Ministry of Higher Education and Scientific Research

Scientific Supervision and Evaluation Authority

Quality Assurance and Academic Accreditation Department

Academic Program Description
University of Hillah
College of Engineering Technologies
Department of Refrigeration and Air Conditioning Engineering

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University Name: University of Hillah

College / Institute: College of Engineering Technologies

Academic Department: Refrigeration and Air Conditioning Engineering

Academic or Professional Program Name: Bachelor of Engineering in Refrigeration **and** Air Conditioning Technology

Final Degree Awarded: Bachelor of Engineering in Refrigeration and Air Conditioning Technology

Study System: Semester-Based – Bologna Process

Program Description Prepared On: 8/9/2025

File Completed On: 9/9/2025

Reviewed by Quality Assurance and University Performance Division

Name of Quality Assurance and University Performance Officer: Ali Hussein Ghalta

Date: 9/9/2025

:Signature 

Approved by the Dean

Prof Dr Haroun A K Shahad

1. Vision

The academic body of the Department of Refrigeration and Air Conditioning Engineering at quality technical education that makes the -of Hilla aims to provide high the University expected outcomes of the educational process more efficient and distinguished by developing in a technical skills, critical thinking abilities, social and personal skills, and work values constantly changing environment in mechanical engineering and alternating current engineering. The collaboration and teamwork among the department's academic, technical, ove their and administrative staff enhance students' understanding of the program and impr .tech global environment-practical skills in a highly competitive, high

2. Program Mission

To prepare distinguished technical engineering cadres in the fields of refrigeration and air conditioning through advanced scientific curricula, modern applied laboratories, and practical research that serves the labor market and keeps pace with the latest developments, while enhancing local, regional, and international partnerships to achieve sustainable development.

2. Program Objectives

1. technical engineers with advanced knowledge and practical skills in Prepare diagnosing faults, operating, and maintaining various types of refrigeration and air .conditioning systems
2. ion, Enable graduates to keep pace with rapid technological developments in refrigerat air conditioning, and thermal environment control, with the ability to employ modern .technologies to enhance performance efficiency
3. Qualify students to design, implement, and manage refrigeration and air conditioning ercial, industrial, and medical buildings in systems used in residential, comm .accordance with international standards
4. Develop students' abilities to sustain, maintain, and calibrate refrigeration and air conditioning systems, ensuring their continuous operation at the highest levels of .fficiency and reliabilitye
5. Enhance graduates' skills in researching innovative alternatives and solutions for .technical components, contributing to cost reduction and performance improvement
6. nd periodic Prepare personnel capable of planning and executing preventive a .maintenance using modern maintenance management methods
7. Raise students' awareness of the importance of occupational safety, energy efficiency, and environmental protection when designing and operating refrigeration .and air conditioning systems

3. Program Accreditation

The program does not have any accreditation

4. External Influences

Monitoring the latest developments in refrigeration and air conditioning, aligning curricula to meet labor market needs, and utilizing international educational resources.

5. Program Structure

Program Structure	Number of Courses	Credit Hours	Percentage%	Notes
Institutional				Core

Requirements				
College Requirements				Core
Department Requirements				Core
Summer Training	Second& Third			
Others				

Academic Program Objectives:

1. Prepare graduates to work as technical engineers in the field of refrigeration and air conditioning.
2. Provide graduates with the scientific and technical knowledge necessary to enter the workforce.
3. Equip graduates with sufficient knowledge to continue in academia and pursue higher degrees.
4. Provide graduates with the practical training required to work in the maintenance of all types of refrigeration and air conditioning systems through summer training courses during their studies.
5. Prepare graduates to work as installation and operation engineers for various refrigeration and air conditioning systems.
6. Qualify graduates to practice their profession with integrity and transparency, applying professional ethics through courses on related laws, such as labor law and the Engineers' Syndicate law, among others.

A. Cognitive Objectives

- Ability to analyze and break down the components of refrigeration and air conditioning systems.
- Ability to diagnose faults and operational problems in various refrigeration and air conditioning systems (residential, industrial, and commercial).
- Ability to find suitable technical and engineering solutions to faults and improve system efficiency.
- Ability to develop and implement preventive and corrective maintenance plans for refrigeration and air conditioning systems to ensure continuous operation and minimize failures.
- Ability to design and study the technical conditions and standards for installing and operating refrigeration and air conditioning systems in compliance with safety, quality, and energy efficiency standards.

A. Program Qualification Objectives:

- Prepare graduates capable of operating, maintaining, and diagnosing faults in various refrigeration and air conditioning systems.

- Enable graduates to design and implement refrigeration and air conditioning systems in accordance with environmental requirements, safety standards, and energy efficiency.
- Prepare qualified personnel to work in hospitals, factories, residential and commercial buildings through the management and operation of refrigeration and air conditioning systems.
- Equip graduates with the ability to use modern instruments and measurement and control tools specific to refrigeration and air conditioning systems.
- Qualify students to use modern engineering and technical software for thermal performance analysis and system design.
- Develop communication skills and the ability to work within a team on field projects or technical workshops.
- Prepare graduates to keep up with technological developments in refrigeration, air conditioning, and energy-efficient smart systems.

Teaching and Learning Methods:
Lectures, practical laboratories, scientific seminars, training courses, and specialized exhibitions in refrigeration and air conditioning systems.

Assessment Methods:
Daily quizzes, semester exams, attendance, laboratory reports, and annual evaluations.

B. Affective and Value Objectives:

1. Design, maintain, and supervise the installation of refrigeration and air conditioning systems.
2. Provide scientific and practical consultancy.

C. Personal Development Planning:

- Organize field visits to building projects, factories, central cooling stations, and specialized refrigeration and air conditioning laboratories.
- Participate in specialized exhibitions and conferences in refrigeration, air conditioning, and sustainable energy.
- Conduct training courses and applied workshops in collaboration with global and local manufacturers of refrigeration and air conditioning systems.
- Encourage students to engage in summer training within institutions and companies to enhance practical skills and link theoretical knowledge with application.

