13	Active, reactive, apparent power in A.C circuit
Week 14	3-phase circuit
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Using Multimeter to measure Voltage, Current and Resistance
Week 2	Lab 2: Ohm's law.
Week 3	Lab 3: Voltage and current divider rules
Week 4	Lab 4: Kirchhoff's laws
Week 5	Lab 5: Thevenin's Theorem
Week 6	Lab 6: Series RLC circuit
Week 7	Lab 7: Parallel RLC circuit

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach, 2020.	No
Websites	https://docs.google.com/file/d/0B_O5jg0LZ_ZXYlg0WVU1bkhrLTg/edit	

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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Engineering Mechanics			**Module Delivery**	
Module Type	C			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC108				
ECTS Credits	7				
SWL (hr/sem)	210				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Mechanical Power Eng. Dep.		**College**	TCB	
Module Leader	Ahmed Jawad Khaleel		**e-mail**	ahmed1982_jk@mtu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MSc	
Module Tutor			**e-mail**		
Peer Reviewer Name	Younis Muhsin		**e-mail**	Younis.muhsin@mtu.edu.iq	
Scientific Committee Approval Date	20 / 6/2023		**Version Number**	1	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC100	**Semester**	L1,S1
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. The course aims to provide first-stage students with basic knowledge of engineering mechanics. 2. Everything related to forces and motion and related concepts such as equilibrium and analysis of forces, centers of gravity, moments of inertia, friction and motion of bodies are studied. 3. The course aims to enable students to gain access to the science of geometry by understanding how to perform correct engineering analysis 4. Dealing with laws, equations, illustrations, and other data, and linking data together to reach outputs. 5. Enabling the student to be able to analyze, devise and draw conclusions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The student can understand the fundamentals and laws of engineering mechanics. 2. The student is familiar with the types of forces and methods of analysis. 3. The student can understand the basics of the Equilibrium of a Particle 4. Understand the Moment of a Force around the point and axis. 5. Learn the basics of Equilibrium of a Rigid Body and equations of equilibrium. 6. The student can understand Structural Analysis. 7. Enabling students to obtain knowledge, understanding, and analyze the motion of mechanical systems. 8. Learn concepts of motion laws. 9. Learn and analyze the motion of projectiles. 10. Absolute Dependent Motion Analysis of Two Particles. 11. The Students can understand the Kinetics of a Particle: Force and Acceleration. 12. The Students can understand the Kinetics of a Particle: Work and Energy.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** 1. The fundamentals and laws of engineering mechanics. 2. Analyze forces. 3. Equilibrium of a Particle 4. Moment of a Force 5. Structural Analysis 6. Laws of Motion. 7. Analyze the motion of mechanical systems.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	Assessment is based on hand-in assignments, written exams, Quizzes, reports, Practical testing ,and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	87	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	123	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	210		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	
	Assignments	5	10% (10)	3,5,7,10,13	
	Projects / Lab.				
	Report	2	10% (10)	8 , 15	
Summative assessment	**Midterm Exam**	2 hr	20% (20)		
	Final Exam	2hr	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	STATIC: Basic principles in mechanics, Vector Quantities and forces Analysis (2d ,3d)
Week 2	Equilibrium of a Particle (2d , 3d)

Week 3	Force System Resultants: Moment of a Force Scalar Formulation/Moment of a Force-Vector Formulation
Week 4	Force System Resultants: Moment of a Force about a Specified Axis/Moment of a Couple
Week 5	Equilibrium of a Rigid Body: Conditions for Rigid Body Equilibrium/ Free-Body Diagrams/ Equations of Equilibrium
Week 6	Equilibrium in three dimensions: Free-Body Diagrams/ Equations of Equilibrium
Week 7	Structural Analysis: Simple Trusses/ The Method of Joints/ Zero·Force Members
Week 8	Structural Analysis:The Method of Sections/ Space Trusses/ Frames and Machines
Week 9	DYNAMICS: Kinematics of a Particle/ Rectilinear Kinematics: Continuous Motion
Week 10	Motion of a Projectile
Week 11	Absolute Dependent Motion Analysis of Two Particles
Week 12	Kinetics of a Particle: Force and Acceleration
Week 13	Kinetics of a Particle: Work and Energy/ The Work of a Force
Week 14	Principle of Work and Energy
Week 15	Power and Efficiency

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering Mechanics, Twelfth Edition, R. C. Hibbeler	Yes
Recommended Texts		
Websites		

Grading Scheme

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Thermodynamics 2			**Module Delivery**	
Module Type	C			☐ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	MPAC109				
ECTS Credits	8				
SWL (hr/sem)	240				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Mechanical Power Eng. Dep.		**College**	TCB	
Module Leader	Hassan J. Fadhil		**e-mail**	hassan_jfsd@yahoo.com	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Dr.Ahmed Qasim Ahmed		**e-mail**	aqaa1@mtu.edu.iq	
Scientific Committee Approval Date	20 /6/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	NA	**Semester**	
Co-requisites module	NA	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Studying the principles of thermodynamics including, thermal systems according to energy interactions with their direct surroundings, the differences in the properties of both the system and the surrounding with their engineering applications
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To know the basic properties of material with units 2. To know the laws of thermodynamics 3. To know the phases of substance 4. To know the basic thermodynamic cycles 5. To know the entropy 6. To know the basics on combustion
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Laws of thermodynamics First and second law of thermodynamics. [24 hrs.] Part B – P-V diagram P-v diagram of water and different gases. Phases of the water and substances. [16 hrs.] Part C – Thermal cycle Carnot cycle, vapor cycle, steam cycle, gas cycle, Otto cycle, Diesel cycle, duel cycle, and duel cycle. [58 hrs.] Part D – Combustion Combustion, combustion and equilibrium equations [24 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignment, written exams, case study, quizzes, seminars and practical testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	144	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	96	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	10
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	240		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5	5 % (5)	2,5,8,10,13	LO # 1, 4, 5, 7,8
	Assignments	5	5 % (5)	1,4,7,11,15	LO # 1-15
	Lab.	10	10 % (10)	1-9	LO # 1-15
	Report	10	10 % (10)	1-8	LO # 1-15
Summative assessment	**Midterm Exam**	3 hr.	20 % (20)	9	LO # 1-15
	Final Exam	3 hr.	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introductions, references, units, pressure, force, work, Temperature, unit of temperature and conversion, temperature measurements. Zeorith law of Thermodynamics. Energy, types of energy, positional, kinetic, internal and flow energy energies. Heat and work, power, enthalpy.
Week 2	First law of thermodynamics, Steady flow energy equation for open system, non-flow energy equation Transient state,
Week 3	Ideal gas, Boyle's law and Charles law and equation of state, Specific heat at constant pressure and constant volume, Closed system processes using ideal gas. Isometric and isobaric processes
Week 4	Isothermal and adiabatic processes, Polytropic processes, Control volume processes

Week 5	Vapour, phase of substance, Phase change curve on P-V diagram. Dryness fraction, liquid and vapour lines, wet vapour
Week 6	Steam tables and Examples on steam tables, Super-heated vapour, tables of super-heated tables
Week 7	Processes using two phase system, processes on P-V diagram, Irreversible processes Closed system, Second law of thermodynamics, heat engine, heat pump
Week 8	Carnot cycle and reversed Carnot cycle. Irreversible and reversible processes
Week 9	Clausius in equality for second law, Entropy on T-S and entropy calculations.
Week 10	Entropy for vapour, Entropy for system and surroundings, Isentropic efficiency
Week 11	Air standard cycle, Otto cycle. Diesel and Dual cycles
Week 12	Steam power plants- Rankin Cycle, Rankin Cycle with superheated. Modified Rankin Cycle
Week 13	Modification on Carnot to use as vapour compression cycle. Vapour compression cycle,
Week 14	Combustion, combustion equations, equilibrium of combustion equation. Volumetric analysis on combustion process
Week 15	Final exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Measurement and instruments
Week 2	Types of temperature measurements
Week 3	Measuring the velocity of air
Week 4	Calibration of thermocouple
Week 5	Joule experiment
Week 6	Boyle Experiment
Week 7	Measuring of C.V of fuel
Week 8	Measuring specific heats
Week 9	Finding the law of expansion
Week 10	Measuring the latent heat of evaporation
Week 11	Heat pump
Week 12	finding of the degree of superheating

Week 13	Performance of simple compression cycle
Week 14	Actual vapour compression cycle
Week 15	Final exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Borgnakke, C. and Sonntag, R.E., 2022. *Fundamentals of thermodynamics*. John Wiley & Sons. Cengel, Y.A., Boles, M.A. and Kanoğlu, M., 2011. *Thermodynamics: an engineering approach*. New York: McGraw-hill. Rajput, R.K., 2005. *A textbook of engineering thermodynamics*. Laxmi Publications.	Yes

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Humans Rights and Democracy			**Module Delivery**	
Module Type	B			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC110				
ECTS Credits	2				
SWL (hr/sem)	60				
Module Level		1	**Semester of Delivery**		2
Administering Department		Mechanical Power Eng. Dep.	**College**	TCB	
Module Leader	Dr. Hind Qasim Mohammed		**e-mail**	Hind.qasim90@gmail.com	
Module Leader's Acad. Title		lecturer	**Module Leader's Qualification**		PhD
Module Tutor	NA		**e-mail**	E-mail	
Peer Reviewer Name			**e-mail**	E-mail	
Scientific Committee Approval Date		20/6/2023	**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 Aims أهداف المادة الدراسية	تعريف الطلبة بالنظام الديمقراطي واساسياته . تعريف الطلبة بحقوقه وواجباته التي يتمتع بها في ظل النظام السياسي الديمقراطي . تعريف الطلبة بكافة حقوقهم الانسانية وكيفية الحفاظ عليها والدفاع عنها وحمايتها . تعريف الطلبة بالنظام السياسي الديمقراطي في العراق ودستور العراق الدائم لعام ٢٠٠٣ .
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	المعرفة والفهم : أ- من خلال القاء المحاضرات النظرية الصفية . ب- تكليف الطلبة بقراءة كتاب معين . ت- تكليف الطلبة بواجب بيتي باعداد تقرير عن موضوع معين . ث- الامتحانات الشفهي ج-
Indicative Contents المحتويات الإرشادية	يتكون المقرر من جزئين الأول يختص بالتعريف بحقوق الانسان واهم المواضيع التي يتعرف من خلالها الطلبة على حقوقهم . وتضمن الجزء الثاني التعريف بالديمقراطية وطبيعة النظم الديمقراطية وكيفية الحكم بالنظام الديمقراطي فضلا عن التعرف بالنظام الديمقراطي في العراق

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	محاظرات شرحية مكتوبة – اسئلة واجوبة – الاطلاع ع مصادر معينة

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	60		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي العملي	
weeks	**Material Covered**
1	حقوق الانسان . تعريفها . اهدافها حقوق الإنسان في الحضارات القديمة وفي الشرائع السماوية
2	حقوق الإنسان في التاريخ المعاصر والحديث: الاعتراف بحقوق الإنسان منذ الحرب العالمية ألاولى وعصبة الأمم المتحدة الاعتراف الإقليمي بحقوق الإنسان اللاتفاقيةالأوربية لحقوق الإنسان ١٩٥٠ الاتفاقية الأمريكية لحقوق الانسان ١٩٦٩ الميثاق الإفريقي لحقوق الإنسان ١٩٨١. الميثاق العربي لحقوق الإنسان ١٩٩٤
3	المنظمات الغير حكومية وحقوق الانسان (١- اللجنة الدولية للصليب الاحمر، ٢- منظمة العفو الدولية منظمة مراقبة حقوق الانسان ، المنظمات الوطنية لحقوق الانسان حقوق الانسان في الدستور العراقي (ا لحقوق والحريات في دستور جمهورية العراق لسنة ٢٠٠٥)
4	العلاقة بين حقوق الانسان والحريات العامة في الاعلان العالمي لحقوق الانسان في الإعلان العالمي لحقوق الإنسان في المواثيق الاقليمية والدساتير الوطنية حقوق الانسان الاقتصادية والاجتماعية والبيئية والثقافية والتنموية وحقوق الانسان المدنية والسياسية.
5	حقوق الانسان الحديثة (الحق في التنمية ، الحق في البيئة النظيفة ، الحق في التضامن ، الحق في الدين) ضمانات احترام وحماية حقوق الانسان على الصعيد الوطني . الضمانات في الدستور والقوانين الضمانات في مبدا سيادة القانون الضمانات في الرقابة الدستورية الضمانات في حرية الصحافة والراي العام دور المنظمات الغير حكومية في احترام وحماية حقوق الانسان
6	ضمانات احترام وحماية حقوق الانسان على الصعيد الدولي دور الامم المتحدة ووكالاتها المختصة في توفير الضمانات دور المنظمات الاقليمية (الجامعة العربية ، الاتحاد الاوربي ، الاتحاد الافريقي ، منظمة الدول الامريكية) دور المنظمات الدولية الاقليمية غير الحكومية والراي العام في احترام وحماية حقوق الانسان النظرية العامة للحريات ،اصل الحقوق والحريات ، موقف الشرع من الحقوق والحريات المعلنة ،استخدام مصطلح الحريات العامة
7	دولة القانون وضمانات دولة القانون تنظيم الحريات العامة من قبل السلطات العامة
8	المساواة : التطور التاريخي لمفهوم المساواة التطور الحديث لمفهوم المساواة

	المساواة بين الجنسين المساواة بين الافراد حسب معتقداتهم وعنصرهم
٩	الديمقراطية تعريفها وانواعها
١٠	مقومات ومعوقات الديمقراطية
١١	النظام الديمقراطي في دستور العراق لسنة ٢٠٠٣ – الانتخابات – الاحزاب السياسية -
١٢	مفهوم الحريات وتصنيف الحريات العامة , الحريات الاساسية ، الحريات الفكرية ، الحريات الاقتصادية والاجتماعية
١٣	التقدم العلمي والتقني والحريات العامة مستقبل الحريات العامة
١٤	المفهوم العام للوعي (تعريف الوعي البيئي والوعي المائي والحاجة لدراسته) مفهوم الوعي البيئي وسائل تحقيق الوعي البيئي ابعاد الوعي المائي االتحديات التي تواجه الامن المائي في العراق جراءات مقترحة لحل ازمة نقص المياه العذبة
١٥	تعريف الابادة الجماعية ، اتفاقية الامم المتحدة بشان الابادة الجماعية عمليات الابادة الجماعية ، محاكم الابادة الجماعية ،جرائم الابادة الجماعية ،الجرائم ضد الانسانية جرائم حزب البعث الاشتراكي حقوق ذوي الاعاقة

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	ملزمة حقوق الانسان والديمقراطية الجامعة التقنية الوسطى	no
Recommended Texts	د. فاروق السامرائي ، حقوق الانسان في القرأن الكريم ، مركز دراسات الوحدة العربية ، بيروت ، ٢٠٠٢ رعد ناجي الجدة واخرون ، حقوق الانسان والطفل والديمقراطية ، ٢٠٠٩ .	no
Websites		

Grading Scheme مخطط الدرجات				
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Arabic**			**Module Delivery**	
Module Type	B			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC111				
ECTS Credits	2				
SWL (hr/sem)	60				
Module Level		1	**Semester of Delivery**		2
Administering Department		Mechanical Power Eng. Dep.	**College**	TCB	
Module Leader	Aseel Ghazi Ibrahim		**e-mail**	Asilaljanabi2020@gmail.com	
Module Leader's Acad. Title		Assist Lecturer	**Module Leader's Qualification**		Msc
Module Tutor	NA		**e-mail**		
Peer Reviewer Name		Dr. Ali Khadum Jawad	**e-mail**	dr.ali.kadhim@mtu.edu.iq	
Scientific Committee Approval Date		20 / 6/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	NA	**Semester**	
Co-requisites module	NA	**Semester**	

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

Module Aims أهداف المادة الدراسية	• ١- تعميق معرفة الطالب بقواعد اللغة والإملاء التي تعلمها سابقا؛ ليتحاشى الوقوع في الأخطاء اللغويّة والاملائية، وليسهل عليه كتابة التقارير وجميع الأعمال الكتابية بصورة صحيحة نحويًا ولغويًا. • ٢- توسيع نطاق الوعي اللغويّ والأدبيّ ليشمل جميع الطلبة والمجتمع المحلي من خلال المحاضرات والندوات والدورات التدريبية المختلفة، والأخذ بيد المبدعين مِن أصحاب المواهب.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	المعرفة والفهم والتطبيق من خلال إلقاء المحاضرات النظرية الصفية وحث الطلبة على قراءة كتاب معين في المادة، إضافة إلى تكليف الطلبة بواجبات بحثيّة، أو تقارير مكتبيّة وذلك في مستوى السنة الأولى من الدراسة.
Indicative Contents المحتويات الإرشادية	يتكون المقرر من جزء واحد يتناول تعليم الطلبة القواعد العامة للكتابة باللغة العربية بما يضمن عدم الإخلال بأساسيات هذه اللغة.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	استراتيجيات التعلم: التعلم الذاتي ـ التعلم النشط ـ التعلم التعاوني. استراتيجيات التعليم : عرض المادة ـ طرح الأسئلة ـ اختبارات صفيّة ـ واجب بيتي.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	60		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	20%	1 ,2 ,3 , 4	تطبيق ما تعلمه الطالب من قواعد في الأعمال الكتابية وتنمية المعرفة اللغويّة لديه من خلال تمكين مهارات الإملاء، واستخدام الكلمة المناسبة في موضعها المناسب.
	Assignments	2	10%	5 , 11	
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam	2hr	20%	7	
	Final Exam	3hr	50%	15	
Total assessment			100%		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	- مفهوم الأخطاء اللغويّة - قواعد كتابة التاء المربوطة والتاء المفتوحة
Week 2	- الألف الممدودة والمقصورة - الحروف الشمسيّة والقمريّة
Week 3	الضاد والظاء
Week 4	كتابة الهمزة: - همزة الوصل والقطع - الهمزة المتوسطة - الهمزة المتطرفة
Week 5	علامات الترقيم
Week 6	الاسم والفعل والتفريق بينهما
Week 7	المفاعيل: - المفعول به

	- المفعول المطلق - المفعول لأجله - المفعول فيه - المفعول معه
Week 8	العدد
Week 9	تطبيقات الأخطاء اللغويّة الشائعة
Week 10	تطبيقات الأخطاء اللغويّة الشائعة
Week 11	- معاني حروف الجر - قاعدة الألف الفارقة - قاعدة النون والتنوين
Week 12	الجوانب الشكلية للخطاب الإداري
Week 13	لغة الخطاب الإداري
Week 14	لغة الخطاب الإداري
Week 15	امتحان