D. Admission Criteria:

- Graduates of the General Secondary Education – Science branch.
- Students graduating from technical and vocational institutes.
- Students graduating from industrial vocational preparatory schools.

First stage

UGI

Module Information
معلومات المادة الدراسية

Module Title	**Mathematics**	**Module Delivery**	
Module Type	**S**		☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**
Module Code	**HUC-ACR-100**		
ECTS Credits	**8**		
SWL (hr/sem)	**200**		

Module Level	1	**Semester of Delivery**	1
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**
Module Leader	سامي كاظم	**e-mail**	E-mail
Module Leader's Acad. Title	Assist Professor	**Module Leader's Qualification**	M.Sc.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	02/10/2023	**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	To apply the knowledge of mathematics in science and engineering

Outcomes	applications.
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	113	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	20% (20)	4,8,12	LO # All
	Assignments	2	10% (10)	3, 11	LO # All
	Homework	4	10%(10)	3,6,8,11	LO # All
	Report	1	10% (10)	13	LO # All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # All
	Final Exam	3hr	50% (50)	15	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	Mid. Term examination, 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 $ax^2 + bx + c$
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, Simpson rule for area, Trapezoidal rule for area, applications
Week 15	**Final Examination**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Advanced *Engineering Mathematics*	No
Recommended Texts	Calculus	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.

رئيس القسم

جامعة الحلة كلية التقنيات الصناعية UNIVERSITY OF HILLA التدريب والتعليم

استاذ المادة

Module Information
معلومات المادة الدراسية

Module Title	**Engineering Drawing**	**Module Delivery**	
Module Type	**C**	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-101**		
ECTS Credits	**6**		
SWL (hr/sem)	**150**		

Module Level	1	**Semester of Delivery**	1
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**
Module Leader	د هارون عبد الكاظم شهد	**e-mail**	hakshahad@yahoo.com haroon_abd@hilla-unc.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	ست دموع حيدر	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	02/10/2023	**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. 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-Able to use drawing tools 2-Enhancing student imagination skills to sketch and/or draw engineering objects 3-Use dimension system 4-Able to draw projections 5-Able to construct isometric drawing 6-able to use AUTOCAD software
Indicative Contents المحتويات الإرشادية	Part A: 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. Part B: 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 encourage students to use the engineering drawing tools and drawing board correctly and to improve their imagination skills to produce proper design sketches for mechanical and machine elements. This can be achieved by intense class and homework exercises.

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	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5

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

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	4,8	LO #All
	Assignments	10	10% (10)	continuous	LO # All
	Homework	10	10%(10)	continuous	LO # All
	Class work	10	10%(10)	continuous	LO # All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Define the Engineering Drawing, tools, types of drawing sheets, and types of lines
Week 2	Learning how to write letters and numbers
Week 3,4,5	Geometric constructions
Week 6	Learning how to write drawing dimensions
Week 7	Mid. term examination, learning drawing scale
Week 8,9,10	Projection
Week 11	Sectioning
Week 12,13,14	AUTOCAD
Week 15	Final Examination

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the**

		Library?
Required Texts	Engineering Drawing for Beginners	No
Recommended Texts		
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.

رئيس القسم

جامعة الحلة كلية التقنيات الهندسية
UNIVERSITY OF HILLA
قسم هندسة تقنيات التبريد والتكييف

استاذ المادة

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Workshops**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-102**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	أيناس طالب		**e-mail**	E-mail	
Module Leader's Acad. Title	Assist Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/10/2023		**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 objectives of this module is to teach the student how to proper use of different workshops tools and to operate and work on workshops machines the students. The student is asked to make simple mechanical elements using the available tools in the workshops.
Module Learning Outcomes	At the end of the module the student will be able to work successfully in workshops.

مخرجات التعلم للمادة الدراسية	
Indicative Contents المحتويات الإرشادية	1. Occupational safety and security needs to work in workshops. 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-Milling machine: its operation procedure, operating tools and processes. 12. 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. Assemble exercises using various cutting and welding equipment.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Introductory lecture for each workshop and extensive practical exercises to produce simple mechanical elements.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	112	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**				
	Assignments				
	Projects / Lab.				
	Report				
Summative assessment	**Mid. term Exam**				
	Final Exam				
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي	
	Material Covered
Week 1	Safety precautions and security needs. 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	Mid. term examination, 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	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.
Week 15	Final Examination

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
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رئيس القسم

جامعة الحلة كلية التقنيات الهندسية UNIVERSITY OF HILLA

استاذ المادة

Module Information
معلومات المادة الدراسية

Module Title	**Engineering Materials**	**Module Delivery**	
Module Type	**C**	☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-103**		
ECTS Credits	**6**		
SWL (hr/sem)	**150**		

Module Level	1	**Semester of Delivery**	1
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**
Module Leader	ايناس طالب	**e-mail**	E-mail
Module Leader's Acad. Title	Assist Lecturer	**Module Leader's Qualification**	M.Sc.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	02/10/2023	**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	1. Knowledge of materials mechanical properties. 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	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) 2- Defects ,point defects ,dislocations ,linear defects ,planar defects (3hr) 3-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) 4-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) 5- Corrosion and corrosion prevention(3hr) 6-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	59	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	91	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

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.	No
Recommended Texts	2- Jones, D.A., "Principal and Protection of Corrosion", PrenticeHall	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.