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	١. كتاب الاملاء الفريد: نعوم جرجيس زرازير، نقحه: د. مصطفى جواد – مطابع النعمان النجف الاشرف – ط٦- ١٩٧٣م. ٢. كتاب الاملاء للمرحلة المتوسطة: عبد الجبار عبد الله الآلوسي واخرون – وزارة التربية المديرية العامة للمناهج –ط١٨ – ٢٠١٤م. ٣. دروس فب اللغة والنحو والاملاء لموظفي الدولة: إسماعيل حمود عطوان واخرون – مطبعة وزارة التربية (٣) بغداد –ط٢ – ١٩٨٤م. ٤. اللغة العربية العامة لأقسام غير الاختصاص: عبد القادر حسن امين واخرون – وزارة التعليم العالي والبحث العلمي – ط٢ – ٢٠٠٠م.	نعم
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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Computer principles			**Module Delivery**	
Module Type	E			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC112				
ECTS Credits	4				
SWL (hr/sem)	120				
Module Level			**Semester of Delivery**	2	
Administering Department	قسم هندسة المواد		**College**	TCB	
Module Leader	1		1	alshekhrahman@gmail.com	
Module Leader's Acad. Title	Mechanical Power Eng. Dep.		Mechanical Power Eng. Dep.	MSc.	
Module Tutor	Rahman A. Hussein		Rahman A. Hussein	E-mail	
Peer Reviewer Name	Ass. Professor		Ass. Professor	E-mail	
Scientific Committee Approval Date	Name (if available)		Name (if available)	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 Aims أهداف المادة الدراسية	الهدف العام : اكساب الطالب مهارات التعامل مع التطبيقات المكتبية الاساسية وانشاء الملفات والمستندات المكتبية واستخدام نظم التشغيل فضلا عن اساسيات العمل مع البيئة الرقمية.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	أ- المعرفة والفهم • ١- من خلال إلقاء المحاضرات النظرية الصفية وحث الطلبة على قراءة كتاب معين في المادة، إضافة إلى تكليف الطلبة بواجبات بحثية و/أو تقارير مكتبية وذلك في مستوى السنة الأولى من الدراسة.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	محاضرات مكتوبة

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	88	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	120		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**				
	Assignments				
	Projects / Lab.				
	Report				
Summative assessment	**Midterm Exam**				
	Final Exam				
Total assessment					

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
weeks	**Material Covered**
1	**اساسيات الحاسوب ومفهوم الحاسوب** **مجالات استخدام الحاسوب ومميزاته وتصنيفه من حيث الحجم والغرض من الاستخدام ونوع البيانات.**
2	**مكونات الحاسوب المادية والكيان البرمجي للحاسوب** **مكونات سط المكتب وقائمة ابدا وشريط المهام**

المجلدات والملفات والايقونات اجراء العمليات على النوافذ وخلفيات سطح المكتب	
الحاسوب الشخصي ومفهوم امن البرامج وتراخيص البرامج اخلاق العالم الالكتروني وامن الحاسوب وخصوصيته تراخُص برامج الحاسوب وانواعها، الملكُة الفكرّية، الاختراق الإلكتروني، برمجيات خبّيثة اهم الخطوات اللازمة للحمأية من عملّيات الاختراق، اضرار الحاسوب على الصحة	3
التحكم في نظام التشغيل ومكوناتها ومجموعاتها حذف البرامج وتنصيبها	4
بعض الحالات والاعدادات الشائعة في الحاسوب ,ادارة الطابعة وضبط الوقت والتارّيخ , صّيانة الاقراص الاولية.	5
مايكروسوفت ٢٠١٠ تشغيل برنامج مايكروسوفت ٢٠١٠ واجهة البرنامج التبوييبات الرئيسية	٦
تبويب home تبويب عرض تبويب تخطيط الصفحة	٧
ادراج الكائنات والجدول مجموعة نص ورموز الكائنات الاضافية في وورد	٨
برنامج بوربوينت ٢٠١٠ فتح البرنامج بيئة البرنامج اضافة وتحرير الشرائح	٩
الاضافات على الشرائح وحركاتها الاضافات والادراج والتعاليق	١٠
برنامج اكسل ٢٠١٠ بيئة البرنامج وفتحه واغلاقه التعرف على التبوييات	١١
التعامل مع الجداول والدوال	١٢

المعادلات ادخال المنحنيات والمضلعات واضافتها	
ملخص لبرنامج بينت paint كمثال على معالجة الصور لنسخ والاضافة والنقل بين البرامج المختلفة للحاسوب	١٣
مراجعة	١٤
امتحان نهاية الفصل للمادة النظرية	١٥

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي العملي	
weeks	**Material Covered**
1	تدريب الطالب على التعامل مع بيئة الحاسوب والديسك توب و تصفح وفتح واغلاق النوافذ ومربعات الحوار والطرّق الصحيحة للتعامل مع لوحة المفاتّيح والمؤشر والأجهزة الأخرى. -امثله عملّة حول التخصّيص والتعامل مع الايقونات وتغّيير دقة الشاشة.
2	تدريب الطالب على قائمة ابدا وتكوّن ملف وخزنه باسم الطالب على سطح المكتب .التعامل من النوافذ للبرنامج واشرطة

التمرّير. -انشاء مجلد باسم معّين والتدرّيب حول تغّيير الاسم والاخفاء والاسترجاع والحذف تدرّب الطالب على اجراء عملّات على النوافذ خلفّات سطح المكتب.	
تدرّيب الطالب على التعامل مع تراخّيص برامج الحاسوب وانواعها والتعامل مع المنشأ الأصلي للبرامج . تدرّب الطالب على التعامل مع امن الحاسوب والاختراق الالكتروني	3
التعرف على نظم التشغيل تهيئة القرص الصلب وتنصيب نظام التشغيل وندوز	4
تدرّب الطالب على استخدام لوحة التحكم و الاعدادات الشائعة فّي الحاسوب و تنصّب الطابعة وكّيفّية التعامل معها , ضبط الوقت والتارّيخ	5
التعرف على بيئة برنامج وورد وقوائمه وتنسيقاته كتابة نصوص كثيرة وتدريب الطالب عليها بأنواع التنسيقات وسحبها على الطابعة.	٦
تدريب الطالب على تخطيط الصفحة وباقي التبويبات واضافة الرموز والمعادلات	٧
التدريب على ادراج الكائنات عمل الجداول وامثلة متنوعة عليها عمل المستندات باحترافية اكثر	٨
برنامج بور بوينت التدريب والتعرف على بيئة البرنامج والشرائح وتبوبياته وتنسيقاته واضافتها وحذفها	٩
عمل شرائح متعددة والتدريب على حركة الشرائح والاصوات و ادراج الكائنات	١٠
التعرف على بيئة برنامج اكسل وقوائمه وتنسيقاته تدريب الطالب على أنواع التنسيقات والتبويبات	١١
التحكم بالجداول ورسم المنحنيات والمضلعات	١٢
برنامج مايكروسوفت بينت كمثال على برامج معالجة الصور التدريب على ربط البرامج ببعضها والتحكم بذلك	١٣
مراجعة	١٤
امتحان نهاية الفصل للمادة العملية	١٥

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		yes
Recommended Texts		no
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Advanced Mathematics			**Module Delivery**	
Module Type	S			☒ **Theory** ☐ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC200				
ECTS Credits	6				
SWL (hr/sem)	180				
Module Level	2		**Semester of Delivery**	1	
Administering Department	Mechanical Power Eng. Dep.		**College**	TCB	
Module Leader	Esam Esmael Ibrahim		**e-mail**	Esam.esmael1994@mtu.edu.iq	
Module Leader's Acad. Title	Assistant lecture		**Module Leader's Qualification**	M.Sc	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	20 / 6/2023		**Version Number**	1	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC100	**Semester**	L1,S1
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aim of this module are : 1. To introduce students to the mathematical concepts and techniques that They will encounter in the various engineering. 2. To develop an awareness of the role of mathematics in the solution of Engineering problems. 3. Solve problems involving differentiation and integration. 4. Solve system of linear equations using matrix method. 5. Apply vector methods to the solution of geometric problems. 6. Uses differential equations in problems of heat transfer and other Engineering systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Apply basic operation in vector algebra(cartesian and geometric representation) to represent lines and planes, calculate the gradient of a scalar field using partial derivatives. 2. Apply the basic rules and techniques of **differential** calculus and its application in engineering. 3. Apply the basic rules and techniques of **integral** calculus and its application in engineering. 4. Demonstrate the basics, rules and techniques for differential equation and partial differentiation. 5. Demonstrate the basics, rules and techniques of complex number algebra and its application in engineering. 6. Use basic operations of matrix algebra, determinants and their application in solving systems of linear equations. 7. Use of software packages for matrix calculations.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Differential and integral calculus of functions of two or more variables and Their applications. Vectors in 3D and their applications, line and surface Integrals, infinite and power series ,matrices , functions of complex variables.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Class activities , homework, quizzes, online testing , written exam .

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	180		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	15%(15)	3,6,9,12	
	Assignments	3	15%(15)	4,8,12	
	Projects / Lab.				
	Report				

Summative assessment	**Midterm Exam**	2hr	20%(30)	7	
	Final Exam	3hr	50%(50)	16	
Total assessment					

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Overview of differentiation and integration.
Week 2	Vectors in 3D , triple product of vectors (dot and cross), equations of line and plane in space.
Week 3	Complex numbers, De moiver's theory, power and roots of complex numbers, Euler formula, complex functions, Cauchy- Riemann equations.
Week 4	Functions of two or more variables, dependent and independent variables, limits, continuity, partial derivatives.
Week 5	Applications of partial derivatives, tangent plane to surface, normal line to surface, tangent line to curve, normal plane to curve, relative maximum and minimum points, directional derivative.
Week 6	Polar coordinate, polar functions, graph polar function, relations between polar and cartesian, cylindrical and spherical coordinate.
Week 7	Double integration ,change of double integration, polar coordinate in double integration.
Week 8	Applications of double integration.
Week 9	Triple integration, cylindrical and spherical coordinate in triple integration, applications.
Week 10	Line integrals, green theory.
Week 11	Sequences and series, finite and infinite series.
Week 12	Types of series, methods test diverge and converge of series.
Week 13	Power series, expansion of functions in power series (Taylor and Maclaurin).

Week 14	Ordinary differential equations, first and second O.D.E .
Week 15	**Solving of first and second O.D.E , applications of O.D.E .**
Week 16	**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	1. Mu Murray R.Spiegel "Advanced calculus " schaum's outline series, McGraw-Hill company 1974. 2. G. Stephenson, " Mathematical methods for science students " Longman house, 1981 . 3.G. Thomas and R. Finney " calculus and analytical geometry " sixth edition,2000.	

	4.J. Hass , C. Heil and M. D.Weir " Thomas calculus " fourteenth edition, 2018.	
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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mechanical Drawing**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC201				
ECTS Credits	**6**				
SWL (hr/sem)	**180**				
Module Level	2		**Semester of Delivery**	1	
Administering Department	Mechanical Power Eng. Dep.		**College**	TCB	
Module Leader	Rahman A. Hussein		**e-mail**	alshekhrahman@gmail.com	
Module Leader's Acad. Title	Ass. Prof.		**Module Leader's Qualification**	M.Sc.	
Module Tutor	None		**e-mail**	E-mail	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	20 / 6/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC101	**Semester**	L1,S1
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims	To teach the student, 6. the basic skill of reading engineering drawing along with their simples and terms as well as the standards 7. . joining, bolts and gears, knowledge of assembly drawings 8. how to use ACD in mechanical drawing 9. fits and tolerances
Module Learning Outcomes	Upon completion of the course, students should be able to: 1- Focus on engineering drawing along with their simples and terms as well as the standards 2- joining, bolts and gears, knowledge of assembly drawings. 3- how to use ACD in mechanical drawing 4- fits and tolerances.
Indicative Contents	Indicative content includes the following. Application on computer, basic of engineering drawing with their simples and terms as well as their standards.[12hrs] using AutoCAD to draw an example of joining by bolts. [10 hrs] Classification of keys, pins and rivets. [10hrs] Application on computer, using AutoCAD to draw an example of joining of keys or pins. [10 hrs] Tolerances, basic size, limits of size and deviation. [10 hrs] Fits , classes of fit/ clearance. Transition. Interference. Calculation of fits & tolerance. [15 hrs] Assembly drawing using AutoCAD to draw general assembly. [10hrs] Application on computer, using AutoCAD to draw an example of spur gear. [10 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	116	**Structured SWL (h/w)**	8
Unstructured SWL (h/sem)	64	**Unstructured SWL (h/w)**	4
Total SWL (h/sem)	180		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20% (20)	3,5,6,10	LO #1,2,…..10
	Assignments	2	10% (10)	7, 8	LO # 8
	Seminar	1	10% (10)	11	LO # 11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	12	LO # 1-12
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) theoretical and practical المنهاج الاسبوعي النظري والعملي محتوى كل اسبوع يجب ان يغطي الوقت المحدد	
	Material Covered
Week 1	Symbols, expressions, general review
Week 2	Screws, bolts, studs and nuts, Keys.
Week 3	Screws, bolts, studs and nuts, Keys.
Week 4	pulleys
Week 5	Gears(bevel gear, warm gear, spur gear)

Week 6	Fit and tolerance
Week 7	Surface finishing and part tables
Week 8	Surface finishing and part tables
Week 9	Assembly drawing and working drawing for advanced mechanisms
Week 10	Assembly drawing and working drawing for advanced mechanisms
Week 11	Pipes and tubes
Week 12	Pipes and tubes
Week 13	Gears assembly
Week 14	Advanced machine assembly
Week 15	Advanced machine assembly

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Recommended Texts	➢ AutoCAD reference book	Yes

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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Fluid Mechanics**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MPAC202**				
ECTS Credits	**8**				
SWL (hr/sem)	**240**				
Module Level	**2**		**Semester of Delivery**	**3**	
Administering Department	**Mechanical Power Eng. Dep.**		**College**	**Technical Engineering College-Baghdad**	
Module Leader	**Johain Jawdet Faraj**		**e-mail**	**johaintech@mtu.edu.iq**	
Module Leader's Acad. Title	**Assistant Professor**		**Module Leader's Qualification**	**PhD**	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	**Ahmed Jasim Alhamad**		**e-mail**	E-mail: ahmed.elhamad99@gmail.com**@mtu.edu.iq**	
Scientific Committee Approval Date	20 / 6/2023		**Version Number**		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC108, MPAC109	**Semester**	2
Co-requisites module	MPAC100	**Semester**	1

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. This module fluid mechanics is intended to develop a deeper understanding of the relationship between design and analysis processing as this module discusses various fluid systems.. 2. The student will be able to analyze simplified fluid problems with the aim of reduction of energy losses and manpower. The student will be able to identify/control the appropriate process parameters, and possible defects of processes malfunctions so as to remove them. 3. For each fluid process, the aspects covered include: aesthetics, principles, choices of materials, choice of processes, properties of materials, advantages and disadvantages, process economics. Examples are drawn from practical processes mainly used in aerospace, automotive and airconditioning industries. 4. To introduce the theory and practice of fluid machines parts and assemblies using a wide range of technologies. 5. To allow processes to be chosen appropriately for any given application with any given fluid material. 6. To develop group working, research and writing skills. 7. To provide knowledge on the influence of thermal and mechanical parameters on system structure.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Examine fluid processes to describe the system properties of fluid devices. 2. Calculate and measure the fluid behavior in thermal processes. 3. Define the characteristics of various fluid operations. 4. Choose appropriate processes for different parts. 5. Design parts such that they are suitable for energy utilization using appropriate techniques. 6. Graduates from this module will be skilled in the methods of scientific investigation. 7. They will be able to think as a fluid engineer, critically evaluating scientific information and solving scientific problems. 8. will be able to effectively communicate scientific information.
Indicative Contents المحتويات الإرشادية	1) Introduction to Fluid Mechanics. 1. Fluid Properties. 2. density. 3. viscosity. 4. pressure. 5. Shear stress. 2) Fluid Statics. a) Pressure Distribution. b) Forces. c) Buoyancy. d) Manometers. 3) Fluid Dynamics a) Momentum b) Control Volume c) Energy d) Continuity 4) Fluid machines and hydraulics

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Quizzes and tests throughout the semester to check understanding and knowledge 2. Examinations, both written and practical, that assess learners' understanding of concepts, principles, and theories related to Fluid Processes 3. Observation of learners' practical skills in laboratory and workshop based or simulated settings.

	4. Peer evaluation and feedback tools used as part of group projects or reciprocal feedback assignments. 5. Assignments and essays used to assess learners' comprehension of theoretical concepts. 6. Presentation and demonstration of acquired knowledge in real-world scenarios.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	116	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	96	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	240		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10%	5, 10	
	Assignments	1	5%	9	
	Projects / Lab.	1	10%	continuous	
	Report	1	5%	12	
Summative assessment	**Midterm Exam**	2hr	10%	7	
	Final Exam	3hr	60%	15	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Fluid Properties
Week 2	Deriving Pressure equation in fluids
Week 3	Manometry and pressure measurements.
Week 4	fluid forces on vertical surfaces
Week 5	Force on inclined surfaces and center of pressure
Week 6	fluid forces on curved surfaces
Week 7	Buoyancy and metastable center
Week 8	Fluid dynamics applications
Week 9	Control volume concept
Week 10	Continuity
Week 11	Momentum of fixed control volume
Week 12	momentum of moving control volume and inertial systems
Week 13	Energy equation as applied to fluid systems
Week 14	Fluid machinery and hydraulics.
Week 15	**Final exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Fluid properties (density)
Week 2	Fluid properties (viscosity)
Week 3	Pressure distribution
Week 4	Vertical gates
Week 5	inclined gates

Week 6	fluid forces on different types of surfaces
Week 7	improving metastable center
Week 8	Introduction fluid dynamics (laminar flow)
Week 9	Introduction fluid dynamics (turbulent flow)
Week 10	Continuity
Week 11	fixed turbomachines blades
Week 12	moving turbomachines blades
Week 13	Report
Week 14	**Final exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Streeter, Mikell P. Fluid Mechanics. 2. Fox, Fluid Mechanics. 3. F. White, Elementary Fluid Mechanics.	yes
Recommended Texts	None	
Websites	None	

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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information **معلومات المادة الدراسية**			
Module Title	Thermodynamics 2	**Module Delivery**	
Module Type	C	☐ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	MPAC203		
ECTS Credits	10		
SWL (hr/sem)	300		
Module Level	2	**Semester of Delivery**	TCB
Administering Department	Mechanical Power Eng. Dep.	**College**	yasir_abulatif1@mtu.edu.iq

Module Leader	Yasir Abdulateef Gheni	**e-mail**	TCB
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	MSc
Module Tutor		**e-mail**	
Peer Reviewer Name	Dr.Ahmed Qasim Ahmed	**e-mail**	aqaa1@mtu.edu.iq
Scientific Committee Approval Date	20 / 6/2023	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	MPAC109	**Semester**	L1,S1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	To study the principles of applied thermodynamics, as the basis of refrigeration & air conditioning engineering and power plant subjects
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	7. To know the type of steam power plants 8. To know the regenerative cycle – dual cycle, High speed gas flow 9. To know the properties of isentropic flows, Shock waves 10. To know the supersonic nozzles, single and multi-stage reciprocating compressors

	11. To know the multistage gas turbines and velocity triangles 12. To know the steam turbines. Internal combustion engines, Thermodynamics relations 13. To know the Maxwell relations, Clausius Clapyron relations 14. To know the gas mixtures, Gibbs- equations 15. To know the gravimetric analysis, Combustion, heat of reaction.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Steam Power Plans Regenerative cycle – dual cycle, High speed gas flow. [24 hrs.] Part B – Gas Flow Isentropic flows, shock waves, supersonic nozzles. [16 hrs.] Part C – Compressors and Turbines Single and multi-stage reciprocating compressors, multistage gas turbines, velocity triangles, steam turbines, internal combustion engines. [32 hrs.] Part D – Thermodynamics Relations Maxwell relations, Clausius Clapeyron relations, gas mixtures, Gibbs-equations. [48 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignment, written exams, case study, quizzes, seminars and practical testing.

Student Workload (SWL) الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	158	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	11
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	142	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	10
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	300		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	5 % (5)	2,5,8,10,13	LO # 1, 4, 5, 7,8
	Assignments	5	5 % (5)	1,4,7,11,15	LO # 1-15
	Lab.	10	10 % (10)	1-9	LO # 1-15
	Report	10	10 % (10)	1-8	LO # 1-15
Summative assessment	**Midterm Exam**	3 hr.	20 % (20)	9	LO # 1-15
	Final Exam	3 hr.	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	An overview of steam, dryness fraction measurements

Week 2	Steam power plants, Rankine - reheat cycle
Week 3	Regenerative cycle – dual cycle, High speed gas flow
Week 4	Properties of isentropic flows, Shock waves
Week 5	Supersonic nozzles, Reciprocating compressors
Week 6	Dynamic analysis, Clearance volume
Week 7	Multistage compressors, Gas turbines
Week 8	Velocity triangles, frictional effects, Gas turbines comparison
Week 9	Steam turbines. Internal combustion engines, Thermodynamics relations
Week 10	Maxwell relations, Clausius Clapeyron relations
Week 11	Thermodynamic relations for du, dh, ds, Cp and Cv, Real gases
Week 12	Compressibility factors, Real gas equations of states
Week 13	Gas mixtures, Gibbs- equations
Week 14	Daltons law and molar ratio, Volumetric analysis
Week 15	Gravimetric analysis, Combustion, heat of reaction

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Measurement of specific heat ratio of air
Week 2	Operating parameters of VCR
Week 3	Saturated vapor pressure and temperature relation
Week 4	Steam boiler efficiency
Week 5	Determination the phase of the refrigerant for VCR system components
Week 6	Vapor dryness fraction measurement
Week 7	Determination the latent heat of evaporation
Week 8	Determination of thermal efficiency for VCR cycle
Week 9	EES software training

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Borgnakke, C. and Sonntag, R.E., 2022. *Fundamentals of thermodynamics*. John Wiley & Sons. 2. Cengel, Y.A., Boles, M.A. and Kanoğlu, M., 2011. *Thermodynamics: an engineering approach* (Vol. 5, p. 445). New York: McGraw-hill. 3. Rajput, R.K., 2005. *A textbook of engineering thermodynamics*. Laxmi Publications.	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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Fundamentals of Air Conditioning and Refrigeration**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MPAC205**				
ECTS Credits	**10**				
SWL (hr/sem)	**300**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	Mechanical Power Eng. Dep.		**College**	TCB	
Module Leader	Dr. Hayder Mahdi Baqer		**e-mail**	dr.haydermahdi@mtu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Dr. Abdul Hadi N Khalifa		**e-mail**	ahaddi58@gmail.com	
Scientific Committee Approval Date	20 / 6/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC109	**Semester**	L1, S2
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Introduce the student to the basic processes of refrigeration and conditioning 2. Identifying the properties of air and the processes that take place on the moisture content of air. 3. Learn about the different cooling media and how to use their tables and curves. 4. Learn about the refrigeration compression system and its accessories
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- The student will be able to complete basic operations calculations on the content of moisture air content 2- The student will be able to determine the internal and external conditions for the design of the air conditioning system according to the conditions of human comfort. 3- The student will be able to complete all the operations of the compression refrigeration system, its components and accessories.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Air Conditioning</u> The basic properties of a mixture of air and water vapor: components of atmospheric air, general equation of gases, Dalton's law of partial pressures, saturated vapor pressure, water vapor pressure in moist air, relative humidity, moisture content, humidification percentage, dew point, enthalpy, The psychometric scheme and adaptation processes: a general explanation of the psychometric chart and the basis for its construction. [15 hrs] Sensible cooling, sensible heating, dehumidification, humidification by water injection, adiabatic humidification, humidification efficiency, humidification by constant wet bulb temperature, contact factor, and bypass factor. [15 hrs] Humidification by steam injection, adiabatic air mixing, cooling, and dehumidification with reheating, preheating with humidification and reheat. [10 hrs]

	Air mixing and adiabatic humidification with reheating, summer cycle and winter cycle, practical applications for the case of summer, and practical applications for the case of winter. [15 hrs] Selection of supplied air conditions: removal of sensible heat, specific heat capacity of moisture air, removal of latent heat, inclination of the sensible heat ratio line, heat generated by fan motors, waste reheating, selection of appropriate air supply conditions [6 hrs] Part B – Refrigeration cycle Fundamentals Refrigerants, types of old and modern refrigerants, side effects of refrigerants on the ozone layer and global warming, secondary refrigerants, concept of refrigeration: uses of refrigeration and refrigeration methods, second law of thermodynamics, heat pump, reverse Carnot cycle, simple vapor compression cycle, simple vapor compression cycle parts.. [15 hrs] Mathematical analysis of the simple vapor compression cycle, the factors affecting the performance parameter of the vapor compression cycle (the impact of suction temperature, the impact of condensation temperature, the impact of sub-cooling, the impact of superheating, and the impact of pressure losses). Theoretical vapor compression cycle and its comparison with the real one, Improving the vapor compression cycle, Using flash tank, Supercooling of refrigerant.. [7 hrs] Multistage compression: flash gas removal, intercooler, one evaporator and one compressor, two evaporators and one compressor, two compressors and one evaporator. multi-stage compression: two compressors and evaporators, multi-stage compression with several types of inter-cooling (water intercooler, liquid flash intercooler, flash gas intercooler) [15 hrs] Vapor Compression refrigeration cycle components: compressors type, positive displacement compressors, reciprocating compressors, volumetric efficiency, mechanical efficiency, rotary compressors, screw compressors, scroll compressors, centrifugal compressors. Condensers, evaporators, and cooling towers Expansion tools, accessories for vapor compressor cooling system. [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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	144	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	156	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	11
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	300		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	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	The basic properties of a mixture of air and water vapor: components of atmospheric air, general equation of gases, Dalton's law of partial pressures, saturated vapor pressure, water vapor pressure in moist air, relative humidity, moisture content, humidification percentage, dew point, enthalpy, The psychometric scheme and adaptation processes: a general explanation of the psychometric chart and the basis for its construction
Week 2	Sensible cooling, sensible heating, dehumidification, humidification by water injection, adiabatic humidification, humidification efficiency, humidification by constant wet bulb temperature, contact factor, and bypass factor.
Week 3	Humidification by steam injection, adiabatic air mixing, cooling and dehumidification with reheating, preheating with humidification and reheat.
Week 4	Air mixing and adiabatic humidification with reheating, summer cycle and winter cycle, practical applications for the case of summer, and practical applications for the case of winter.
Week 5	Comfort and internal conditions: Metabolism and human comfort, body mechanics in heat transfer and thermoregulation, metabolic rate, clothing, the effect of the environment on human comfort, other factors affecting human comfort, and selection of internal conditions.
Week 6	Climate and external conditions: climate, wind, local winds, dew formation, seasonal temperature change, seasonal humidity change, meteorological measurements, seasonal change of the psychometric condition of the external outdoor conditions, selection of external conditions (the three methods).
Week 7	Selection of supplied air conditions: removal of sensible heat, specific heat capacity of moisture air, removal of latent heat, inclination of the sensible heat ratio line, heat generated by fan motors, waste reheating, selection of appropriate air supply conditions
Week 8	Refrigerants, types of old and modern refrigerants, side effects of refrigerants on the ozone layer and global warming, secondary refrigerants, concept of refrigeration: uses of refrigeration and refrigeration methods, second law of thermodynamics, heat pump, reverse Carnot cycle, simple vapor compression cycle, simple vapor compression cycle parts.
Week 9	Mathematical analysis of the simple vapor compression cycle, the factors affecting the performance parameter of the vapor compression cycle (the impact of suction temperature, the impact of condensation temperature, the impact of sub-cooling, the impact of superheating, and the impact of pressure losses).

Week 10	Theoretical vapor compression cycle and its comparison with the real one, Improving the vapor compression cycle, Using flash tank, Supercooling of refrigerant.
Week 11	Multistage compression: flash gas removal, intercooler, one evaporator and one compressor, two evaporators and one compressor, two compressors and one evaporator.
Week 12	Multi-stage compression: two compressors and evaporators, multi-stage compression with several types of intercooling (water intercooler, liquid flash intercooler, flash gas intercooler)
Week 13	Vapor Compression refrigeration cycle components: compressors type, positive displacement compressors, reciprocating compressors, volumetric efficiency, mechanical efficiency, rotary compressors, screw compressors, scroll compressors, centrifugal compressors.
Week 14	Condensers, evaporators, and cooling towers
Week 15	Expansion tools, accessories for vapor compressor cooling system.
Week 16	**The preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Air velocity measuring devices - measuring air velocity using a Petot tube and a manometer.
Week 2	Applications to the air properties Psychometric Chart.
Week 3	Sensible cooling
Week 4	Sensible heating
Week 5	Dehumidification process
Week 6	Air Humidification by Direct Injection of Water Drops
Week 7	Humidify the air with a jet of steam
Week 8	Air mixing process
Week 9	Cooling and dehumidifying with reheating
Week 10	Preheating, cooling and dehumidifying with reheating
Week 11	Mixing and adiabatic saturation with reheating

Week 12	Theoretical calculations for compressor performance
Week 13	Condenser calculations for vapor compression cycle
Week 14	Calculations of capacity and performance factor for vapor compression cycle
Week 15	Calculations of the coefficient of performance for the real vapor comprssion cycle

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	***Jan F. Kreider, Peter S. Curtiss " Heating and cooling of Building" Mc Graw Hill, 2000*** ***ASHRAE, Fundamental . 1997.***	Yes
Recommended Texts	***Sapali, S.N., 2009."Refrigeration and air conditioning". PHI Learning Pvt. Ltd.***	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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	F – Fail	راسب	(0-44)	Considerable amount of work required

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Strength of Materials**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MPAC206**				
ECTS Credits	**8**				
SWL (hr/sem)	**240**				
Module Level		2	**Semester of Delivery**		2
Administering Department		Mechanical Power Eng. Dep.	**College**	TCB	
Module Leader	HAITHAM T YAHYA		**e-mail**	Haithamyahya@mtu.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		Ammar Ali Hussain	**e-mail**	Drammar@mtu.edu.iq	
Scientific Committee Approval Date		10/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC108	**Semester**	L1- S2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This course is the foundation to many advanced techniques that allow engineers to design machine components, mechanisms, predict failure and understand the physical properties of materials. Mechanics of Materials gives the student basic tools for stress, strain and deformation analysis. Methods for determining the stresses, strains and deformations produced by applied loads are presented. Engineering design concepts are integrated throughout the course.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1.To apply the formal theory of solid mechanics to calculate forces, deflections, moments, stresses, and strains in a wide variety of structural members subjected to tension, compression, torsion, bending, both individually and in combination, including : • axially loaded bars • components in pure shear • circular shafts in torsion • beams in bending • thin-walled pressure vessels 2. Determine the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading 3. To determine principal stresses and angles, maximum shearing stresses and angles, and the stresses acting on any arbitrary plane within a structural element. 4. Analyze slender, long columns subjected to axial loads 5. Determine the deflections and rotations produced by the flexural loading. 9.
Indicative Contents المحتويات الإرشادية	***Indicative content includes the following.*** Give the students information about stress and strain, [12 hrs] Thermal stress, [12 hrs] Thin Walled stress torsion, [12 hrs] Thin Walled Torsion, [12 hrs] Shear force and bending moment diagram, [12 hrs] complex stress , [12 hrs] Mohr's circle. [12 hrs] Sum. 7*12=84 with lab. Part test for

	tensile, [4 hrs] impact, [4 hrs] hardness , [4 hrs] creep , [4 hrs] compression, [4 hrs] bending , [4 hrs] buckling , [4 hrs] torsion [4 hrs] sum.4*8=32 **TOTAL Structured SWL (h/sem)=84+32=116**
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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	116	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	124	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	240		

Module Evaluation تقييم المادة الدراسية				
	Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**

Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	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

Week	Subject
1	Introduction to strength of materials
2	Simple stress and Strain
3	Compound Bars
4	Thermal stresses
5	Shearing force and bending moment diagrams
6	Bending of beam
7	Slope and deflection of beams
8	Shear stresses in beam
9	Torsion of shaft
10	Thin cylinders and shells
11	Complex stresses
12	Mohr's stress circle
13	Buckling of column
14	Strain Energy
15	Theories of Elastic failure
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

Week No.	Material vocabulary
1-2	Tensile
3-4	Torsion
5-6	Impact
7-8	Hardness
9-10	Effect of heat treatment on steel hardness
11-12	Bending

13-14	Compression
15	Buckling

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Recommended Texts	1. Mechanics of materials By Hearn 2. Mechanics of materials By Dean Updike 3. Mechanics of materials By R.C. Hibbeler 4. Mechanics of materials By F.P. Beer 5. Mechanics of materials By Goodno and Gere	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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Applications 1**			**Module Delivery**	
Module Type	**S**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MPAC207**				
ECTS Credits	**6**				
SWL (hr/sem)	**180**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	Mechanical Power Eng. Dep.		**College**	TCB	
Module Leader	Zahraa Ibrahim Saber		**e-mail**	alshmaryzahraa79@yahoo.com	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**	Ms. Tech.	
Module Tutor	None		**e-mail**	None	
Peer Reviewer Name	Name		**e-mail**	None	
Scientific Committee Approval Date	20 / 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 Aims	To make the student able to process, program, and solve arithmetic and engineering problems using Matlab
Module Learning Outcomes	1. To apply the knowledge about Matlab. 2. To enable students solve scientific and mathematical problems, write codes, design projects and process images.
Indicative Contents	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	88	**Structured SWL (h/w)**	6
Unstructured SWL (h/sem)	92	**Unstructured SWL (h/w)**	6

Total SWL (h/sem)	180

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري محتوى كل اسبوع يجب ان يغطي الوقت المحدد

	Material Covered
Week 1	Introduction to Matlab
Week 2	Mathematical Functions
Week 3	Vectors & Matrices
Week 4	Vectors & Matrices
Week 5	Introduction to Programming in MATLAB
Week 6	Control flow
Week 7	Control flow
Week 8	Debugging
Week 9	Mathematical Equations
Week 10	Graph Plot
Week 11	GUI
Week 12	GUI
Week 13	Image Processing
Week 14	Simulink
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Matlab and Mathematical Functions
Week 2	Lab 2: Vectors & Matrices
Week 3	Lab 3: Control flow
Week 4	Lab 4: Mathematical Equations
Week 5	Lab 5: GUI
Week 6	Lab 6: Image Processing
Week 7	Lab 7: Simulink

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Recommended Texts (Website)	https://www.mathworks.com/products/matlab.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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	English 2		**Module Delivery**	
Module Type	S		☒ **Theory** ☐ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC208			
ECTS Credits	6			
SWL (hr/sem)	180			
Module Level	2	**Semester of Delivery**	**2**	
Administering Department	Mechanical Power Eng. Dep.	**College**	**TCB**	
Module Leader	**Dr. Nabil Taih**	**e-mail**		
Module Leader's Acad. Title	**Lecturer. Assist**	**Module Leader's Qualification**	**MSc**	
Module Tutor	**Asst. Lecturer. Labed Kadhim Jawad**	**e-mail**	labed1970@mtu.edu.iq	
Peer Reviewer Name	Asst. Prof. Dr Ammar A. Hussain	**e-mail**	Drammar@mtu.edu.iq	
Scientific Committee Approval Date	20 / 6/2023	**Version Number**	1.0	

Relation with other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	MPAC104	**Semester**	L1,S1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The goal is to study English language and gain knowledge of it as benefit engineers in general, and to develop speaking skills and understand its basic rules taking the way to the acquisition of the ability to use technical key words in their work and the capability of communicating with other engineers correctly
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Developing speaking skills and understanding its basic rules to take the way to the acquisition of the ability to use technical keywords in their work and the capability of communicating with other engineers correctly .
Indicative Contents المحتويات الإرشادية	Through the prepared syllabus, the student acquires the ability to understand grammar English language through weekly lectures and classes in a gradual and sequential manner for a period of four years, starting from the first stage, such as interrogative, negative, formation of sentences, parts of speech, and others.