رئيس القسم

جامعة الحلة كلية التقنيات الهندسية UNIVERSITY OF HILLA

استاذ المادة

Module Information معلومات المادة الدراسية					
Module Title	**English Language 1**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-104**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	سندس عوض		**e-mail**	E-mail	
Module Leader's Acad. Title	Assist. Lect.		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/10/2023		**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	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

Outcomes مخرجات التعلم للمادة الدراسية	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	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5,10	LO # All
	Assignments	2	10% (10)	2,12	LO # All
	Projects	1	10%(10)	14	LO # All
	Report	1	10% (10)	13	LO # All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # All
	Final Exam	3hr	50% (50)	15	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	Mid. Term examination, 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 examination

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Headway plus for beginners	No
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-ma award/?gad=1&gclid=EAIaIQobChMI_Nqu2tqA_wIVZ4VoCR2O0woLEAAYASAAE D_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 Information
معلومات المادة الدراسية

Module Title	**Electrical Engineering**		**Module Delivery**	
Module Type	**C**		☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-105**			
ECTS Credits	**7**			
SWL (hr/sem)	**175**			
Module Level	1	**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**	
Module Leader	دموع حيدر	**e-mail**	dumue_haider@hillla-unc.edu.iq	
Module Leader's Acad. Title	Assist. Lect.	**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)	**e-mail**	E-mail	
Peer Reviewer Name	Name	**e-mail**	E-mail	
Scientific Committee Approval Date	02/10/2023	**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. 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 مخرجات التعلم للمادة الدراسية	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 المحتويات الإرشادية	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) الحمل الدراسي المنتظم للطالب خلال الفصل	115	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	3,5,9,12	LO #1-8
	Assignments	2	10% (10)	3, 11	LO # 1-8
	Lab.	10	10% (10)	continuous	LO # 1-8
	Homework	4	10%(10)	3,6,9,12	LO # 1-8
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-8
	Final Exam	3hr	50% (50)	15	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	Mid. term Examination, 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	Final Examination
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?
Required Texts	DC Electrical Circuit Analysis: A Practical Approach, 2020.	No
Recommended Texts		
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.

رئيس القسم

جامعة الحلة كلية التقنيات الكهربائية UNIVERSITY OF HILLA

استاذ المادة

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Mechanics**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-106**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	سجاد حسن ناصر		**e-mail**	Sajjad_hasan@hilla-unc.edu.iq	
Module Leader's Acad. Title	Assist. Lect.		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HACR100	**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	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 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	113	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Engineering Mechanics, Twelfth Edition, R. C. Hibbeler	No
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.

رئيس القسم

جامعة الحلة كلية التقنيات الهندسية UNIVERSITY OF HILLA قسم هندسة تقنيات التبريد والتكييف

استاذ المادة

Module Information معلومات المادة الدراسية					
Module Title	**Thermodynamics**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-107**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Haroun A K Shahad		**e-mail**	hakshahad@yahoo.com, haroon_abd@hilla-unc.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	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/10/2023		**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	Studying thermodynamic properties of pure substance and working fluid, the interaction between heat and work, the laws of thermodynamics and the entropy and entropy generation.
	1. Use thermodynamic terminology correctly.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	2. Explain fundamental thermodynamic properties. 3. Derive and discuss the first and second laws of thermodynamics. 4. Solve problems using the properties and relationships of thermodynamic fluids. 5 Students must have understanding of thermodynamic fundamentals before studying their application in applied thermodynamics. 6. The understanding of thermodynamic properties and processes will assist students in other related coursework.
Indicative Contents المحتويات الإرشادية	Introduction, properties of pure substance and working fluid, P-V and P-T diagrams, using steam tables, Heat and work, First law of thermodynamics, Second law of thermodynamics, entropty

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	143	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	4,6,8,12	LO # 1-6
	Assignments	2	10% (10)	3, 11	LO # 1-6
	Lab.	10	10% (20)	1-14	LO # 1-6
	Home work	4	10% (10)	3,6,9,12	LO # 1-6
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO 1-4
	Final Exam	3hr	50% (50)	15	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Thermodynamic terms and definitions, units and units conversion
Week 2	Thermodynamics Properties of Pure substance
Week 3	Working Fluid
Week 4	Work and Heat
Week 5	First Law of Thermodynamics
Week 6,7	Non-flow Processes
Week 8	Mid. Term Examination, Flow Processes
Week 9	Flow processes
Week 10	Second law of thermodynamics
Week 11	Corollaries of second law of thermodynamics
Week 12.13,14	Entropy and entropy change
Week 15	Final Examination

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Engineering Thermodynamics, Concepts and Applications Haroun A K Shahad , 2023	Yes
Recommended Texts	Cengel, Y.A., Boles, M.A. and Kanoğlu, M., 2011. *Thermodynamics: an engineering approach*. New York:	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 Information معلومات المادة الدراسية					
Module Title	**Human Rights and Democracy**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-108**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**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	Introducing students to the democratic system and its fundamentals. Introducing students to their rights and duties under a democratic political system. Introducing students to all their human rights and how to preserve, defend, and protect them. Introducing students to the democratic political system in Iraq and the Permanent Iraqi Constitution of 2023.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Knowledge and Comprehension: ١- Through classroom theoretical lectures. ٢- Assigning students to read a specific book. ٣- Assigning students a homework assignment to prepare a report on a specific topic. ٤- Oral exams
Indicative Contents المحتويات الإرشادية	The course consists of two parts. The first introduces human rights and the most important topics through which students learn about their rights. The second part includes an introduction to democracy, the nature of democratic systems, and how democratic governance is achieved, as well as an introduction to the democratic system in Iraq.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Written lectures - questions and answers - access to specific sources