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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٨٦	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٩٤	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٨٠		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	20% (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	Revision, vocabulary and comprehension
Week 2	Present continuous, comparative and superlative adjective, vocabulary.
Week 3	Time clauses, this and that, vocabulary and comprehension.
Week 4	If clauses, vocabulary and comprehension
Week 5	This and that, expletive there, prepositions
Week 6	Past perfect, past perfect continuous , vocabulary and comprehension
Week 7	Relative pronouns, relative clauses
Week 8	Past perfect, Past perfect continuous, vocabulary and comprehension

Week 9	Used to, Infinitives, passive voice
Week 10	Passive voice, coordinating conjunctions, subordinating conjunction
Week 11	Future perfect, future perfect continuous, vocabulary and comprehension
Week 12	Writing a composition, comprehension
Week 13	Technical English (1), Keywords, English use
Week 14	**Revision**
Week 15	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Headway plus for pre intermediate	Yes
Recommended Texts	Any Grammar and comprehension for technical learning	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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Engineering and Numerical Analysis**	**Module Delivery**	
Module Type	**S**	☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC300		
ECTS Credits	4		
SWL (hr/sem)	**120**		

Module Level	3	**Semester of Delivery**	1
Administering Department	Mechanical Power Eng. Dep.	**College**	TCB
Module Leader	HAITHAM T YAHYA	**e-mail**	Haithamyahya@mtu.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	Ammar Ali Hussain	**e-mail**	Drammar@mtu.edu.iq
Scientific Committee Approval Date	20/06/2023	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC200	**Semester**	L2- S1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This course aims to provide a good knowledge to the students about the Engineering and numerical analysis with understand the basis of solutions and their application in different branches of engineering / mechanical, material, Civil and power.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	10. Understand the methods of solutions for first, second and high orders differential equations and their engineering applications. 11. Understand the types and method of solution for Fourier Series and their engineering applications. 12. Understand the methods of solution by Laplace transformation and their applications. 13. Understand the methods of solution for partial differential equation and their engineering application. 14. Understand the numerical methods for solving linear and non-linear equations and their engineering applications. 15. Understand the numerical methods for solving the differential equations and their engineering applications.
Indicative Contents المحتويات الإرشادية	***Indicative content includes the following.*** Give the students information about : Differential Equations. First, 2nd and, Higher Linear Order Differential Equations, [12hrs] Fourier series, [10hrs] Laplace and Laplace Inverse transformation, [12hrs]

	Euler equation, [10hrs] Runge-Kutta method, [10hrs] interpolation, [10hrs] iteration, [10hrs] partial Differential Equations[13hrs] **TOTAL Structured SWL (h/sem)=87**

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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	87	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.0
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	33	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	120		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	15% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	15% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	0	0% (10)	0	
	Report	1	10% (10)	13	LO # 5, 8 and 10
	Midterm Exam	2 hr	10% (10)	7	LO # 1-7

Summative assessment	**Final Exam**	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week	Subject
1	First order differential equations, Special cases of first order D.E and their engineering applications.
2	Second order linear equation with constant coefficients and their engineering applications.
3	High order linear differential equations , Integral operators and their engineering applications.
4	Fourier series, even and odd functions and their engineering applications.
5	Gamma Function and integral solution.
6	Laplace transformation, Inverse Laplace transformation, Laplace transformation to solution for differential equations and their engineering applications.
7	Partial differential equations, solution by separation method and their engineering applications.
8	Nonlinear equations solution, Simple Iteration, Newton-Raphson, finite difference methods.
9	Solution of simultaneous linear equations, Direct and Indirect methods
10	Interpolation by Lagrangian and Newton methods.
11	Curves fitting analysis by Newton method.
12	Numerical integration, complex numerical integration and their applications.
13	Numerical method to solve partial differential equations by separation method.
14	Numerical method to solve differential equations by Rang-Kotta and Power series.
15	Numerical method to solve differential equations by exponential equations. method
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Recommended Texts	1- Advanced Engineering Mathematics, Erwin Kreyszig , John Wiley & Sons, Inc. 2- Advanced Engineering Mathematics, Peter V. O'Neil, Thomson Brooks/Cole 3- Advanced Engineering Mathematics, A.B. Mathur & V.P. Jaggi, Khanna Publishers 4- Advanced Engineering Mathematics, Wyle Barrett /fifth edition. 5- Numerical Methods for Scientists and Engineers, R.w. Hamming knowledge.	no

	6- Numerical Analysis, Richard L. Burden & J. Douglas Faires. 7- Introduction to Numerical Analysis, F.B. Hildebrand.	

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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	Computer Applications 2	**Module Delivery**
Module Type	S	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial**
Module Code	MPAC301	
ECTS Credits	4	

SWL (hr/sem)	120			☐ **Practical** ☐ **Seminar**	
Module Level			**Semester of Delivery**		
Administering Department		Mechanical Power Eng. Dep.	**College**	TCB	
Module Leader	Wajdy Qassim Hussen		**e-mail**	wajdiqasem@mtu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		MSc
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name			**e-mail**	E-mail	
Scientific Committee Approval Date		20 / 6/2023	**Version Number**		1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	MPAC207	**Semester**	L2,S2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	١-أن يكون الطالب قادرا رسم وتصميم مختلف الأجزاء الميكانيكية الأكثر شيوعا في الصناعات الميكانيكية ٢-ان يكون الطالب قادرا استخدام البرمجيات لتوصيف الأجزاء الميكانيكية والأنتقال من الحسابات الورقية المطولة الى العمليات الحاسوبية السريعة ومقارنة النتائج من حيث الدقة والسرعة واجراء حسابات عزم القصور الذاتي والانحناء لأجزاء ميكانيكية معينة

	٣-ان يفهم الطالب ويطبق المحاكات لحساب وحل مختلف مسائل العتبات بانواعها البسيطة والمركبة وتحت مختلف الاحمال نقطي او منتشر او عزم التواء
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	أ- المعرفة والفهم ١- اعداد مهندسين تطبيقيين قادرين على التعرف على الفرق بين استخدام الحاسوب بالتصميم والعمل الورقي ٢- التعرف على الخطوات والطرق الصحيحة والأقصر للوصول الى نتائج مناسبة ٣- التعامل مع كتب المواصفات العالمية ولمختلف الدول ٤- تنفيذ الرسومات لاجزاء ميكانيكية وتحليل الاجهادات نظريا
Indicative Contents المحتويات الإرشادية	يتكون المقرر من جزئين, الأول يوضح التعرف على الطرائق التقليدية لتصميم ورسمالأجزاء الميكانيكية الرئيسية المختلفة, اما الجزء الثاني فيدرس حسابات عزم القصور الذاتي والانحناء والتشوه لمختلف مقاطع المعادن بالحاسبة وحل مسائل العتبات المختلفة ورسم مخططات الانحناء والتشوه لمحتلف انواع المعادن

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	مختبرات الحاسوب,فيديوهات تعليمية منشوره على القناة الخاصة في اليوتيوب رابط القناة https://youtu.be/F_zgHo-T8mg

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	88	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	120

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	4,10	LO# 1,2.10 and 11
	Assignments	2	10% (10)	2,13	LO# 3,4.6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	14	LO# 5,8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO# 1-7
	Final Exam	2 hr	50%(50)	16	ALL
Total assessment			100%(100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي العملي	
weeks	**Material Covered**
1	Fasteners (screw –washer –nut)
2	Shaft Generator(cylinder –gear –thread-wrench)
3	Spur Gear & Groove
4	Retaining Rings
5	Keys(4 types of keys)
6	Roller Bearings(single & double)- Plain Bearings
7	Drill Bushings(headless & headed)
8	Seals
٩	Springs(compression ,extension
10	,torsion Belleville)
11	Shaft Break
١٢	Moment of Inertia for steal shapes (nine types)
١٣	Shaft Calculations
١٤	Deflection Line
١٥	Bearing Calculation

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1-Engineering Design and Graphics with Mechanical Desktop 5.0 (book)	no
Recommended Texts	2-Learning Mechanical Desktop Release 4(book) 3- ASTM standardizes 4-Mechanical Desktop (book)	no
Websites	https://www.autodesk.com/	

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

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

MODULE DESCRIPTION FORM

نموذج وصف مادة نظرية المكائن والاهتزازات الميكانيكية

Module Information معلومات المادة الدراسية				
Module Title	**Theory of Machine and Vibrations**		**Module Delivery**	
Module Type	**C**		☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC302			
ECTS Credits	**4**			
SWL (hr/sem)	**120**			
Module Level	3	**Semester of Delivery**	1	
Administering Department	Mechanical Power Eng. Dep.	**College**	TCB	
Module Leader	**Wisam A. Ajlan**	**e-mail**	waahwisam@gmail.com	

Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor	None	**e-mail**	E-mail
Peer Reviewer Name	Asst. Prof. Dr. Hassan Hamoodi Mahdi	**e-mail**	dr_hassan1961@mtu.edu.iq
Scientific Committee Approval Date	20/06/2023	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC108 MPAC206	Semester	L1,S2 L2,S2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims	10. To identify and enumerate different link based mechanisms with basic understanding of motion. 11. To understand and illustrate various power transmission mechanisms using suitable method. 12. The knowledge of this subject is very essential for an engineer in designing the various parts of a machine. 13. Vibration analysis is a process of looking for anomalies and monitoring change from the established vibration signature of a system. The vibration of any object in motion is characterized by variations of amplitude, intensity, and frequency. 14. Vibration is highly applicable for investigating the operational conditions and status of rotating machinery and structures. Vibrations can be represented in different forms, including displacement, velocity and acceleration.

Module Learning Outcomes	Upon completion of the course, students should be able to: 1. Balance the rotating masses to reduce (or even eliminating) the unbalanced forces and couples in a mechanical system. 2. Learn and understand how the motion can be transmitted by two or more toothed wheels. 3. Learn that there are many types of governors and the main function of a governor is to regulate the mean speed of an engine within certain limits, when there are variations in the load. 4. The student will learn how the belts or ropes are used to transmit power from one shaft to another by means of pulleys which rotate at the same speed or at different speeds. 5. Learn to calculate the braking torque for different types of brake, and learn how to dealing with the braking of a vehicle. 6. Learn general information about the cam, and also learn the type of motion of follower. 7. Understand the engineering principles in mechanical system to identify. 8. Formulate and solve the problem of mechanical engineering. 9. Able to find the source of engineering problems in mechanical system through research that includes identification, formulation, analysis, data interpretation based on engineering principles. 10. Able to formulate the solution of engineering problem in mechanical system by considering economy, safety, environment and energy conservation. 11. Analyze mechanical vibration on 1 and 2 degree of freedom system. 12. Explain basic concept of free body diagram and vibration mathematics model system. 13. Formulate movement equation and analyze vibration respond from undamped and damped in free and forced excitation with various excitation.
Indicative Contents	Indicative content includes the following. Balancing of a Single Rotating Mass by a Single Mass Rotating in the Same Plane, balancing of a Single Rotating Mass by Two Masses Rotating in Different Planes, Balancing of Several Masses Rotating in the Same Plane Using Analytical and Graphical Methods, Balancing of Several Masses Rotating in Different Planes. [4 hrs] Classification of Gears, Spur Gears, Velocity Ratio (Gear Ratio), Center to Center Distance, Gear Trains, Velocity Ratio of Simple Gear Trains, Velocity Ratio of Compound Gear Trains, Epicyclic Gear Trains, Simple Epicyclic Gear Trains, Compound Epicyclic Gear Trains. [4 hrs] Types of Governors, Watt Governor, Porter Governor, Proell Governor, Hartnell Governor. [4 hrs] Types of Belts, Types of Flat Belt Drive, Selection of Belt Drive, Velocity Ratio of Open Belt Drive, Effect of Belt Thickness on Velocity Ratio, Slip of the Belt, Velocity Ratio of a Compound Belt Drive, Length of Open and Cross Belt, Ratio of Driving Tension for Flat Belts, Determination of Angle of Contact for Open and Cross belt., Power Transmitted by a Belt, Centrifugal Tension, Maximum Tension in the Belts, Initial Tension in the Belt, V – Belt Drive and Rope Drive. [4 hrs]

	Types of Brakes, Simple Block or Shoe Brake (Single and Double Block), Band Brake (Simple and Differential Band Brake), Band and Block Brake, The Braking of a Vehicle. [4 hrs] Types of Followers, Nomenclatures for Cam Profile, Motions of the Follower, Uniform Motion or Uniform Velocity of a Follower, Simple Harmonic Motion of Follower, Uniform Acceleration and Uniform Retardation, Cam profile construction. [4 hrs] Basic concepts of vibration, Oscillatory motion, Second Order Differential Equations with Constant Coefficients. [4 hrs] Undamped Free Vibrations of Single degree of Freedom Systems, Torsional Oscillation of Elastic Shafting, Energy Methods. [4 hrs] Damped Free Vibrations of Single degree of Freedom Systems, Logarithmic Decrement, Forced Vibrations of Undamped Single Degree of Freedom Systems, Force Vibrations of Damped Single Degree of Freedom Systems, Forced Angular Oscillations of Rigid Bodies. [4 hrs] Influence of Frequency Ratio and Damping Factor on Steady State Response, Force Transmission and Vibration Isolation. [2 hrs] Natural Frequency of Transverse Vibrations of Shafts or Beams Under Different Types of Loads and End Conditions, Natural Frequency of Transverse Vibration of a System of Several Loads Attached to the Same Shaft (Energy and Dunkerley's Methods). [2 hrs] Whirling Speeds or Critical Speeds. [2 hrs] Free Vibrations of Undamped Systems with Two Degree of Freedom. [2 hrs] Free Vibrations of Damped Systems with Two Degree of Freedom. [2 hrs] Forced Vibrations for Systems with Two Degree of freedom. [2 hrs] Natural Frequency of Free Torsional Vibrations, Free Torsional Vibrations of a Single Rotor System, Free Torsional Vibrations of a Two Rotor System. [2 hrs] Free Torsional Vibrations of a Three Rotor System, Torsional Equivalent Shaft. [2 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Quizzes, Practical testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	116	**Structured SWL (h/w)**	8
Unstructured SWL (h/sem)	4	**Unstructured SWL (h/w)**	1
Total SWL (h/sem)	120		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	2, 5, 12	LO # 1-15
	Assignments				
	Practical / Lab	2	20% (20)	Continuous	
	Report / Lab	1	10% (10)	14	LO # 1-7
Summative assessment	**Midterm Exam**	2 hr	10% (10)		LO # 1-7
	Final Exam	3hr	50% (50)		All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري محتوى كل اسبوع يجب ان يغطي الوقت المحدد	
	Material Covered
Week 1	Balancing of Rotating Masses Balancing of a Single Rotating Mass by a Single Mass Rotating in the Same Plane Balancing of a Single Rotating Mass by Two Masses Rotating in Different Planes Balancing of Several Masses Rotating in the Same Plane (a) Analytical Method (b) Graphical Method Basic concepts of vibration Oscillatory motion. (a) Harmonic motion.

	(b) Periodic motion. Vibration terminology.
Week 2	Balancing of Several Masses Rotating in Different Planes Solve Problems. Second Order Differential Equations with Constant Coefficients. Solve Problems. Undamped Free Vibrations of Single degree of Freedom Systems. (a) Simple Harmonic Oscillation (Equilibrium Method). (b) Angular Oscillations of Rigid Bodies. Torsional Oscillation of Elastic Shafting. Solve Problems.
Week 3	Classification of Gears Spur Gears Velocity Ratio (Gear Ratio) Center to Center Distance Gear Trains Velocity Ratio of Simple Gear Trains Velocity Ratio of Compound Gear Trains Solve Problems
Week 4	Epicyclic Gear Trains Simple Epicyclic Gear Trains Compound Epicyclic Gear Trains Energy Methods. Equivalent Spring Constants. Solve Problems.
Week 5	Solved Problems Damped Free Vibrations of Single degree of Freedom Systems. Logarithmic Decrement. Forced Vibrations of Undamped Single Degree of Freedom Systems. Solve Problems.
Week 6	Types of Governors Watt Governor Porter Governor (a) Equilibrium Method (b) Instantaneous Center Method Solve Problems tions of Damped Single Degree of Freedom Systems. Forced Angular Oscillations of Rigid Bodies. Solve Problems.
Week 7	Proell Governor Hartnell Governor Solve Problems Influence of Frequency Ratio and Damping Factor on Steady State Response. Force Transmission and Vibration Isolation. Base Excitation.

Week 8	Types of Belts Types of Flat Belt Drive Selection of Belt Drive Velocity Ratio of Open Belt Drive Effect of Belt Thickness on Velocity Ratio Slip of the Belt Velocity Ratio of a Compound Belt Drive Length of Belt (a) Open Belt (b) Cross Belt Ratio of Driving Tension for Flat Belts Natural Frequency of Transverse Vibrations of Shafts or Beams Under Different Types of Loads and End Conditions. (a) Natural Frequency of a Shaft Carrying a Single Concentrated Load. (b) Natural Frequency of a Shaft Carrying a Uniformly Distributed Load. Natural Frequency of Transverse Vibration of a System of Several Loads Attached to the Same Shaft. (a) Energy or (Rayleigh's) Method. (b) Dunkerley's Method. Solve Problems.
Week 9	Determination of Angle of Contact (a) Open Belt (b) Cross Belt Power Transmitted by a Belt Centrifugal Tension (T_c) Maximum Tension in the Belts (T_{max}) Condition for the Transmission of Maximum Power Initial Tension in the Belt (T_o) V – Belt Drive and Rope Drive Whirling Speeds or Critical Speeds. Solve Problems.
Week 10	Solve Problems Free Vibrations of Undamped Systems with Two Degree of Freedom. Solve Problems.
Week 11	Types of Brakes Simple Block or Shoe Brake (a) Single Block or Shoe Brake (b) Double Block or Shoe Brake Band Brake (a) Simple Band Brake Differential Band Brake Free Vibrations of Damped Systems with Two Degree of Freedom. Solve Problems.
Week 12	Band and Block Brake Internal Expanding Shoe Brake The Braking of a Vehicle (a) Value of Retardation When the Brakes are Applied to Rear Wheels Only

	(b) Value of Retardation When the Brakes are Applied to Front Wheels Only (c) Value of Retardation When the Brakes are Applied to All the Wheels Solve Problems Forced Vibrations for Systems with Two Degree of freedom. Solve Problems.
Week 13	Types of Followers Nomenclatures for Cam Profile Motions of the Follower (a) Uniform Motion or Uniform Velocity of a Follower Free Torsional Vibrations of a Three Rotor System. Torsional Equivalent Shaft. Solve Problems.
Week 14	(b) Simple Harmonic Motion of Follower (c) Uniform Acceleration and Uniform Retardation Cam profile construction Free Torsional Vibrations of a Three Rotor System. Torsional Equivalent Shaft. Solve Problems.
Week 15	Solve Problems

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: How to balance rotating masses. Mass – Spring system.
Week 2	Lab 2: How to get force equilibrium. Simple and Compound Pendulums.
Week 3	Lab 3: Explain the principle work of gear and gear train. Mass Moment of Inertia Estimation-Part one: Bifilar Suspension.
Week 4	Lab 4: Explain the principle work of governor. Mass Moment of Inertia Estimation-Part two: Auxiliary Mass Method.
Week 5	Lab 5: How plane surface friction calculated. Undamped Forced Vibration.
Week 6	Lab 6: Explain friction of flat belt. Transverse Vibration of a Beam.
Week 7	Lab 7: How frictional clutch operate.

	Undamped vibration absorber.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Recommended Texts	➢ "Theory of Machines", Burasia Publishing House (PVT.) Ltd, 1988, by Khurmi R. S. and Gupta J. K. ➢ "Theory of Machines", Laxmi Publications (P) Ltd, 2004, by Brar J. S. and Bansal R. K. ➢ "Theory of Machines", S. Chand & Company Ltd, 2005, Khurmi R. S. and Gupta J. K.	Yes

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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Heat Transfer			**Module Delivery**	
Module Type	C			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC303				
ECTS Credits	8				
SWL (hr/sem)	240				
Module Level		3	**Semester of Delivery**		1
Administering Department		Mechanical Power Eng. Dep.	**College**	TCB	
Module Leader	Ahmed Jasim Hamad		**e-mail**	ahmed.elhamad@mtu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	None		**e-mail**	E-mail	
Peer Reviewer Name		Johain Jawdat Faraj	**e-mail**	johaintech@mtu.edu.iq	
Scientific Committee Approval Date		20/06/2023	**Version Number**		1

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC203, MPAC202	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	15. To develop students' fundamental knowledge into Heat transfer principles. 16. To describe the physical principles and evolving technical capabilities of heat transfer 17. To explain the heat transfer mechanisms, conduction, convection, and radiation. 18. To describe the thermal resistance concept, conduction through multilayered plane wall, cylinders and spheres. 19. To describe the Heat transfer from finned surfaces, fin equation, fin Efficiency, fin effectiveness. 20. To explain the forced and natural convection heat transfer, boundary layer concepts. 21. To describe the kinds of heat exchangers, heat exchangers design methods. 22. To explain the heat transfer by radiation basic concepts.
Module Learning Outcomes	Upon completion of the course, students should be able to: 16. Use the information of heat transfer principles. 17. Identify the heat transfer mechanisms. 18. Recognize the forced and natural convection heat transfer. 19. Recognize the kinds of heat exchangers and design methods. 20. Recognize the heat transfer by radiation basic concepts. 21. Use the heat transfer principles in the practical applications.
Indicative Contents	Indicative content includes the following: Heat transfer principles [16hrs]. Introduction to heat transfer mechanisms, conduction, convection, and radiation [16hrs]. Thermal resistance concept, conduction through multilayered plane wall, cylinders and spheres [28hrs]. Heat transfer from finned surfaces, fin equation, fin Efficiency, fin effectiveness [16hrs]. Forced and natural convection heat transfer, boundary layer concepts [28hrs]. Heat transfer by radiation basic concepts [24hrs].

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	144	**Structured SWL (h/w)**	10
Unstructured SWL (h/sem)	96	**Unstructured SWL (h/w)**	6
Total SWL (h/sem)	240		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20% (20)	3,6,10,14	LO #1,2,3,4,5,6
	Assignments	2	10% (10)	5, 12	LO # 2.3.4.5
	Seminar	1	10% (10)	12	LO # 1,6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	10	LO # 1,2,3
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري محتوى كل اسبوع يجب ان يغطي الوقت المحدد	
	Material Covered
Week 1	Introduction, Heat Transfer Mechanisms, Steady State general Heat Conduction equation in Rectangular, Cylindrica and spherical Coordinates.
Week 2	Thermal Resistance Concept, Conduction through Multilayered Plane Wall, Cylinders and Spheres.
Week 3	Over all Heat Transfer Coefficient, Critical Radius of Insulation. Thermal Contact Resistance.
Week 4	Heat transfer from finned surfaces, fin equation, fin Efficiency, fin effectiveness
Week 5	Transient Heat Conduction, (Lumped System Analysis) Two-dimensional Steady Heat Conduction, numerical method.

Week 6	Introduction to Heat Transfer by Convection, Review to the Fluid Flow.
Week 7	Non-Dimensional Group Numbers Analysis, Laminar and Turbulent flow.
Week 8	External Forced Convection (on Flat Plate), Boundary layer concept, Empirical Equations
Week 9	Internal Forced Convection (Laminar and Turbulent Flow), Empirical Equations.
Week 10	Natural Convection Heat Transfer, Empirical Equations.
Week 11	Introduction to Heat Exchangers, Kinds of Heat Exchangers
Week 12	The Overall Heat Transfer Coefficient, Fouling Factor, The Log Mean Temperature Difference (LMTD) Method
Week 13	Effectiveness- NTU method, Performanc for Different Kinds of the Heat Exchangers.
Week 14	Heat Radiation, Introduction, Basic Concepts, Absorptivity, Reflectivity, and Transmissivity.
Week 15	Radiation Heat Transfer Between Two Black and Gray Surfaces.

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Calculation of thermal conductivity
Week 2	Lab 2: Calculation of heat transfer rate.
Week 3	Lab 3: Calculation of thermal contact resistance
Week 4	Lab 4: Heat transfer in long straight fins
Week 5	Lab 5: Estimating the convection heat transfer coefficient in fins
Week 6	Lab 6: Forced convection from a cylinder in a cross flow
Week 7	Lab 7: Free convection from a cylinder in free flow
Week 8	Lab 8: Parallel flow shell and tube heat exchanger performance
Week 9	Lab 9: Counter flow shell and tube heat exchanger performance
Week 10	Lab 10: Heat Transfer by Radiation

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Recommended Texts	➢ Yunus C. Cengel,“ Heat and Mass Transfer”, 6th Edition, Mc Graw-Hill Education, 2020.	Yes

	➢ J. P. Holman "Heat Transfer", 10th Edition, Mc Graw-Hill Education, 20١0.	

Grading Scheme مخطط الدرجات				
Group	**Grade**	**التقدير**	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Air Conditioning and Refrigeration systems**	**Module Delivery**	
Module Type	**C**	☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MPAC304**		
ECTS Credits	**10**		
SWL (hr/sem)	**300**		
Module Level		**Semester of Delivery**	

Administering Department	Mechanical Power Eng. Dep.	**College**	TCB
Module Leader	Abdul Hadi N. Khalifa	**e-mail**	Ahaddi58@mtu.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Ahmed Jasim Hamad	**e-mail**	ahmed.elhamad@mtu.edu.iq
Scientific Committee Approval Date	20 / 6/2023	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC205	**Semester**	4
Co-requisites module	MPAC 109	**Semester**	2

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This topic aims to enable and qualify the student to know the heating, ventilation, and air conditioning systems, estimate the cooling and heating load, identify the pipe and duct design, select fans and pumps, etc., and estimate the refrigeration load of the food storage stores and diseases that affect food products during the storage period.
Module Learning Outcomes	**Course Outcomes:** 1. To apply the knowledge of mathematics, science, and engineering fundamentals

مخرجات التعلم للمادة الدراسية	2. To model refrigeration and air conditioning engineering. 3. 2. To study the design procedures of cooling load, heating load, duct design, piping design, food preservation and food microbiology diseases. 4. To study the design of cold store refrigeration load. 5. To know the software that related to the subject.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A** **Cooling and heating load estimation** Site survey of air conditioned space, relation between heat gain and cooling load. Inside and outside design conditions, for winter & summer, heating load calculation (heat loss from windows, doors, walls, roof, floor, base of building, ventilation (air change method, air required for each person, air volume per unit area,) infiltration (crack method) total heating load, Cooling load (radiation glasses, conduction heat transfer through walls, roof, glasses,..etc using equivalent temperature deference,) Heat transfer through part ions, peoples heat generated, people metabolic rate, lighting heat, motors & equipment, ventilation and infiltration load. Room total load, zone load, building load, bypass factor, cooling coil temperature. Heating load estimation, outdoor load, indoor load, ventilation and infiltration load. [30 hrs] **Part B** **Duct design and fans selection** Air ducting (pressure loses in straight duct, duct fittings (sudden enlargement & contraction, branches, bends, ….etc) Duct design, methods of design, equal friction method, balancing of duct system. Fans (type, selection, performance of centrifugal, laws) room air distribution, selection of supply & return air opening, diffusers, grilles, return grilles.) [18 hrs] **Part C**

	Piping and pumps selection Water piping design, pressure losses in straight, and other links, valves, and accessories, cooling water pipes, water pipe network design. Pumps (performance, types, pump selections, design of water distribution system , design of expansion tank) [12 hrs] **Part D** **Food Preservation** Food thermal properties, water contain, primary freezing point, ice fraction, density, specific heat. Freezing and nonfreezing foods, thermal conductivity, parallel method, respiration heat, heat transfer coefficient of surface. Time of Food cooling and freezing. Estimation of Food cooling Time depending on dimensionless heat transfer coefficient, method of freezing estimation. Blank Equation for freezing time estimation. Refrigeration and the food deceases, biological deceases sources, microbes growth, critical growth requirement of microbes, control of microbes growth, HACCP method [18 hrs] **Part E** **Refrigeration Load** Thermal load of transportation, air filtration, equipment, safety factor, total ref. load, principle of freezing storage design, volume calculation, design of the storage construction, storage requirement. Methods of construction, space requirement, treatment of air and vapor infiltration from cracks, floor structure, preparing of the roof, water derange, Freezing systems, fan coil unit, valve selection, vale position, system design, Refrigerators [12 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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	144	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	156	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	11
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	300		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5	10% (10)	3,7,10	LO #1, 2, 3,4,5
	Assignments	2	10% (10)	2, 8	LO # 3, 4
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	10	LO # 3,4,5
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 12,3,4
	Final Exam	2hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
	Cooling and heating load estimation
Week 1	Site survey of air conditioned space, relation between heat gain and cooling load. Inside and outside design conditions, for winter & summer, heating load calculation (heat loss from windows, doors, walls, roof, floor, base of building, ventilation (air change method, air required for each person, air volume per unit area,) infiltration (crack method) total heating load.
Week 2	Cooling load (radiation glasses, conduction heat transfer through walls, roof, glasses,..etc using equivalent temperature deference,)
Week 3	Heat transfer through part ions, peoples heat generated, people metabolic rate, lighting heat, motors & equipment, ventilation and infiltration load.
Week 4	Room total load, zone load, building load, bypass factor, cooling coil temperature.
Week 5	Heating load estimation, outdoor load, indoor load, ventilation and infiltration load.
	Duct design and fans selection
Week 6	Air ducting (pressure loses in straight duct, duct fittings (sudden enlargement & contraction, branches, bends, ….etc)
Week 7	Duct design, methods of design, equal friction method, balancing of duct system.
Week 8	Fans (type, selection, performance of centrifugal, laws) room air distribution, selection of supply & return air opening, diffusers, grilles, return grilles.)
	Piping and pumps selection
Week 9	Water piping design, pressure losses in straight, and other links, valves, and accessories, cooling water pipes, water pipe network design.
Week 10	Pumps (performance, types, pump selections, design of water distribution system , design of expansion tank)
	Food Preservation
Week 11	Food thermal properties, water contain, primary freezing point, ice fraction, density, specific heat. Freezing and nonfreezing foods, thermal conductivity, parallel method, respiration heat, heat transfer coefficient of surface.
Week 12	Time of Food cooling and freezing.

	Estimation of Food cooling Time depending on dimensionless heat transfer coefficient, method of freezing estimation.
Week 13	Blank Equation for freezing time estimation. Refrigeration and the food deceases, biological deceases sources, microbes growth, critical growth requirement of microbes, control of microbes growth, HACCP method.
	Refrigeration Load
Week 14	Thermal load of transportation, air filtration, equipment, safety factor, total ref. load, principle of freezing storage design, volume calculation, design of the storage construction, storage requirement,
Week 15	Methods of construction, space requirement, treatment of air and vapor infiltration from cracks, floor structure, preparing of the roof, water derange, Freezing systems, fan coil unit, valve selection, vale position, system design, Refrigerators.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-3	Case study for cooling load estimation, each student will select a house map and achieving the cooling load for the given house
Week 4-5	Case study for heating load estimation, each student will select a house map and achieving the cooling load for the given house
Week 6-7	Depending on the cooling and heating load, the student design the duct system to the house
Week 8	Design the duct system for the building and select the fan for the duct system. Finding the operating point, power consumption and pressure loss of the fan.
Week 9	Design the piping system for the heating load of the house
Week 10	Select the pumping system, system and finding the operating point, power consumption and pressure loss of the pumps.
Week 11	Perform a calculation for the freezing time of the food
Week 12-13	Perform the refrigeration load for a given cold store

Week 14-15	Estimation the freezing load of the cold store

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Carrier Handbook 2. ASHRAE – Fundamental 3. Stanford III, Herbert W., and Adam F. Spach. Analysis and Design of Heating, Ventilating, and Air-Conditioning Systems. CRC Press, 2019. 4. Wijeysundera, Nihal E. Principles of Heating, Ventilation and Air Conditioning with Worked Examples. World Scientific, 2015. 5. Berk, Zeki. Food process engineering and technology. Academic press, 2018.	Yes
Recommended Texts	1. Stanford III, Herbert W., and Adam F. Spach. Analysis and Design of Heating, Ventilating, and Air-Conditioning Systems. CRC Press, 2019. 2. Wijeysundera, Nihal E. Principles of Heating, Ventilation and Air Conditioning with Worked Examples. World Scientific, 2015. 3. Berk, Zeki. Food process engineering and technology. Academic press, 2018.	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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mechanical Design**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	MPAC305				
ECTS Credits	**5**				
SWL (hr/sem)	**180**				
Module Level		3	**Semester of Delivery**		1
Administering Department		Mechanical Power Eng. Dep.	**College**	TCB	
Module Leader	Hamed A. Husein		**e-mail**	Mechanical10power@gmail.com	
Module Leader's Acad. Title		Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	None		**e-mail**	E-mail	
Peer Reviewer Name		Khudhayer J. Jadee	**e-mail**	khudhayer1970@mtu.edu.iq	
Scientific Committee Approval Date		20 / 6/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC206	**Semester**	4
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	22. Learning the design process of mechanical components, for different design considerations, such like strength, stiffness, and stability. 23. Transfer real life mechanical systems to analytical models and analyze them and deal with design codes and standards. 24. To be able to solve open-ended design problems, cope with decision making and satisfy competing objectives. 25. Use and integrate the fundamentals studied previously towards the goal of analyzing and designing mechanical components to achieve satisfactory levels of safety and life. 26. To improve competence in multi-axis stress analysis. 27. To obtain a knowledge in the use of the proper failure theories under steady and variable loadings. 28. To develop the design skills of mechanical components under steady and variable loadings.
Module Learning Outcomes	Upon completion of the course, students should be able to: 1. Apply basic design principles applicable to components as listed in the core content. 2. Conceptualise, design and calculate simple stresses in mechanical components. 3. Design and calculate working stress and factor of safety in mechanical components. 4. Design and calculate stresses in composite bars and thermal stresses in mechanical components. 5. Perform relevant and applicable calculations for torsional and bending stresses in mechanical components. 6. Identify the principal stresses and principal planes in mechanical components. 7. Apply theories of failure to achieve satisfactory levels of safety for mechanical components. 8. Design and calculate variable stresses and stress concentration in mechanical components.

	9. Perform relevant and applicable calculations to design the shaft. 10. Perform relevant and applicable calculations to design the keys, splines and couplings. 11. Perform relevant and applicable calculations to design the riveted joints. 12. Perform relevant and applicable calculations to design the welded joints. 13. Perform relevant and applicable calculations to design the pressure vessels. 14. Perform relevant and applicable calculations to design the power screws.
Indicative Contents	Indicative content includes the following: General Procedure in Machine Design, Classifications of Machine Design, Material Strength and Stiffness, Simple Stresses, Working Stress, Selection of Factor of Safety, Stresses in Composite Bars, Stresses due to Change in Temperature. [10 hrs] Torsional and Bending Stresses in Machine Parts, Shafts in Series and Parallel [3 hrs] Determination of Principal Stresses for a Member Subjected to Bi-axial Stress, Theories of Failure Under Static Load [5 hrs] Cyclic Stresses, Fatigue and Endurance Limit, Factor of Safety for Fatigue Loading, Theoretical Stress Concentration Factor, Fatigue Stress Concentration Factor, Combined Steady and Variable Stress [4 hrs] Material Used for Shafts, Design of Shafts, Shafts Subjected to Twisting Moment Only, Shafts Subjected to Bending Moment Only, Shafts Subjected to Combined Twisting Moment and Bending Moment, Shafts Subjected to Axial Load in addition to Combined Torsion and Bending Loads [4 hrs] Design of keys and Splines, Effect of Keyways, Types of Shafts Couplings [5 hrs] Riveted Joints, Failures of a Riveted Joint, Efficiency of a Riveted Joint, Design of Longitudinal Butt Joint for a Boiler, Design of Circumferential Lap Joint for a Boiler, Riveted Joint for Structural Use [5 hrs] Types of Welded Joints, Basic Weld Symbols, Strength of Transverse Fillet Welded Joints, Strength of Parallel Fillet Welded Joints [5 hrs] Classification of Pressure Vessels, Hoop and Longitudinal Stress, Spherical Shells, Compound Cylindrical Shells [4 hrs] Types of Screw Threads, Efficiency of Threaded Screws, Efficiency of Self-Locking Screws [3 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	Assessment is based on hand-in assignments, Written exam, Quizzes, Tutorial, Seminars, Reports.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	88	**Structured SWL (h/w)**	6
Unstructured SWL (h/sem)	62	**Unstructured SWL (h/w)**	4
Total SWL (h/sem)	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20% (20)	3,7,9,13	LO #1-13
	Assignments	1	10% (10)	7	LO # 5,12
	Seminar	2	10% (10)	4,11	LO # 10,12
Summative assessment	**Midterm Exam**	2 hr	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 محتوى كل اسبوع يجب ان يغطي الوقت المحدد	
	Material Covered
Week 1	Design consideration, Design principle, Material Strength and Stiffness
Week 2	Simple Stresses in Machine Parts

Week 3	Working Stress and Factor of Safety
Week 4	Stresses in Composite Bars and Thermal Stresses
Week 5	Torsional and Bending Stresses in Machine Parts
Week 6	Principal Stresses and Principal Planes
Week 7	Theories of Failure
Week 8	Variable Stresses in Machine Parts and Stress Concentration
Week 9	Design of Shafts
Week 10	Design of keys, Splines and Couplings
Week 11	Riveted Joints
Week 12	Welded joints
Week 13	Pressure Vessels
Week 14	Power Screws
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	No Lab.
Week 2	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	➢ A Textbook of Machine Design by R.S.KHURMI AND J.K.GUPTA	No
Recommended Texts	➢ Shigley's Mechanical Engineering Design (McGraw-Hill Series in Mechanical Engineering) 10th Edition	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	Maintenance of Air Conditioning systems	**Module Delivery**	
Module Type	C	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC307		
ECTS Credits	10		
SWL (hr/sem)	300		
Module Level	3	**Semester of Delivery**	2

Administering Department	Mechanical Power Eng. Dep.	**College**	TCB
Module Leader	Dr.Ahmed Qasim Ahmed	**e-mail**	aqaa1@mtu.edu.iq
Module Leader's Acad. Title		**Module Leader's Qualification**	
Module Tutor		**e-mail**	
Peer Reviewer Name	Ahmed Jawad Khaleel	**e-mail**	ahmed1982_jk@mtu.edu.iq
Scientific Committee Approval Date	20 / 6/2023	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC205	**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. study the maintenance of all types of refrigeration system. 2. Introducing students to all the basic topics of this course, the theoretical side and the practical side. 3. Introduces theories and operations of heating and air conditioning system. Includes service, testing and repair of air conditioning, ventilation, and heater and engine cooling systems

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe the Refrigeration and Air Conditioning system and the principle of work inside Refrigeration and Air Conditioning workshop 2. The student can General Safety Practices and getting to know theTools and equipment, Refrigeration and air conditioning systems strategies. 3. Diagnose air conditioning and heating failures and make the required repairs. 4. the student have ability to Refrigeration and air conditioning equipment installation, Inspection and welding of pipes , vacuum and charge, installation problems. 5. The student able to troubleshoot for central air conditioning systems, Refrigeration and Oil Chemistry and Management—Recovery, Recycling, Reclaiming, and Retrofitting 6. Study the Mechanical and Electrical troubleshooting of Refrigeration and air conditioning system and water chillers 7. Study the Conventional air conditioning system (mechanical and electrical components, features, installation, connection, commissioning, maintenance, and control. 8. Study the Compressors (types, applications, maintenance, assembly and dis assembly, test and commissioning). 9. Study the Evaporators ,Condensers, Expansion devices and air washer (types, applications, maintenance, assembly and dis assembly, test and commissioning). 10. Study Cooling tower (types, applications, maintenance, assembly and dis assembly, test and commissioning). 11. Pumps (types, applications, maintenance, assembly and dis assembly, test and commissioning). 12. Refrigeration and air conditioning components cleaning by using chemical materials.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** 1. General Safety Practices 2. Tools and equipments 3. Refrigeration and air conditioning equipment classification 4. air conditioning and heating failures and make the required repairs. 5. Refrigeration and air conditioning equipment installation 6. Mechanical and Electrical troubleshooting 7. Conventional air condition system(mechanical and electrical components)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exams, Quizzes, reports, Practical testing ,and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	144	**Structured SWL (h/w)**	10

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	156	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	11
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	300		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 , 11	
	Assignments	5	10% (10)	3,5,7,10,13	
	Projects / Lab.				
	Report	2	10% (10)	8 , 13	
Summative assessment	Midterm Exam	2 hr	20% (20)	7	
	Final Exam	3hr	50% (50)	15	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	General Safety Practices, Tools and equipment, Refrigeration and air conditioning systems strategies.Refrigeration and air conditioning equipment classification (types, applications, maintenance, control, mechanical and electrical parts).Test and commissioning Refrigeration and air conditioning equipment.
Week 2	Refrigeration and air conditioning equipment installation, tubing, welding, leak
Week 3	types of installation, mechanical and electrical connections, piping, Appropriate places selection, piping's and insulations assembly, air purge, vacuum and charge, installation problems
Week 4	Mollier's charts (drawing, point's determination, troubleshooting for central air conditioning systems, Refrigeration and Oil Chemistry and Management—Recovery, Recycling, Reclaiming, and Retrofitting
Week 5	Mechanical troubleshooting study of Refrigeration and air conditioning system and water chillers.
Week 6	Electrical troubleshooting study of Refrigeration and air conditioning system and water chillers.
Week 7	Conventional air condition system (mechanical and electrical components, features, installation, connection, commissioning, maintenance, and control.