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	٢
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-4
	Assignments	2	10% (10)	3, 11	LO # 1-4
	Homework	2	10%(10)	5,9	LO # 1-4
	Report	1	10% (10)	13	LO # 1-4
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	LO # 1-4
	Final Exam	2hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري	
	Material Covered
Week 1	uman rights. Definition. Objectives. Human Rights in Ancient Civilizations and Divine Laws
Week 2	Human Rights in Contemporary and Modern History: Recognition of Human Rights Since World War I and the League of Nations Regional Recognition of Human Rights: European Convention on Human Rights 1950, American Convention on Human Rights 1969, African Charter on Human Rights 1981, Arab Charter on Human Rights 1994
Week 3	NGOs and Human Rights (1) International Committee of the Red Cross, 2) Amnesty International, Human Rights Watch, National Human Rights Organizations, Human Rights in the Iraqi Constitution (Rights and Freedoms in the Constitution of the Republic of Iraq of 2005
Week 4	Human Rights and Public Freedoms in the Universal Declaration of Human Rights, Regional Charters and National Constitutions, Economic, Social, Environmental, Cultural, and Developmental Human Rights, and Civil and Political Human Rights
Week 5	Modern human rights (the right to development, the right to a clean environment, the right to solidarity, the right to religion). Guarantees for respect and protection of human rights at the national level. Guarantees in the constitution and laws. Guarantees in the principle of the rule of law. Guarantees in constitutional oversight. Guarantees in freedom of the press and public opinion. The role of non-governmental organizations in respecting and protecting human rights.
Week 6	Guarantees of respect for and protection of human rights at the international level; the role of the United Nations and its specialized agencies in providing guarantees. The role of regional organizations (the Arab League, the European Union, the African Union, the Organization of American States). The role of international, regional, non-governmental organizations and public opinion in respecting and protecting human rights. The general theory of freedoms, the origin of rights and freedoms, the position of Islamic law on declared rights and freedoms, and the use of the term "public freedoms."
Week 7	Midterm exam; The rule of law and guarantees of the rule of law; Regulation of public freedoms by public authorities
Week 8	Equality: the historical development of the concept of equality; the modern development of the concept of equality; gender equality; equality between individuals according to their beliefs and race.
Week 9	Democracy: Definition and Types
Week 10	Components and Obstacles to Democracy
Week 11	The Democratic System in the Iraqi Constitution of 2003 - Elections - Political Parties -
Week 12	, Fundamental Freedoms, Intellectual Freedoms, Economic and Social Freedoms, Concept of Freedoms and Classification of Public Freedoms
Week 13	Scientific and Technological Progress and Public Freedoms; The Future of Public Freedoms
Week 14	The general concept of awareness (defining environmental awareness, water awareness, and the need to study them); the concept of environmental awareness; means of achieving environmental awareness; dimensions of water awareness; challenges facing water security in Iraq; proposed measures to resolve the freshwater shortage crisis; definition of genocide; the United Nations Convention on the Prevention and Punishment of the Crime of Genocide; acts of genocide; genocide tribunals; crimes of genocide; crimes against humanity; crimes of the Ba'ath Socialist Party; rights of persons with disabilities.
Week 15	Final Exam

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 Information
معلومات المادة الدراسية

Module Title	**Arabic Language**	**Module Delivery**	
Module Type	**B**	☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-109**		
ECTS Credits	**2**		
SWL (hr/sem)	**50**		

Module Level	1	**Semester of Delivery**	2
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**
Module Leader	Name	**e-mail**	E-mail
Module Leader's Acad. Title	Professor	**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	02/10/2023	**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	١.-Deepen students' knowledge of the grammar and spelling rules they have previously learned, thus avoiding linguistic and spelling errors, and facilitating the writing of reports and other written work grammatically and linguistically correct. ٢.-Expand linguistic and literary awareness to include all students and the local community through various lectures, seminars, and training courses, and support for creative talents.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Knowledge, understanding, and application are taught through classroom lectures, encouraging students to read a specific book in the subject, and assigning students research assignments or office reports during the first year of study.
Indicative Contents المحتويات الإرشادية	The course consists of one part that teaches students the general rules of writing in the Arabic language, ensuring that the basics of this language are not compromised.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Learning strategies: Self-directed learning, active learning, cooperative learning Teaching strategies: Presenting material, asking questions, classroom tests, homework.

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	٢
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO # All
	Assignments	2	10% (10)	3, 11	LO # All
	Homework	2	10%(10)	4,10	LO # All
	Report	1	10%(10)	13	LO # All
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	LO # All
	Final Exam	2hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري	
	Material Covered
Week 1	- The concept of linguistic errors - Rules for writing the closed taa and the open taa
Week 2	- The extended and shortened alif - The solar and lunar letters
Week 3	Dhad and Thā
Week 4	Writing the hamza: the hamzat al-wasl and hamzat al-qata'; the medial hamza; the extreme hamza
Week 5	Punctuation marks
Week 6	Nouns and verbs and the difference between them
Week 7	Midterm Exam; Objects: Object, Absolute Object, Object for Purpose, Object in Which, Object with
Week 8	Number
Week 9	Applications of Common Grammatical Mistakes
Week 10	Applications of Common Grammatical Mistakes
Week 11	- Meanings of Prepositions - The Rule of the Distinguishing Alif - The Rule of the Nun and Tanween
Week 12	Formal Aspects of Administrative Discourse
Week 13	Language of Administrative Discourse
Week 14	Language of Administrative Discourse
Week 15	End-of-Semester Exam

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 Information
معلومات المادة الدراسية

Module Title	**Computer Principles**	**Module Delivery**	
Module Type	**E**	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-110**		
ECTS Credits	**3**		
SWL (hr/sem)	**75**		

Module Level	1	**Semester of Delivery**	2
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**
Module Leader	ايناس طالب	**e-mail**	E-mail
Module Leader's Acad. Title	Assist. Lect.	**Module Leader's Qualification**	M.Sc.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	02/10/2023	**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	General objective: To provide students with skills in using basic office applications, creating office files and documents, using operating systems, and the basics of working in the digital environment.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Knowledge and Understanding ١-Through classroom lectures, encouraging students to read a specific book in the subject, and assigning students research assignments and/or office reports during the first year of study.

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	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	15	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Areas of computer use, its features, and classification by size, purpose, and data type.