Week 8	Compressors (types, applications, maintenance, assembly and dis assembly, test and commissioning).
Week 9	Evaporators and air washer (types, applications, maintenance, assembly and dis assembly, test and commissioning).
Week 10	Condensers (types, applications, maintenance, assembly and dis assembly, test and commissioning).
Week 11	Cooling tower (types, applications, maintenance, assembly and dis assembly, test and commissioning).
Week 12	Expansion devices (types, applications, maintenance, assembly and dis assembly, test and commissioning).
Week 13	Fans (types, applications, maintenance, assembly and dis assembly, test and commissioning).
Week 14	Pumps (types, applications, maintenance, assembly and dis assembly, test and commissioning).
Week 15	Refrigeration and air conditioning components cleaning by using chemical materials.

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Dismantling the commercial system knew the basic parts and accessories and isolate each part of it for other parts.
Week 2	Repair compressor through the dismantling of reciprocating compressor semi –hermetic of commercial system
Week 3	identify the parts and functions and the method of examination and then gathered and examined parts of the compressor and take all measures in order to examine the operation and performance.
Week 4	Maintenance of air cooled condenser system for commercial and examination of the leak and treatment. Cleaning of the inside and outside and sweep the fins also work includes everything related to the fans for the condenser. Maintenance of water-cooled condenser system for commercial and examination of the leak and treatment. Cleaning of the interior and exterior work includes mechanical and chemical cleaning, as well as the pump and piping for the condenser
Week 5	Maintenance - evaporator system for commercial and leakage of examination and treatment. Cleaning of the inside and outside and sweep the fins also work includes everything related to the fans for the evaporator
Week 6	Dismantling expansion valve (used for different types of commercial systems) and checked and calibrated and cleaned.
Week 7	Maintenance of electrical accessories for commercial and test it (power and control circuit. Connect the electrical connections of the power and control circuits and test the connections.
Week 8	Conduct a process of checking the leak and add oil and make the process of charging and discharging of the gas by using modern equipment not impact on the environment. Checking the final inspection of the system and the first to hold the operation of the system to ensure the safety of the electrical and mechanical connection.
Week 9	Maintenance of mechanical and electrical axial fans and Accessories. Maintenance of mechanical and electrical centrifugal fans and Accessories.
Week 10	Maintenance of water pumps (the dismantling of the pump and the maintenance of internal parts and then assembled) adjust the straightness of the pump and the electric motor.
Week 11	Maintenance of all extensions of piping system (disassembly of the different types of valves to get to know their parts and re- assembled and tested) and examined and operated.

Week 12	Maintenance of air handling unit through the dismantling of parts and inspection and lubrication and then re- connect and straighter transmission belt and pulleys.
Week 13	Maintenance of cooling tower (fans –ball bearing- tank-nozzles-piping-pill and straighter transmission belt and pulleys).
Week 14	Maintenance of an air vehicle air conditioner and includes cleaning -Maintenance – components vacuum and churching with modern equipment that do not adversely affect the environment.
Week 15	operating and inspection the vehicle air conditioner system.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Refrigeration and air conditioning Technology	yes
Recommended Texts	Modren refrigeration and airconditioning maintenance	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	English 3	**Module Delivery**	
Module Type	S	☒ **Theory** ☐ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC308		
ECTS Credits	3		
SWL (hr/sem)	90		

Module Level	3	**Semester of Delivery**	**2**
Administering Department	Mechanical Power Eng. Dep.	**College**	**TCB**
Module Leader	**Aseel Jabbar**	**e-mail**	
Module Leader's Acad. Title	**Lecturer. Assist**	**Module Leader's Qualification**	**M.Sc**
Module Tutor	**Aseel Jabbar**	**e-mail**	**Aseel.jabbar@mtu.edu.iq**
Peer Reviewer Name	**Mr. Labed Kadhim**	**e-mail**	**Labed1970@mtu.edu.iq**
Scientific Committee Approval Date	20 / 6/2023	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC208	**Semester**	L2S1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The goal is to study English language and gain knowledge of it as benefit engineers in general, and to develop speaking skills and understand its basic rules taking the way to the acquisition of the ability to use technical key words in their work and the capability of communicating with other engineers correctly
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Developing speaking skills and understanding its basic rules to take the way to the acquisition of the ability to use technical keywords in their work and the capability of communicating with other engineers correctly .
Indicative Contents المحتويات الإرشادية	

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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٤٤	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٤٦	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	٩٠		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	20% (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	Revision, vocabulary and comprehension
Week 2	Phrasal verbs, vocabulary and comprehension
Week 3	Academic writing (1), introduction
Week 4	English words with more than one meaning, vocabulary and comprehension
Week 5	Present tenses, vocabulary and comprehension
Week 6	Past tenses, vocabulary and comprehension
Week 7	Future tenses, vocabulary and comprehension

Week 8	Types of Essays, vocabulary and comprehension
Week 9	Punctuation, passive voice, vocabulary and comprehension
Week 10	Writing technical e-mails, vocabulary and comprehension
Week 11	Academic writing (1), writing a paragraph
Week 12	Technical English (2), keywords, vocabulary and comprehension
Week 13	Grammar revisions
Week 14	**General Revision**
Week 15	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Headway plus for intermediate	Yes
Recommended Texts	Any Grammar and comprehension for technical learning and academic writing text.	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.

Air Conditioning Systems Drawing

Module Information
معلومات المادة الدراسية

Module Title	Air Conditioning Systems Drawing		**Module Delivery**	
Module Type	C		☐ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	MPAC309			
ECTS Credits	7			
SWL (hr/sem)	210			
Module Level	3	**Semester of Delivery**	2	
Administering Department	Mechanical Power Eng. Dep.	**College**	TCB	
Module Leader	Yasir Abdulateef Gheni	**e-mail**	yasir_abulatif1@mtu.edu.iq	
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	M. Tech.	
Module Tutor		**e-mail**		
Peer Reviewer Name	Dr.Ahmed Qasim Ahmed	**e-mail**	aqaa1@mtu.edu.iq	
Scientific Committee Approval Date	20 / 6/2023	**Version Number**	1.0	

Relation with other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	MPAC 201 MPAC 205	**Semester**	3, 4
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To enable and qualify the student to understand the architectural plans and their sections. 2. To draw and understand the mechanical layouts of the ducting network for ventilation. 3. To provide the ability to draw the piping network of the central air conditioning systems with all the necessary accessories of valves, fittings and sensors. 4. To draw the detail drawings of the air conditioning devices of fan coil units, chillers, boilers, air handling units, and cooling towers. 5. To design VRF systems for selective AC companies. 6. To understand the electrical and control diagrams of the air conditioning systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	29. Making site survey and drawing the architectural plans. 30. Estimate the cooling load of buildings by Rule of Thumb method. 31. Estimate the required ventilation of buildings by Rule of Thumb method. 32. Using the Duct Sizer software to design the ducting network. 33. Drawing the ducting network by AutoCAD MEP or Revit software. 34. Selection of chillers, boilers, AHU's, package units, fan coils and cooling towers of deferent brand.

	35. Using the Pipe Sizer software to design the piping network of the air conditioning system. 36. Drawing the piping network by AutoCAD MEP or Revit software. 37. Designing the VRV/VRF system by the selection software of some manufacturer brands.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Drawing Plans</u> Walls, columns, doors, windows, stairs, shafts, elevation. [9 hrs] <u>Part B – Ducting Drawing</u> Load estimation, specify ventilation, units' selection, duct design and drawing. [30 hrs] <u>Part C – Piping Drawing</u> Chillers, boilers, pumps selection, piping design and drawing, VRF system drawing. [30 hrs] <u>Part D – Electrical Drawing</u> Chillers, boilers, pumps, VRF system electrical drawing. [21 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. This will be achieved through classes, interactive tutorials and by considering some simple real projects as well as site visiting for finished and ongoing projects.

Student Workload (SWL) الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	116	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	94	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	210		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	5% (8)	3,8,12,13	LO # 1, 5, 8, 9
	Assignments	8	15 % (12)	2,4,5,8,12, 13,14,15	LO # 1-9
Summative assessment	**Midterm Exam**	3 hr.	30% (30)	9	LO # 1-9
	Final Exam	3 hr.	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Making site survey
Week 2	Draw architectural plans

Week 3	Draw elevation plans
Week 4	Cooling load estimation
Week 5	Specify the required ventilation
Week 6	Package units, fan coil units and AHUs selection
Week 7	Design ducting network by Duct Sizer
Week 8	Drawing ducting network
Week 9	Midterm Exam
Week 10	Chillers, boilers, cooling towers and pumps selection
Week 11	Design piping system by Pipe Sizer
Week 12	Drawing the piping system
Week 13	VRV/VRF system design and drawing
Week 14	Drawing the electrical and control diagram of central air conditioning system
Week 15	Drawing the electrical and control diagram of VRV/VRF systems

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. 2021 ASHRAE handbook. Fundamentals 2. Principles of heating, ventilating, and air conditioning: a textbook with design data based on the 2021 ASHRAE handbook--Fundamentals 3. Design manual for heating, ventilation and air conditioning with coordinated standard details: Lee Kendrick, Julian C. Gonzalez,1986	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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Electrical and Electronic Engineering**	**Module Delivery**	
Module Type	**C**	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC311		
ECTS Credits	**5**		
SWL (hr/sem)	**150**		
Module Level	3	**Semester of Delivery**	2

Administering Department	Mechanical Power Eng. Dep.	**College**	TCB
Module Leader	Odai isam wadea	**e-mail**	Odai-asam@mtu.edu.iq
Module Leader's Acad. Title	Asst. lecturer.	**Module Leader's Qualification**	MSc
Module Tutor	None	**e-mail**	E-mail
Peer Reviewer Name	Sali dakheel	**e-mail**	Sali-dakeel@mtu.edu.iq
Scientific Committee Approval Date	20/06/2023	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	MPAC107	**Semester**	L1,S2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims	To study the principles of electrical machines and electronic devices that are necessary for refrigeration and air conditioning engineer.
Module Learning Outcomes	Upon completion of the course, students should be able to: 38. Be able to analyze DC motor 39. Calculate the current and voltage of Motor then calculate the Torque 40. Compare between single phase and three phase motor
Indicative Contents	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	88	**Structured SWL (h/w)**	6
Unstructured SWL (h/sem)	62	**Unstructured SWL (h/w)**	4
Total SWL (h/sem)	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20% (20)	3,5,6,10	LO #1,2,…..10
	Assignments	2	10% (10)	7, 8	LO # 8
	Seminar	1	10% (10)	11	LO # 11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	12	LO # 1-12
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري محتوى كل اسبوع يجب ان يغطي الوقت المحدد	
	Material Covered
Week 1	D.C motors, construction, commutator, types of D.C motors
Week 2	Starting of D.C motor, starter connection, torque of D.C motors
Week 3	Single phase induction motor, split-phase, capacitor-start, shaded-pole type

Week 4	3-phase induction motor , construction , synch. Speed, slip .
Week 5	Starting of 3-phase induction motor, star-delta method, step down transformer
Week 6	Instruments and measurements, ammeters, voltmeter, ohmmeter, kw - h meters .
Week 7	Contactors, relays, timers .. Thermal overload, starter (contactor +timer)
Week 8	Fuse, circuit breakers, types, choice
Week 9	Diode, V-I characteristic, half –wave rectifier
Week 10	Full-wave rectifier, bridge and center-top transformer rectifier
Week 11	Transistor, construction, types
Week 12	Saturation, active, break-down region and cutoff regions
Week 13	Transistor as amplifier and Transistor as electronic switch.
Week 14	Diac – Traic , characteristics applications with SCR .
Week 15	Operational amplifier 741.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Basic wiring diagram for electrical measurements
Week 2	Test of current, voltage and solid state relay
Week 3	Start-up compressor with solid state relay
Week 4	Start-up compressor with current relay
Week 5	Star delta starter
Week 6	Simulation of block for refrigerant , notice the effects
Week 7	Simulation of valve damage, notice the effects
Week 8	Dismantling of induction motor
Week 9	Diode characteristics
Week 10	Diode characteristics
Week 11	Half wave rectifier

Week 12	Full wave rectifier
Week 13	Full wave rectifier with filter
Week 14	Diode limiters
Week 15	Zener diode

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Recommended Texts	➢ Principle of Dc Motor and types	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
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Air Conditioning System Design			**Module Delivery**	
Module Type	C			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC401				
ECTS Credits	10				
SWL (hr/sem)	300				
Module Level	4		**Semester of Delivery**	1	
Administering Department	Mechanical Power Eng. Dep.		**College**	TCB	
Module Leader	Dr. Ahmed Qasim Ahmed		**e-mail**	aqaa1@mtu.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Ahmed Jawad Khaleel		**e-mail**	ahmed1982_jk@mtu.edu.iq	
Scientific Committee Approval Date	20/6/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC304	**Semester**	L3,S1
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	4. Study the type of all types of refrigeration system. 5. This course provides information on air conditioning system design and gives a good understanding of the techniques, concepts, and methods of the HVAC system design. 6. Introduces theories and operations of heating and air conditioning system. Includes design of HVAC system
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Learn how to select the suitable air terminal device and the indoor air distribution behavior 2-Study and learn some important concepts of air distribution such as duct layout, Fan, AHU, etc. 3-Work on the advanced process in the HVAC system 4-Learn about the different types of air conditioning system 5-Learn some rules of piping systems and accessories
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** 8. Air distribution systems 9. Room air distribution, conditioned room air distribution 10. Refrigeration and air conditioning equipment classification 11. Piping's systems and accessories. 12. Advanced applications on psychometric charts. 13. Conventional air condition system(mechanical and electrical components)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exams, Quizzes, reports, Practical testing, and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	144	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	156	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	11
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	300		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 , 11	
	Assignments	5	10% (10)	3,5,7,10,13	
	Projects / Lab.				
	Report	2	10% (10)	8 , 13	
Summative assessment	**Midterm Exam**	2 hr	20% (20)	7	
	Final Exam	3hr	50% (50)	15	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Air distribution systems, zoning, Air –conditioning layout systems.
Week 2	Room air distribution, conditioned room air distribution systems, room air distribution requirements, air outlets (types) and selection. Air –handling units, fan-coil units (components and selection), system resistance in series and parallel.
Week 3	Fans (types ,designs ,selection ,calculation and connection)

Week 4	Air filtration (types, application, selection and its relations with conditioned room function. The noise in air conditioning systems. (Sources and treatments by using ducts silencers and plenum), air outlet selection with recommended noise.
Week 5	Advanced applications on psychometric charts.
Week 6	Advanced applications on psychometric charts.
Week 7	Piping's systems and accessories (open and closed system), (two, three, four pipe system) comparative study and design and applications.
Week 8	Evaporative cooling systems, application and design of (air cooler, cooling tower, and air washers), psychometric chart. Air conditioning systems (types and selection) and its relation with occupant's activities..
Week 9	All air systems, features, advantages, disadvantages, comparative study with other systems, and psychometric chart.
Week 10	Single zone system (variable volume constant temperature and variable temperature constant volume), comparative study (cost and performance), psychometric chart.
Week 11	Dual conduit system, multi zone system comparative study, psychometric chart.Air –water systems (types, features, advantages, disadvantages, comparative study with other systems, psychometric chart.
Week 12	Induction unit systems (features, types, advantages and disadvantages). All –water systems, advantages, disadvantages, performance and applications.
Week 13	Fan –coil unit systems ,and primary air and fan –coil system (comparative study) Dx – systems, package system, and applications.
Week 14	Energy conservation in air conditioning systems. Heat pump system for air conditioning system.
Week 15	Evaluations and commercial analysis for air conditioning systems.