Week 2	The physical and software components of the computer; components of the desktop, Start menu, and taskbar; folders, files, and icons; operations on windows and desktop backgrounds.
Week 3	The personal computer and the concept of software security and software licenses; cyberethics, computer security, and privacy; software licenses and their types, intellectual property, hacking, and malware; the most important steps necessary to protect against hacking; the health effects of computers.
Week 4	Controlling the operating system, its components, and groups; uninstalling and installing programs.
Week 5	Some common computer settings and conditions; managing the printer, setting the time and date, and maintaining initial disks.
Week 6	Microsoft 2010; Running Microsoft 2010; Program Interface; Main Tabs
Week 7	Midterm Exam; Home Tab; View Tab; Page Layout Tab
Week 8	Inserting Objects and Tables; Text and Symbol Groups; Additional Objects in Word
Week 9	PowerPoint 2010; Opening the Program; Program Environment; Adding and Editing Slides
Week 10	Additions to Slides and Animations; Add-ons, Inserts, and Comments
Week 11	Excel 2010; Program Environment, Opening, and Closing; Understanding Tabs
Week 12	Working with Tables, Functions, and Equations; Inserting and Adding Curves and Polygons
Week 13	Summary of Paint as an Example of Image Processing; Copying, Adding, and Moving Between Different Computer Programs
Week 14	Review
Week 15	End-of-Semester Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Training students to deal with the computer and desktop environment, browsing, opening and closing windows and dialog boxes, and the correct ways to deal with the keyboard, cursor, and other devices. - Practical examples on customization, dealing with icons, and changing screen resolution.
Week 2	Train the student on the Start menu; create a file and save it under the student's name on the desktop. Work with the program's windows and scroll bars. Create a folder with a specific name and train on renaming, hiding, retrieving, and deleting. Train the student on operating windows and desktop backgrounds.
Week 3	Training the student to deal with computer software licenses and their types and to deal with the original source of the software. Training the student to deal with computer security and electronic hacking.
Week 4	Learn about operating systems; format the hard disk and install the Windows operating system.
Week 5	Training the student on using the control panel and common settings on the computer, installing the printer and how to deal with it, and setting the time and date.
Week 6	Familiarize yourself with the Word environment, its menus, and formats; write a wide range of texts, train students on various formatting techniques, and print them on the printer.
Week 7	Training students on page layout, other tabs, adding symbols, and equations.
Week 8	Training on inserting objects; creating tables and various examples; creating documents more professionally.
Week 9	PowerPoint: Training and familiarization with the program's environment, slides, tabs, and formats, as well as adding and deleting them.
Week 10	Create multiple slides and practice slide animation, sounds, and inserting objects.
Week 11	Get familiar with the Excel environment, its menus, and formats. Train students on formatting and tab types.

Week 12	Manage tables and draw curves and polygons.
Week 13	Microsoft Paint as an example of image processing software; practice linking and controlling the programs.
Week 14	Review
Week 15	End-of-semester exam

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.

رئيس القسم

استاذ المادة

Module Information معلومات المادة الدراسية					
Module Title	**Matlab**			**Module Delivery**	
Module Type	**E**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-111**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**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	To make the student able to process, program, and solve arithmetic and engineering problems using Matlab.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	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 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	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	15	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO # All
	Assignments	2	10% (10)	3, 11	LO # All
	Lab.	10	10% (10)	continuous	LO # All
	Homework	2	10%(10)	5,10	LO # All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # All
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	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	Mid. Term Examination, 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	Final Examination

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?
Required Texts		
Recommended Texts		

Websites	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.

Second stage

UGII

Module Information معلومات المادة الدراسية					
Module Title	**Advanced Mathematics**			**Module Delivery**	
Module Type	**S**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-200**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-100	**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	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	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	101	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	49	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

		mber			Outcome
Formative assessment	Quizzes	4	10% (10)	4,6,8,12	LO #1-7
	Assignments	3	10% (10)	3, 6,11	LO # 1-7
	Homework	4	10%(10)	3,5,7,9	LO # 1-7
	Report	1	10%(10)	13	LO # 1-7
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

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	Mid. Term examination, 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 . Solving of first and second O.D.E , applications of O.D.E .
Week 15	Final Examination

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.

رئيس القسم

استاذ المادة

Module Information
معلومات المادة الدراسية

Module Title	**Mechanical Drawing**	**Module Delivery**	
Module Type	**C**	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-201**		
ECTS Credits	**6**		
SWL (hr/sem)	**150**		

Module Level	2	**Semester of Delivery**	1
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**
Module Leader	Name	**e-mail**	E-mail
Module Leader's Acad. Title	Professor	**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	02/10/2023	**Version Number**	1.0

Relation with other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	HUC-ACR-101	**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 basic skill of reading engineering drawing along with their symbols and terms as well as the standards. Understanding joining, bolts and gears, knowledge of assembly drawings How to use ACD in mechanical drawing 9. fits and tolerances
Module Learning Outcomes	1-Understand engineering drawings, 2-Understand blue prints of mechanical elements

مخرجات التعلم للمادة الدراسية	3-Understand assemblies and their implementation. 4-Understand the terms fit and tolerance.
Indicative Contents المحتويات الإرشادية	Application on computer, basic of engineering drawing with their simples and terms as well as their standards. Using AutoCAD to draw an example of joining by bolts. Classification of keys, pins and rivets. Application on computer, using AutoCAD to draw an example of joining of keys or pins. Tolerances, basic size, limits of size and deviation. Fits , classes of fit/ clearance. Transition. Interference. Calculation of fits & tolerance. Assembly drawing using AutoCAD to draw general assembly. Application on computer, using AutoCAD to draw an example of spur gear.

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	115	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	35	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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)	4,8,12	LO #1-4
	Assignments	2	10% (10)	3, 11	LO # 1-4
	Homework	10	10%(10)	continuous	LO # 1-4
	Class work	10	10% (10)	continuous	LO # 1-4
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-2
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	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	Mid. Term examination, 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	Final Examination

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	AutoCAD reference book, Mechanical Drawing/ University of Technology	
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 Information
معلومات المادة الدراسية

Module Title	**Fluid Mechanics**	**Module Delivery**	
Module Type	**C**	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-202**		
ECTS Credits	**8**		
SWL (hr/sem)	**200**		

Module Level	2	**Semester of Delivery**	1
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**
Module Leader	Falah Kaify Matloub	**e-mail**	E-mail falahkaify@gmail.com falahkaify@hilla-unc.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	Name	**e-mail**	E-mail
Scientific Committee Approval Date	02/10/2023	**Version Number**	1.0

Relation with other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	HUC-ACR-106, HUC-ACR-107	**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. This module is intended to develop a deeper understanding of the fluid flow processes and the governing laws and related fluid properties. 2. The student will be able to analyze simple fluid problems with the aim of reduction of energy losses. 3. To introduce the theory and practice of fluid machines parts and assemblies using a wide range of technologies. 4. To allow processes to be chosen appropriately for any given application with any given fluid material. 5. To provide knowledge on the influence of thermal and mechanical parameters on system structure.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Possess a sound knowledge of fundamental properties of fluids and fluid continuum and types of fluid flow. 2. Compute and solve problems on hydrostatics, including practical applications. 3. Apply principles of mathematics to represent kinematic concepts related to fluid flow. 4. Apply fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications. 5. Compute the discharge through pipes can critically analyze the performance of pumps and turbines
Indicative Contents المحتويات الإرشادية	1) Introduction to Fluid Mechanics. a) Fluid Properties, b) density. c)viscosity. D)pressure. e) 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	143	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	١٠

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-5
	Assignments	2	10% (10)	3, 11	LO #1-5
	Laboratory	7	10%(10)	continuous	LO #1-5
	Homework	4	10%(10)	3,6,9,12	LO #1-5
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-3
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

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	Mid. Term examination, 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 Examination

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)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. B. R. Munson, Th. H. Okiishi, W W. Huebsch, A P. Rothmayer Fundamentals of fluid mechanics. 2. Fox, Fluid Mechanics. 3. F. White, Elementary Fluid Mechan	
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 Information
معلومات المادة الدراسية

Module Title	**Applied Thermodynamics**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-203**				
ECTS Credits	**10**				
SWL (hr/sem)	**250**				
Module Level	2		**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Haroun A K Shahad		**e-mail**	hakshahad@yahoo.com haroon_abd@hilla-unc.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	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/10/2023		**Version Number**	1.0	

Relation with other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	HUC-ACR-107	**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	Study thermodynamic power cycles, refrigeration cycles. Mixture properties, mixture laws, combustion
Module Learning	1-Understand and analyze different vapor power cycles. 2-Study and understand different components of steam power plants. 3-Understand and analyze different gas power cycles.

Outcomes مخرجات التعلم للمادة الدراسية	4-Study and analyze different components of gas power plants. 5-Understand and analyze internal combustion engine cycles. 6-Understand and analyze different vapor compression and absorption cycles 7-Analyze the properties of isentropic flows, shock waves and supersonic nozzle. 8-Ubderstand single and multi-stage reciprocating compressors. 9-Understand the thermodynamic properties of gas mixtures. To know the gravimetric 10-Understand combustion process, heat of reaction.
Indicative Contents المحتويات الإرشادية	Power cycles, refrigeration cycles, compressors, mixtures

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	157	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	11
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	93	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	250		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-10
	Assignments	2	10% (10)	3, 11	LO #1-10
	Lab.	7	10%(10)	continuous	LO #1-10
	Homework	4	10%(10)	3,6,8,12	LO #1-10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Weeks 1,3	Vapor power cycles
Weeks 4-7	Gas power cycles
Weeks 8,9,10	mid. term examination, vapor compression cycles, absorption cycles
Weeks 11,12	Non-reacting gas mixtures
Weeks 13,14	Reacting gas mixtures (combustion)
Week 15	Final examination

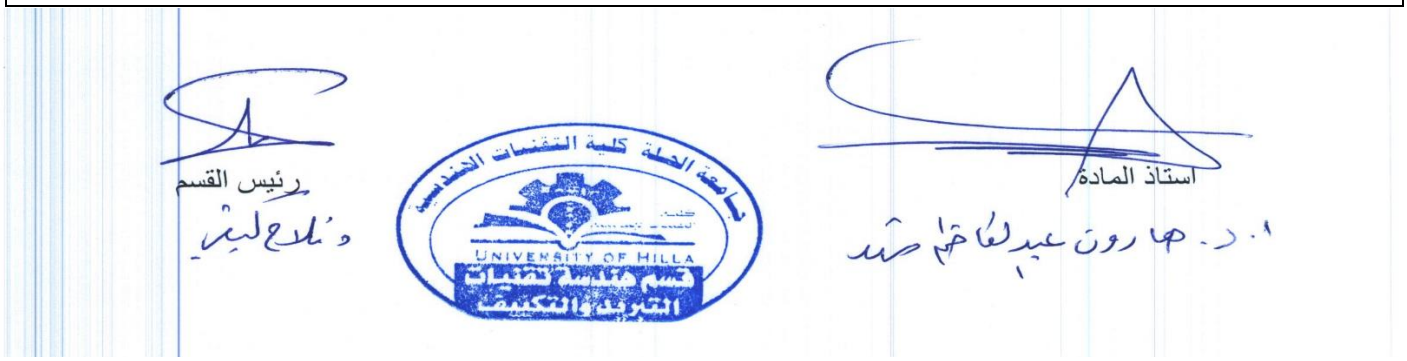
Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Steam boiler efficiency
Week 2	Determination of steam dryness fraction
Week 3	Determination of latent heat of evaporation
Week 4	Determination the phase of the refrigerant for VCR system components
Week 5	Determination of thermal efficiency for VCR cycle
Week 6	EES software training
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	*1-Engineering Thermodynamics, Concepts and Applications* *Prof Haroun A K Shahad, 2024* *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 Publicati*	
Recommended Texts	*1. Cengel, Y.A., Boles, M.A. and Kanoğlu, M., 2011. Thermodynamics: an engineering approach (Vol. 5, p. 445). New York: McGraw-hill.* *2. Thermodynamics Through Solved Problems* *Prof. Haroun A K Shahad*	
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 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	**HUC-ACR-204**				
ECTS Credits	**14**				
SWL (hr/sem)	**350**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name Ali Hussein Ghalta		**e-mail**	E-mail alihussein@hilla-unc.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name Ali Hussein Ghalta		**e-mail**	E-mail alihussein@hilla-unc.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/10/2023		**Version Number**	1.0	

Relation with other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	HUC-ACR-203	**Semester**	L2, S3
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. 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 familiar with compression refrigeration system, its components and accessories in addition to its operation.
Indicative Contents المحتويات الإرشادية	Part A – Air Conditioning 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. Sensible cooling, sensible heating, dehumidification, humidification by water injection, adiabatic humidification, humidification efficiency, humidification by constant wet bulb temperature, contact factor, and bypass factor. Humidification by steam injection, adiabatic air mixing, cooling, and dehumidification with reheating, preheating with humidification and reheat. 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. 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 Part B – Refrigeration cycles. 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.. 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, Super-cooling of refrigerant.. 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). 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.