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

Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- "REFRIGERATION AND AIR CONDITIONING " By RAMESH CHANDRA ARORA 2-"Heating, Ventilating, and Air Conditioning" Analysis and Design By Faye C. McQuiston, Jerald D. Parker, and Jeffrey D. Spitler. Sixth Edition	yes
Recommended Texts	"REFRIGERATION AND AIR CON.DITIONING" By W. F. Stoecker, and J. W. Jones	Yes
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Power Plants			**Module Delivery**	
Module Type	C			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC402				
ECTS Credits	6				
SWL (hr/sem)	180				
Module Level		4	**Semester of Delivery**		1
Administering Department		Mechanical Power Eng. Dep.	**College**	ETC	
Module Leader	Dr. Asiem S, Allawi		**e-mail**	Dr.asimalobidy@mtu.edu.iq	
Module Leader's Acad. Title		Assist. Professor	**Module Leader's Qualification**		PhD.
Module Tutor	None		**e-mail**	E-mail	
Peer Reviewer Name			**e-mail**		

Scientific Committee Approval Date	20/06/2023	**Version Number**	1

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC203	**Semester**	L2
Co-requisites module	MPAC303	**Semester**	L3

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	1- Introduce the student to the basic processes of power cycles. 2- Identifying the properties of steam from tables and the processes that take place on the steam power plants cycle. 3- Learn about the different parts of the steam power plants and how it working. 4- Learn about the calculation the performance of each part of the steam power plants and the accessories.
Module Learning Outcomes	Upon completion of the course, students should be able to: 1- The student will be able to complete basic operations calculations on the steams cycles. 2- The student will be able to understand the thermal processes. 3- The student will be able to understand all types of boilers and fuels. 4- The student will be able to understand and calculate all performance which used in power plants.
Indicative Contents	Indicative content includes the following.

	*In the fourth week, outside the students' commitments, a scientific trip to a steam station (1) to see the parts of the system and how it works in reality, and to make a report [8 hrs]. *In the eighth week, outside the students' commitments, a scientific trip to a gas power station (1) to see the parts of the system and how it works in reality, and to make a report .[8 hrs] *In the Twelfth week, outside the students' commitments, a scientific trip to a steam station (2) to see the parts of the system and how it works in reality, and to make a report .[8 hrs] *In the Fifteenth week, outside the students' commitments, a scientific trip to a thermal machinery repair plant to see the parts of the system and how it works in reality, Or showing scientific films about repairing thermal machines and steam turbines and to make a report .[8hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	144	**Structured SWL (h/w)**	10
Unstructured SWL (h/sem)	36	**Unstructured SWL (h/w)**	2
Total SWL (h/sem)	180		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	20% (20)	3,5,6,10	LO #1,2,…..10
	Assignments	2	10% (10)	7, 8	LO # 8
	Seminar	1	10% (10)	11	LO # 11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	12	LO # 1-12
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

	Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري محتوى كل اسبوع يجب ان يغطي الوقت المحدد
Week	Subject
1	Introduction to power cycles and main equations in thermodynamics..
2	Power Plant Steam Cycles, Main Cycles.
3	Carnot cycle and its efficiency and all performance.
4	Steam table and its calculations.
5	Ideal Rankine cycle and colocations its performance.
6	Reheat cycle.
7	Regenerative cycle with open feed water heater.
8	Regenerative cycle with closed feed water heater.
9	Introduction to Heat Exchangers, Theoretical Principles, Parallel Flow H.E., Counter Flow H.E, Cross Flow H.E, The Log Mean Temperature Difference Method, The NTU Method, Shell and Tubes H.E., Condensing, Evaporation. .

10	Combustion and Fuels, Complete and Incomplete Combustion, Correct Air/Fuel Ratio, Access Air Supplied, Heat Generation, Boiler Efficiency, pinch principle.
11	Steam Boilers, Kinds, Burners, Air Preheated, Preheated and Superheated, Combustion and Fuels, Complete and Incomplete Combustion, Correct Air/Fuel Ratio, Access Air Supplied, Heat Generation, Boiler Efficiency, pinch principle.
12	Steam Nozzles, Applications, Steam Expansion, Discharge, Velocity of Steam Through Nozzles, Values of Critical Pressure, Diameters of Throat and Exit for Maximum.
13	Steam Condensers, Kinds, Direct Contact Condensers, Surface Condenser, Design and Manufacturing.
14	Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency, Reaction Turbine, Reaction Ratio, Installation, Multi Stage Blades,
15	The Pumps, Kinds of Pumps, System Characteristics, Pumps Characteristics, Matching Pumps to System Characteristics, Operation of Pumps in series and Parallel, Performance of the Condensers. Applications

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Feed water treatments .
Week 2	Fuel .
Week 3	The burner.
Week 4	The boiler.
Week 5	The quality calculation.
Week 6	The condense system part 1.
Week 7	The condense system part 2.
Week 8	The efficiency calculation for cycle.
Week 9	The turbine .
Week 10	The efficiency of the turbine .
Week 11	Bryton cycle .
Week 12	Efficiency of the Bryton cycle.

Week 13	Centrifugal pump.
Week 14	Axial pump.
Week 15	The effectiveness of the heat exchanger.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Recommended Texts	➢ 1-Dr. Rahim K. Jassim "POWER PLANT ENGINEERING and ECONOMY"2010 ➢ 2-Nag, P. K., "Power Plant Engineering", (2002) Tata-McGraw Hill. Higher Education, 2nd edition. ➢ 3-Kotas, T. J. (1995) "The Exergy Method of Thermal Plant Analysis", reprinted, Malabar, Florida, USA: Krieger.	yes

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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Computer Applications 3			**Module Delivery**	
Module Type	S			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC404				
ECTS Credits	5				
SWL (hr/sem)	150				
Module Level		4	**Semester of Delivery**		2
Administering Department		Mechanical Power Eng. Dep.	**College**	TCB	
Module Leader	Ahmed Mohammed		**e-mail**	ahmed_mohammed19@mtu.edu.iq	
Module Leader's Acad. Title		Ass. Lecturer	**Module Leader's Qualification**		MS.c
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr. Ahmed Qasem	**e-mail**	aqaa1@mtu.edu.iq	
Scientific Committee Approval Date			**Version Number**		

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC101 MPAC201	**Semester**	1 3
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	AutoCAD 3d course teaches students to create basic 2D and 3D drawings using drawing and editing tools, organizes drawing objects on solids, basic dimensions, and prepares to plot. This course is designed for Mechanival Engineers.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	AutoCAD 3D certificate goal is to educate individuals on extra-advanced functions, the strategy, how to design and model items in the 3D design software program, enveloping surface areas, and solids in visualizing engineering designs.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part 1 – 3d solids Drawing the basic components of 3d solids in space. Part 2 – 3d operatios Enable to make operations on the 3d solids. Part 3 – Solid editing Enable to editing on 3d solids, faces and edges. Part 4- User cooradinate system UCS Types of UCS and their applications on 3d solids. Part 5- Advanced 3d commands (Extrude, revolve, sweepand loft), 2d drawindgs and UCS . Part 6 – Surface Drawing different types of surfaces in space.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in this module is to encourage students participation in the exercises, in the same time refining and expanding their critical thinking skills. This will be achieved through classes and interactive tutorials.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	88	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل			

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 4
	Assignments	2	10% (10)	2, 12	LO # 3, 5
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 1, 2m 3, 4, 5
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-3
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered

Week 1	Introduction to AutoCAD -3D, workspace, visual style, 3d views, view ports, right hand rule, world coordinate and user coordinate systems and types of coordinate systems. 3D solids (box, wedge and cylinder).
Week 2	3D solids (cone and tours). 3D solids (sphere and pyramid).
Week 3	Examples to 3D solids. 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	More applied examples. User coordinate system (origion, face and objects) with examples.
Week 7	User coordinate system (view, world ,x-y-z) with examples. User coordinate system (z-axis and 3 points) with examples.
Week 8	Advanced 3d commands (extrude and loft) with examples.
Week 9	Advanced 3d commands (revolve, sweep) with examples. Advanced 3d commands (presspull and section plane) with examples.
Week 10	Advanced solid editing/face (extrude, move,rotate and offest).
Week 11	Advanced solid editing/face (taper, delete, copy, color, material, undo and exit).
Week 12	Applied examples. Advanced solid editing/edge (copy and color).
Week 13	Advanced solid editing/body (imprint, separate, shell, clean and check).
Week 14	Surface (box, cone, dome and mesh). surface (pyramid and sphere)
Week 15	surface (torus and wedge) with examples.
Week 16	**The preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	examples on coordinate systems
Week 2	examples on box, wedge and cylinder
Week 3	examples on cone and tours examples on sphere and pyramid
Week 4	applied examples examples on asic solid editing
Week 5	examples on fillet and chamfer examples on 3d move and 3d rotate
Week 6	examples on 3d align and 3d mirror examples on 3d array and slice
Week 7	applied examples on ucs
Week 8	applied examples on ucs
Week 9	examples on extrude and loft
Week 10	examples on revolve and sweep presspull and section plane
Week 11	examples on advanced solid editing/face (extrude, move,rotate and offest
Week 12	Advanced solid editing/face (taper, delete, copy, color,).material, undo and exit
Week 13	Applied examples.
Week 14	examples
Week 15	examples on 3d surface Surface (box, cone, dome and mesh)

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

Required Texts	Autocad user manual	Yes
Recommended Texts	Introduction to AutoCAD 2009	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 is 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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Industrial Engineering Management			**Module Delivery**	
Module Type	B			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC405				
ECTS Credits	3				
SWL (hr/sem)	90				
Module Level	**4**		**Semester of Delivery**	**1**	
Administering Department	Mechanical Power Eng. Dep.		**College**	**TCB**	
Module Leader	**Sohaib Khalil Ibrahim**		**e-mail**	sohaib-khlil@mtu.edu.iq	
Module Leader's Acad. Title	**Lecturer**		**Module Leader's Qualification**	**M.Sc**	
Module Tutor	Suzan abbas		**e-mail**	suzan.abbas@mtu.edu.iq	
Peer Reviewer Name			**e-mail**	Suzanabbas977@gmail.com	
Scientific Committee Approval Date	20 / 6/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	NA	**Semester**	
Co-requisites module	NA	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Providing the engineer with information related to the management of the industrial unit (productivity) and its structural composition and finding the optimal solution using known methods in operations research and other engineering mathematical methods.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Achieving the objectives of the industrial unit with the highest possible efficiency and maximum profitability and at the lowest cost, through the optimal use of production resources (workers, machines, and raw materials), maintenance and warehousing operations, then introducing the student to the system and economics of quality control and its functions and the principles of statistics and probability distributions.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Quizzes and tests throughout the semester to check understanding and knowledge 2. Examinations, written, that assess learners' understanding of concepts, principles, and theories related to Industrial Engineering 3. Peer evaluation and feedback tools used as part of group projects or reciprocal feedback assignments. 4. Assignments and essays used to assess learners' comprehension of theoretical concepts. 5. Presentation and demonstration of acquired knowledge in real-world scenarios.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	45	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	90

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10%	5, 10	
	Assignments	1	5%	9	
	Projects / Lab.				
	Report	1	5%	12	
Summative assessment	Midterm Exam	2hr	10%	7	
	Final Exam	3hr	60%	15	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction of management and industrial engineering
Week 2	Factors affecting the selection of the project place
Week 3	Methods of calculating transportation costs as an applied case
Week 4	Network diagrams and their applications in engineering projects
Week 5	Production lines and their types
Week 6	Planning and balancing production lines in the industrial unit
Week 7	Linear programming and its applications in industrial engineering
Week 8	Work study and time study
Week 9	Production process capability
Week 10	Inventory and its levels
Week 11	Maintenance and replacement and its applications Mathematics
Week 12	Economic feasibility
Week 13	The methods used to calculate the economic feasibility
Week 14	Normal Distribution and Area Calculation of the Standard Normal Curve
Week 15	Final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1.	yes
Recommended Texts	None	
Websites	None	

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

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Refrigeration Systems**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC406				
ECTS Credits	**10**				
SWL (hr/sem)	300				
Module Level	4		**Semester of Delivery**	2	
Administering Department	Mechanical Power Eng. Dep.		**College**	TCB	
Module Leader	Fadhil Abdulrazzaq Kareem		**e-mail**	Fadhiljua91@yahoo.com	
Module Leader's Acad. Title	Leacture		**Module Leader's Qualification**	M.sc.	
Module Tutor	None		**e-mail**	E-mail	
Peer Reviewer Name	Prof. Dr. Saad Mohsen Al Mashat		**e-mail**	almashatsaad@yahoo.com	
Scientific Committee Approval Date	13 / 6/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC205	**Semester**	L2,S1
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	41. Enhance the students' knowledge of the principles of vapor compression refrigeration systems and its analysis. 42. Provide the students the basic design of all components for vapor refrigeration system 43. Studying types of refrigeration units and cryogenic refrigeration.
Module Learning Outcomes	Upon completion of the course, students should be able to: 15. To understand the principles of work of refrigeration systems, and main advantages, disadvantages and application of each them. 16. To investigate the general design of condenser, evaporator, expansion device and cooling tower 17. To understand the basic calculations of the all type of refrigeration systems.
Indicative Contents	Indicative content includes the following: Condensers and Evaporators: Condensers and evaporators as heat exchangers, overall heat transfer coefficients, heat transfer and pressure drop for the fluid flow in heat exchanger tubes and shell. Extended surfaces, Heat transfer and pressure drop for air side. Required condensing capacity, condensing coefficient, fouling factor, de-super heating, condenser design, Wilson plots, air and non-condensable gases. Evaporators, Boiling in the shell, boiling inside tube, evaporators performance, pressure drop in tubes, frost. [10 hrs] Expansion devices: Purpose and types of expansion devices, capillary tube, selection of capillary tube ,analytical computation of pressure drop in capillary tube, increment length, chocked flow graphical method of capillary tube selection ,Constant pressure expansion valve, controlling of super-heating in thermostatic expansion valve [3 hrs] Vapor compression refrigeration system Analysis: balance point and system simulation, reciprocating compressors, condenser performance, condensing unit system mathematical and graphical analysis, evaporator performance, performance of complete system graphical and mathematical analysis, some performance trends, the expansion devices, sensitivity analysis. [5 hrs] Cooling towers and evaporative condensers: Heat rejected to atmosphere, cooling towers, analysis of counter flow cooling tower, stepwise integration, acceptance test, predicting outlet conditions from tower, air conditions through tower, evaporative condensers, when using a cooling tower and evaporative condensers. [4 hrs]

	Absorption refrigeration system: relation between vapour 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, absorption cycle with heat exchanger, crystallization, capacity control, aqua-ammonia system . [4 hrs] Adsorption system : the relation between adsorption and absorption, absorption and vapour compression cycle, the analysis of adsorption system, mathematical analysis of the adsorption system . Steam jet refrigeration: system components, analysis of steam jet refrigeration system, approximation analysis, equilibrium concentration. [5 hrs] Air refrigeration system : the working principle of the cycle, design considerations, atmosphere temperature, humidity and pressure, load calculation, refrigeration, heating, temperature control, ventilation, pressure control of zone, types of air system. [5 hrs] Thermoelectric refrigeration: working principle, types of thermoelectric refrigeration systems, electro-acoustic refrigeration, working principle, types. [5 hrs] Cryogenic and liquefaction of gases: Cryogenic, Joule-Thomson effect, air liquefaction by Hopson system (Joule-Thomson expansion). Temperature entropy diagram for air, calculation of work required for gas compression , Claude system, cascade system, general consideration for gas liquefaction, Hydrogen , Pre-Cooling system for air liquefaction, Helium [4 hrs] Vortex tube: Types and working principle. Heat Pipe: Types and working principle. [3 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, Written exam, Quizzes, Tutorial, Seminars, Reports.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	158	**Structured SWL (h/w)**	11
Unstructured SWL (h/sem)	142	**Unstructured SWL (h/w)**	10
Total SWL (h/sem)	300		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20% (20)	3,7,9,13	LO #1-13
	Assignments	1	10% (10)	7	LO # 5,12
	Seminar	2	10% (10)	4,11	LO # 10,12
Summative assessment	**Midterm Exam**	2 hr	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 محتوى كل اسبوع يجب ان يغطي الوقت المحدد

	Material Covered
Week 1	Condensers and Evaporators: Condensers and evaporators as heat exchangers, overall heat transfer coefficients, heat transfer and pressure drop for the fluid flow in heat exchanger tubes and shell.
Week 2	Extended surfaces, Heat transfer and pressure drop for air side. Required condensing capacity, condensing coefficient, fouling factor, de-super heating, condenser design, Wilson plots, air and non-condensable gases

Week 3	Evaporators, Boiling in the shell, boiling inside tube, evaporators performance, pressure drop in tubes, frost.
Week 4	Expansion devices: Purpose and types of expansion devices, capillary tube, selection of capillary tube ,analytical computation of pressure drop in capillary tube, increment length, chocked flow graphical method of capillary tube selection ,Constant pressure expansion valve, controlling of super-heating in thermostatic expansion valve
Week 5	Vapor compression refrigeration system Analysis: balance point and system simulation, reciprocating compressors, condenser performance, condensing unit system mathematical and graphical analysis, evaporator performance, performance of complete system graphical and mathematical analysis, some performance trends, the expansion devices, sensitivity analysis.
Week 6	Cooling towers and evaporative condensers: Heat rejected to atmosphere, cooling towers, analysis of counter flow cooling tower, stepwise integration, acceptance test, predicting outlet conditions from tower, air conditions through tower, evaporative condensers, when using a cooling tower and evaporative condensers.
Week 7	Absorption refrigeration system: relation between vapour 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, absorption cycle with heat exchanger, crystallization, capacity control, aqua-ammonia system .
Week 8	Adsorption system : the relation between adsorption and absorption, absorption and vapour compression cycle, the analysis of adsorption system, mathematical analysis of the adsorption system .
Week 9	Steam jet refrigeration: system components, analysis of steam jet refrigeration system, approximation analysis, equilibrium concentration.
Week 10	Air refrigeration system : the working principle of the cycle, design considerations, atmosphere temperature, humidity and pressure, load calculation, refrigeration, heating, temperature control, ventilation, pressure control of zone, types of air system.

Week 11	Thermoelectric refrigeration: working principle, types of thermoelectric refrigeration systems, electro-acoustic refrigeration, working principle, types.
Week 12	Cryogenic and liquefaction of gases: Cryogenic, Joule-Thomson effect, air liquefaction by Hopson system (Joule-Thomson expansion)
Week 13	Temperature entropy diagram for air, calculation of work required for gas compression , Claude system, cascade system, general consideration for gas liquefaction, Hydrogen , Pre-Cooling system for air liquefaction, Helium
Week 14	Vortex tube: Types and working principle.
Week 15	Heat Pipe: Types and working principle.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-15	Project

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	➢ Refrigeration and air condition, second edition , W. F. Stocker and J. W. Jones ➢ REFRIGERATION AND AIR CONDITIONING --- Ramesh Chandra Arora ➢ A textbook of refrigeration and air condition, R. S. Khurmi and J. K. Gupta	yes

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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Renewable Energy**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MPAC407**				
ECTS Credits	**10**				
SWL (hr/sem)	**300**				
Module Level	4		**Semester of Delivery**	2	
Administering Department	Mechanical Power Eng. Dep.		**College**	TCB	

Module Leader	Dr. Wisam Abd Mohammed Mahmood	**e-mail**	wam@mtu.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Dr. Ahmed Qasim Ahmed	**e-mail**	aqaa1@mtu.edu.iq
Scientific Committee Approval Date	20 / 6/2023	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC203	**Semester**	2
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Provide the students the basic knowledge of all sources of renewable energies. 2. Provide the students with the fundamentals of the different power generation systems working based on renewable energies. 3. Provide the students the experimental training about the different renewable energy systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To understand the sources of renewable energies and the main advantages and disadvantages of each of them. 2. To understand the effects of renewable energy on the environment. 3. To understand the principles of work of renewable energy systems.