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	143	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	207	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	14.7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	350		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-3
	Assignments	2	10% (10)	3, 11	LO # 1-3
	Lab.	7	10% (10)	continuous	LO # 1-3
	Homework	4	10%(10)	3,6,9,12	LO # 1-3
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-2
	Final Exam	3hr	50% (50)	15	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 condition
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	Mid. Term examination, 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, Super-cooling 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 intercool
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, Expansion tools, accessories for vapor compressor cooling system.

Week 15	Final Examination

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, 4	Sensible cooling
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	Cooling and dehumidifying with reheating
Week 11	Mixing and adiabatic saturation with reheating

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.*	
Recommended Texts	*Sapali, S.N., 2009."Refrigeration and Air Conditioning". PHI Learning Pvt. Ltd.*	
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 Information معلومات المادة الدراسية					
Module Title	**Strength of Materials**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-205**				
ECTS Credits	**11**				
SWL (hr/sem)	**225**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-106	**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	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,

مخرجات التعلم للمادة الدراسية	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. 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.
Indicative Contents المحتويات الإرشادية	Give the students information about stress and strain, Thermal stress, Thin Walled stress torsion, Thin Walled Torsion, Shear force and bending moment diagram, Complex stress , Mohr's circle. with lab. Part test for tensile, Impact, Hardness , Creep , Compression, Bending , Buckling , Torsion.

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	115	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	110	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7.9
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	225		

Module Evaluation تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to strength of materials
Week 2	Simple stress and Strain
Week 3	Compound Bars
Week 4	Thermal stresses
Week 5	Shearing force and bending moment diagrams
Week 6	Bending of beam
Week 7	Mid. Term examination, Slope and deflection of beams
Week 8	Shear stresses in beam
Week 9	Torsion of shaft
Week 10	Thin cylinders and shells
Week 11	Complex stresses
Week 12	Mohr's stress circle
Week 13	Buckling of column
Week 14	Strain Energy, Theories of Elastic failure
Week 15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered

Week 1+2	Tensile
Week 3+4	Torsion
Week 5+6	Impact
Week 7+8	Hardness
Week 9+10	Effect of heat treatment on steel hardness
Week 11	Bending
Week 12	Compression
Week 13	Buckling

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

رئيس القسم

م.م حسنا حسين جاسم
أستاذ المادة

Module Information

معلومات المادة الدراسية

Module Title	Computer Applications 1	Module Delivery
Module Type	S	☐ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	HUC-ACR-206	
ECTS Credits	3	
SWL (hr/sem)	75	

Module Level	2	**Semester of Delivery**	2
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	HUC
Module Leader	Name	**e-mail**	E-mail
Module Leader's Acad. Title	Professor	**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	02/10/2023	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	HUC-ACR-110	**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	To make the student able to process, program, and solve arithmetic and engineering problems using Matlab.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	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 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	73	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	2	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1, 2
	Assignments	2	10% (10)	3, 11	LO #1,2
	Lab.	14	10% (10)	continuous	LO # 1,2
	Homework	4	10%(10)	3,7,10,12	LO # 1,2
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Matlab
Week 2	Mathematical Functions
Week 3+4	Vectors & Matrices
Week 5	Introduction to Programming in MATLAB
Week 6+7	Control flow, mid. term examination
Week 8	Debugging
Week 9	Mathematical Equations

Week 10	Graph Plot
Week 11+12	GUI
Week 13	Image Processing
Week 14	Simulink
Week 15	Final Examination

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?**
Required Texts		
Recommended Texts		
Websites	https://www.mathworks.com/products/matlab.html	

Grading Scheme

مخطط الدرجات

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

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

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

Module Information

معلومات المادة الدراسية

Module Title	English Language II	Module Delivery
Module Type	S	☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	HUC-ACR-207	
ECTS Credits	2	
SWL (hr/sem)	50	

Module Level	2	**Semester of Delivery**	2
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	HUC
Module Leader	Name	**e-mail**	E-mail
Module Leader's Acad. Title	Professor	**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	02/10/2023	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	HUC-ACR-104	**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	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	All
	Assignments	2	10% (10)	3, 11	All
	Homework	4	10%(10)	3,6,9,12	All
	Report	1	10% (10)	13	All
Summative assessment	**Midterm Exam**	1hr	10% (10)	7	All
	Final Exam	2hr	50% (50)	15	
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	Mid. Term examination, 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 Examination

Learning and Teaching Resources

مصادر التعلم والتدريس

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

Grading Scheme

مخطط الدرجات

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

Very Good	جيد جدا	80 - 89	Above average with some errors
Good	جيد	70 - 79	Sound work with notable errors
Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
Sufficient	مقبول	50 - 59	Work meets minimum criteria
– Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
Fail	راسب	(0-44)	Considerable amount of work required

places above or below 0.5 will be rounded to the higher or lower full mark (for example a ounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT ss fails" so the only adjustment to marks awarded by the original marker(s) will be the utlined above.

رئيس القسم

UNIVERSITY OF HILLA

استاذ المادة

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Module Information

معلومات المادة الدراسية					
Module Title	**Engineering and Numerical Analysis**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-300**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-200	**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	1-Understand the methods of solutions for first, second and high orders differential equations and their engineering applications. 2-Understand the types and method of solution for Fourier Series and their engineering applications. 3-Understand the methods of solution by Laplace transformation and their applications.