	4. To investigate the general design of renewable energy systems. 5. To understand the basic calculations of renewable energy sources and systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part 1 – Solar energy</u> The principles of solar energy with the solar systems of solar water heating, solar air heating, solar thermal power plants, solar water desalination, and solar dryer. [30 hrs] <u>Part 2 - Photovoltaic</u> Principles of solar cells and photovoltaic modules. Effects of solar radiation and ambient temperature on the photovoltaic systems. Types of photovoltaic systems with different applications. Power outputs of the photovoltaic systems. [30 hrs] <u>Part 3 – Wind energy</u> Wind energy and wind turbines. Classifications and types of wind turbines. Components of wind turbines. Types of wind farms and performance of the wind turbines. [10 hrs] <u>Part 4- Water energy</u> Hydro energy with hydro turbines. Types of hydero power plant. Occen energy with different power plants. Tidel energy and tidel power plants. [10 hrs] <u>Part 5- Geothermal energy</u> Types and applications of geothermal energy, geothermal heating systems, and geothermal power plants. [10 hrs] <u>Part 6 – Bioenergy</u> Types and applications of bioenergy, biomass biogas and biofuel. [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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	158	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	11
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	142	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	10
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	300		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	General introduction to Energy. Introduction to renewable energy. Renewable energy resources and application. Renewable energy and environmental problems (Acid rain, Ozone layer depletion, Global climate change, Nuclear hazards).
Week 2	The sun. Reckoning of time (the equation of time and longitude correction). Solar angles (declination, hour angle, solar altitude angle, solar azimuth angle, sunrise and sunset times and day

	length, incidence angle). Calculations of solar radiation (Extraterrestrial solar radiation, Atmospheric attenuation. Terrestrial irradiation. Total radiation on the surface).
Week 3	Solar energy collectors. Stationary collectors (Flat plate collectors, Compound parabolic collectors, Evacuated tube collectors). Sun-tracking concentrating collectors (Parabolic trough collectors, Fresnel collectors, Parabolic dish reflectors, Heliostat field collectors).
Week 4	Solar water heating systems. Passive systems (Thermo siphon systems, Integrated collector storage). Active systems (Direct circulation systems, Indirect water heating systems, Pool heating systems).
Week 5	Heat storage systems (Air system thermal storage, Liquid system thermal storage, and thermal analysis of storage systems). Module and array design. Differential temperature controller, Placement of sensors.
Week 6	Heat storage systems (Air system thermal storage, Liquid system thermal storage, and thermal analysis of storage systems). Module and array design. Differential temperature controller, Placement of sensors.
Week 7	Industrial process heat (Solar industrial air and water systems, Solar steam generation systems). Chemistry applications (Reforming of fuels, Fuel cells, Materials processing, Solar detoxification). Solar dryers (Active solar energy dryers, Passive solar energy dryers. Greenhouses and greenhouse materials.
Week 8	Solar desalination systems. Desalination processes. Direct collection systems. Classification of solar water desalination systems. Performance of solar stills. Solar cells, Structure of photovoltaic System, Design of photovoltaic system. Hybrid photovoltaic /thermal systems and applications.
Week 9	Solar Thermal Power Systems (Parabolic trough collector systems, Power tower systems, Dish systems, Solar ponds).
Week 10	Introduction to wind energy. Power available in the energy. Wind turbine power and torque. Classification of Wind turbine (Horizontal axis Wind turbine, Vertical axis Wind turbine). Aerodynamics of Wind turbine (Airfoil, Aerodynamic theories). Characteristics of wind rotors (Rotor design, Rotor performance). Analysis of wind data
Week 11	Wind energy conversion systems. Wind electric generators (Tower, Rotor, Gearbox, Power regulation, Safety brakes, Generator). Wind farms, Offshore wind farms. Wind pumps. Wind water heater. Performance of wind energy conversion system. Power curve of wind turbine. Capacity factor.
Week 12	Introduction to water cycle. Water turbines. Hydropower plants (Run - of - River power plants, Storage power plants, Pumped - storage power plants).
Week 13	Introduction to bioenergy (biomass, biogas, biofuel). Biomass heating (Wood as a fuel, Fireplaces and closed wood burning stoves, Wood pellet heating). Biomass heat and power plants.
Week 14	Introduction to geothermal energy. Geothermal plants (Geothermal heat plants, Geothermal power plants), Geothermal heat pumps.

Week 15	Tidal energy. Tidal power plants. Wave energy. Wave power plants.
Week 16	**The preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Measurement devices and safety tools
Week 2	Solar angles
Week 3	Sun path and shading
Week 4	Solar simulators
Week 5	solar water heating systems
Week 6	solar air heating system
Week 7	Solar dryer
Week 8	Solar water desalination
Week 9	Solar concentrators
Week 10	Performance of photovoltaic modules
Week 11	Performance of photovoltaic systems
Week 12	Performance of photovoltaic thermal system
Week 13	Wind turbines
Week 14	Hydro energy
Week 15	Geothermal systems

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Solar energy engineering processes and systems, Second edition. Soteris A. Kalogirou. Wind energy: fundamentals, resource analysis and economics. Sathyajith Mathew. Introduction to geothermal power. Val Pierce. Introduction to renewable energy. Vaughn Nelson.	Yes
Recommended Texts	Solar Energy Thermal Processes, fourth edition. Duffie, John A	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 is 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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Professional Ethics**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC408				
ECTS Credits	**2**				
SWL (hr/sem)	**60**				
Module Level	4		**Semester of Delivery**	2	
Administering Department	App. Mech.		**College**	TCB	
Module Leader	Rahman Ali Hussein		**e-mail**	alshekhrahman@gmail.com	
Module Leader's Acad. Title	Ass. Prof.		**Module Leader's Qualification**	M.Sc.	
Module Tutor	None		**e-mail**	E-mail	
Peer Reviewer Name	Prof. Dr. Hamed A. Husein		**e-mail**	Mechanical10power@gmail.com	
Scientific Committee Approval Date	20 / 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 Aims	1. وصف للاخلاق 2. وصف للعمل والمهنة 3. وصف لاخلاقيات المهنة . 4. وصف لقيم واخلاقيات المهنة 5. وصف لانماط السلوك الغير اخلاقي فى المهنة 6. وصف لوسائل واساليب ترسيخ قيم اخلاقيات المهنة 7. وصف لاخلاقيات ممارسة المهن الهندسية
Module Learning Outcomes	بعد اكمتا هذا الفصل سيكون الطالب قادرا على: 1. فهم صفة الاخلاق. 2. التفريق بين العمل والمهنة. 3. فهم اخلاقيات المهنة 4. التعرف على انماط السلوك الغير اخلاقي في المهنة . 5. التعرف على وسائل واساليب ترسيخ قيم اخلاقيات المهنة . 6. ممارسة اخلافيات المهن الهندسية
Indicative Contents	المحتوى الارشادي يتضمن مايلي:. مفهوم الاخلاق ومنشأها ، القواعد العامة للاخلاقيات، مصادر الاخلاق، القيم الاخلاقية، اهمية الاخلاق للفرد والمجتمع. [6 hrs] العمل والمهنة: العمل واهميته، سلوكيات العمل، مفهوم المهنة، تعريف المهنة، الفرق بين مفهوم العمل والمهنة والحرفة، المعايير التي يجب ان تقوم عليها المهنة [6 hrs] اخلاقيات المهنة: ماهي اخلاقيات المهنة ، المردودات الايجابية للالتزام باخلاقيات المهنة، خصائص اخلاقيات (العمل، صفات اخلاقيات المهنة، خطوات المستوى المقبول من اخلاثيات المهنة [6 hrs]

	القيم واخلاقيات المهنة: الامانة الصدق التصح العدل حسن التعامل، اتقان العمل [6 hrs] انماط السلوك الغير اخلاقي في المهنة: الفساد الاداري تعريفه وانواعه، الرشوة تعريقها وانواعها واسبابها، الغش مفهةمه وطبيعته ومظاهره في اداء الوظيفة. [10 hrs] وسائل واساليب ترسيخ قيم اخلافيات المهنة [5 hrs] اخلاقيات ممارسة المهن الندسية [5 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	30	**Structured SWL (h/w)**	2
Unstructured SWL (h/sem)	30	**Unstructured SWL (h/w)**	2
Total SWL (h/sem)	60		

Module Evaluation

تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	3,5,6,10	LO #1,2,…..10
	Assignments	2	10% (10)	7, 8	LO # 8
	Seminar	1	10% (10)	11	LO # 11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	12	LO # 1-12
	Final Exam	3hr	60% (60)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري محتوى كل اسبوع يجب ان يغطي الوقت المحدد	
	Material Covered
Week 1	الاخلاق: مفهوم الاخلاق ومنشأها، القواعد العامة للاخلاقيات
Week 2	الاخلاق: مصادر الاخلاقيات، القيم الاخلاقية، اهمية الاخلاق للفرد والمجتمع.
Week 3	العمل والمهنة: العمل واهميته، سلوكيات العمل ، مفهوم وتعريف المهنة، المعايير التي تقوم عليها المهنة، الفرق بينها وبين العمل والحرفة
Week 4	اخلاقيات المهنة: تعريفها ومردوداتها الايجابية للالتزام بها،خصائص اخلاقيات العمل والمهنة، خطوات المستوى المقبول منها.
Week 5	القيم وإخلاقيات المهنة: الامانة ، الصدق، النصح، العدل، حسن التعامل واتقان العمل.
Week 6	القيم وإخلاقيات المهنة: الامانة ، الصدق، النصح، العدل، حسن التعامل واتقان العمل.
Week 7	انماط السلوك الغير اخلاقي في المهنة: الفساد الاداري تعريفه وانواعه

Week 8	انماط السلوك الغير اخلاقي في المهنة: الرشوة تعريفها وانواعها واسبابها والدوافع، والغش مفهومه وطبيعته ومظاهره في اداء الوظيفة
Week 9	وسائل واساليب ترسيخ قيم اخلاقيات المهنة:مستويات بناء ووسائل ترسيخ اخلاقيات المهنة
Week 10	الامور التي يجب مراعاتها في صياغة الميثاق الاخلاقي للمهنة، كيفية تعزيز السلوك الاخلاقي في العمل .
Week 11	اخلاقيات ممارسة المهن الهندسية: اهمية التقني الفني في المجتمع
Week 12	الاخلاق الفنية والتكنلوجية
Week 13	شروط التقني المحترفوسماته.
Week 14	بنود لائحة مزاولة المهنة لنقابة العمال
Week 15	النظرة الاسلامية لاخلاقيات المهنة مقارنة بالنظرة الغربية والامريكية.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Recommended Texts	➢ كتاب اخلاقيات المهنة : مقرر منهجي الناشر الجامعة التقنية الوسطى	نعم

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	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	English 4			**Module Delivery**	
Module Type	S			☒ **Theory** ☐ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	MPAC409				
ECTS Credits	2				
SWL (hr/sem)	60				
Module Level	4		**Semester of Delivery**	**2**	
Administering Department	Mechanical Power Eng. Dep.		**College**	**TCB**	
Module Leader	**Dr. Nabil Taih**		**e-mail**		
Module Leader's Acad. Title	**Lecturer. Assist**		**Module Leader's Qualification**	**MSc**	
Module Tutor	**Asst. Lecturer. Labed Kadhim Jawad**		**e-mail**	**Labed1970@mtu.edu.iq**	
Peer Reviewer Name	Asst. Prof. Dr Ammar A. Hussain		**e-mail**	Drammar@mtu.edu.iq	

Scientific Committee Approval Date	20 / 6/2023	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC308	**Semester**	L3, S2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The goal is to study English language and gain knowledge of it as benefit engineers in general, and to develop speaking skills and understand its basic rules taking the way to the acquisition of the ability to use technical key words in their work and the capability of communicating with other engineers correctly
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Developing speaking skills and understanding its basic rules to take the way to the acquisition of the ability to use technical keywords in their work and the capability of communicating with other engineers correctly .
Indicative Contents المحتويات الإرشادية	Through the prepared syllabus, the student acquires the ability to understand grammar English language through weekly lectures and classes in a gradual and sequential manner for a period of four years, starting from the first stage, such as interrogative, negative, formation of sentences, parts of speech, and others.

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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٣٠	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٣٠	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	٦٠		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	20% (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	Grammar revision, vocabulary and comprehension

Week 2	Cause and effect clauses, State verbs, vocabulary and comprehension
Week 3	Academic writing (2), writing technical report
Week 4	Types of sentences in English (1), vocabulary and comprehension
Week 5	Types of sentences in English (2), vocabulary and comprehension
Week 6	Result clauses, vocabulary and comprehension
Week 7	conjunctions, vocabulary and comprehension
Week 8	Punctuation, vocabulary and comprehension
Week 9	Writing CV, passive voice, vocabulary and comprehension
Week 10	Technical writing, technical sentences, vocabulary and comprehension
Week 11	Writing essays, vocabulary and comprehension
Week 12	Writing summary and abstract
Week 13	Paraphrasing
Week 14	**General Revision**
Week 15	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Headway plus for post intermediate	Yes
Recommended Texts	Any Grammar and comprehension for technical learning and academic writing texts.	No
Websites		

Grading Scheme

مخطط الدرجات

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

(50 - 100)	**B -** Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**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 DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**Control and Measurements**	**Module Delivery**	
Module Type	**C**	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MPAC410**		
ECTS Credits	**6**		
SWL (hr/sem)	**180**		
Module Level	4	**Semester of Delivery**	2
Administering Department	Mechanical Power Eng. Dep.	**College**	TCB
Module Leader	Mouayed Hassan AL-Toki	**e-mail**	mouayedaltoki@mtu.iq.edu
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail

Scientific Committee Approval Date	20/06/2023	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC304	**Semester**	L3,S2
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**Course Objectives**: as an example 23. Students become familiar with various types of sensors which have been used in HVAC control systems. 24. Knowing the aims of the control systems and their importance in the HVAC. 25. Providing enough details to understand each element in the HVAC control system. 26. Providing a more in-depth understanding of troubleshooting HVAC control systems. 27. The student will be able to follow and read wiring diagrams.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Outcomes: as an example** 1. Applying fundamentals of control systems. 2. Reading, drawing, and interpreting HVAC control system diagrams. 3. Select the HVAC control systems. 4. Controlling required indoor air quality and thermal comfort conditions. 5. Applying knowledge of how energy savings can be achieved by HVAC control systems. 6. Identifying problems with the HVAC control systems.

Indicative Contents المحتويات الإرشادية	Control engineering is applied in many different fields and at many different levels. The components of all control systems are diverse in nature and may include electrical, electronic, mechanical, thermal, and fluidic devices. The aims behind using control systems in HVAC are: 1. Maintain thermal comfort conditions. 2. Maintain optimum indoor air quality. 3. Reduce energy use. 4. Safe plant operation. 5. To reduce manpower costs. 6. Identify maintenance problems. 7. Efficient plant operation to match the load. 8. Monitoring system performance.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exams, Case studies, Quizzes, report presentations, Practical testing

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	116	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	64	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	180		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fundamentals of control systems and measurements include principles, elements, purposes for HVAC systems, open and close loop control, energy sources, accuracy, the standard of measurements, and description of measurement devices.
Week 2	Controlled variables, sensors, time response, measurements, feedback, and Control actions include two position controllers, proportional controllers, proportional plus integral controllers, and proportional plus integral plus derivative controllers. Control devices, valves, dampers, relays thermostats, humidistats, and pressure transducers.
Week 3	Pneumatic control systems and their sensors. Errors in Measurements: Types of errors and Statistical Analysis.
Week 4	Principles of electrical control systems include their elements, electrical symbols and wiring drawings, control, and power circuit diagrams.
Week 5	Electrical control of air handling units, variable speed controller, and multispeed staters.
Week 6	Fundamentals of electronic control systems include their elements, sensors, transducers, amplifiers, and Wheatstone bridge.
Week 7	Digital Direct Control (DDC), components and operating cycle, microprocessor, pneumatic to electronic control system,
Week 8	Input and output signals – digital and analog, system network controller.
Week 9	Complete control systems, single-zone systems, single-zone AHU; minimum outside air, single-zone AHU; economy cycle outside air, multizone air handling systems
Week 10	Single-zone humidity control, static pressure control of outside air, preheat with outside air thermostat

Week 11	Enthalpy control, outside air; enthalpy economy cycle, economizer control
Week 12	Energy savings in HVAC systems, HVAC energy efficiency ratio (EER), energy-efficient heating and cooling systems, seasonal energy efficiency ratio (SEER), and energy management system (EMS).
Week 13	PLCs, types of PLCs, study hardware and software used in PLC.
Week 14	Implementation of logic gates, implementation of On-Delay Timer,
Week 15	Troubleshooting HVAC control systems.
Week 16	**Preparing for the final exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Workplace safety rules, knowing about the instruments, tools, and supplies.
Week 2	Measurements of controlled variables (temperature, humidity, pressure, etc.).
Week 3	Domestic and commercial refrigerator and freezer controls.
Week 4	Ice maker controls and water cooler controls, vendor machine controls.
Week 5	Defrost control, defrost timers, wiring diagram of the evaporator defrosting, hot gas defrosting, and hot gas bypass.
Week 6	Compressor protection devices, oil pressure controls, low- and high-pressure controls, and overload controls.
Week 7	Air conditioning power and control circuits and reversing valves.
Week 8	Residential central air conditioning control systems,
Week 9	Reversing the rotating direction in 3-phase AC. Motor (power and control circuit). Reversing the rotating direction in 3-phase AC. Motor by using PLC.
Week 10	Star-delta starter (power and control circuit). Star-delta starter (power and control circuit) by using PLC.
Week 11	Chilled controls.
Week 12	Chilled controls by using PLC.
Week 13	Control systems of air handling units (AHU).
Week 14	Control systems of air handling units (AHU) by using PLC.
Week 15	Troubleshooting.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Haines, Roger W., and Douglas C. *Control heating, ventilating, and air conditioning systems*. Springer Science & Business Media, 2006.	Yes
Recommended Texts	Montgomery, Ross, and Robert McDowall. *Fundamentals of HVAC control systems*. Elsevier, 2008	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
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