	4-Understand the methods of solution for partial differential equation and their engineering application. 5-Understand the numerical methods for solving linear and non-linear equations and their engineering applications. 6-Understand the numerical methods for solving the differential equations and their engineering applications.
Indicative Contents المحتويات الإرشادية	Give the students information about : Differential Equations. First, 2nd and, Higher Linear Order Differential Equations, Fourier series, Laplace and Laplace Inverse transformation, Euler equation, Runge-Kutta method, Interpolation, Iteration, Partial Differential Equations.

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
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	13	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-6
	Assignments	2	10% (10)	3, 11	LO # 1-6

	Homework	4	10% (10)	2,5,9,11	LO # 3-6
	Report	2	10%(10)	6,10	LO #1-6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

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

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required 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. 6- Numerical Analysis, Richard L. Burden & J. Douglas Faires. 7- Introduction to Numerical Analysis, F.B. Hildebrand.	
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 Applications II**	**Module Delivery**
Module Type	**S**	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**
Module Code	**HUC-ACR-301**	
ECTS Credits	**3**	
SWL (hr/sem)	**75**	

Module Level		3	**Semester of Delivery**		1
Administering Department		Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	HUC	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title		Professor	**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		02/10/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-206	**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	**1.** The student should be able to draw and design various common mechanical components used in mechanical industries. **2.** The student should be able to use software to model mechanical components, transitioning from lengthy manual calculations to fast computational processes, and compare results in terms of accuracy and speed, including calculating moments of inertia and bending for specific mechanical parts. **3.** The student should understand and apply simulations to solve various types of threshold problems, both simple and composite, under different loads—point, distributed, or torsional.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Prepare applied engineers capable of distinguishing between using computers for design and traditional manual work. 2. Learn the correct and most efficient steps and methods to achieve appropriate results. 3. Work with international standard specification books from various countries.

	4. Execute drawings of mechanical components and analyze stresses theoretically.
Indicative Contents المحتويات الإرشادية	The course consists of two parts: the first part introduces the traditional methods for designing and drawing various main mechanical components, while the second part covers the calculation of moments of inertia, bending, and deformation of different metal sections using computers, solving various threshold problems, and plotting bending and deformation diagrams for different types of metals.

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	59	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	16	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-4
	Assignments	2	10% (10)	3, 11	LO # 1-4
	Lab.	10	10% (10)	continuous	LO # 1-4
	Homework	4	10%(10)	4,6,8,10	LO #1-4
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Fasteners (screw –washer –nut)
Week 2	Shaft Generator(cylinder –gear –thread-wrench)
Week 3	Spur Gear & Groove
Week 4	Retaining Rings
Week 5	Keys(4 types of keys)
Week 6	Roller Bearings(single & double)- Plain Bearings
Week 7	Mid Term Examination, Drill Bushings(headless & headed)
Week 8	Seals
Week 9	Springs(compression ,extension, torsion Belleville)
Week 10	Shaft Break
Week 11	Moment of Inertia for steal shapes (nine types)
Week 12	Shaft Calculations
Week 13	Deflection Line
Week 14	Bearing Calculation
Week 15	Final Examination
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-Engineering Design and Graphics with Mechanical Desktop 5.0 (book) 2-Learning Mechanical Desktop Release 4(book) 3- ASTM standardizes 4-Mechanical Desktop (book)	
Recommended Texts		
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	**Theory of Machines and Vibrations**	**Module Delivery**
Module Type	**C**	☐ **Theory** ☒ **Lecture**
Module Code	**HUC-ACR-302**	

ECTS Credits	**5**			☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
SWL (hr/sem)	**125**				
Module Level		3	**Semester of Delivery**		1
Administering Department		Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title		Professor	**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		02/10/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-205	**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	To identify and enumerate different link based mechanisms with basic understanding of motion. To understand and illustrate various power transmission mechanisms using suitable method. The knowledge of this subject is very essential for an engineer in designing the various parts of a machine. 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. 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 مخرجات التعلم للمادة الدراسية	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 follower. 7. Understand the engineering principles in mechanical system. 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 un-damped and damped in free and forced excitation with various excitation.
Indicative Contents المحتويات الإرشادية	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. 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. Types of Governors, Watt Governor, Porter Governor, Proell Governor, Hartnell Governor. 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. 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. 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. Basic concepts of vibration, Oscillatory motion, Second Order Differential Equations with Constant Coefficients. Undamped Free Vibrations of Single degree of Freedom Systems, Torsional Oscillation of Elastic Shafting, Energy Methods. 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. Influence of Frequency Ratio and Damping Factor on Steady State Response, Force Transmission and Vibration Isolation. 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). Whirling Speeds or Critical Speeds. Free Vibrations of Undamped Systems with Two Degree of Freedom. Free Vibrations of Damped Systems with Two Degree of Freedom. Forced Vibrations for Systems with Two Degree of freedom. Natural Frequency of Free Torsional Vibrations, Free Torsional Vibrations of a Single Rotor System, Free Torsional Vibrations of a Two Rotor System. Free Torsional Vibrations of a Three Rotor System, Torsional Equivalent Shaft.
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) الحمل الدراسي المنتظم للطالب خلال الفصل	115	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	10	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	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. Un-damped 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	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 Vibrations of Damped Single Degree of Freedom Systems. Forced Angular Oscillations of Rigid Bodies. Solve Problems.
Week 7	Mid Term Examination, Proell Governor Hartnell Governor Influence of Frequency Ratio and Damping Factor on Steady State Response. Force Transmission and Vibration Isolation. Base Excitation Solve Problems
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 (Tc) Maximum Tension in the Belts (Tmax) Condition for the Transmission of Maximum Power Initial Tension in the Belt (To) V – Belt Drive and Rope Drive Whirling Speeds or Critical Speeds. Solve Problems.

Week 10	Free Vibrations of Un-damped 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 Problem
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 Problem
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	Final Examination

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. Un-damped Forced Vibration.
Week 6	Lab 6: Explain friction of flat belt. Transverse Vibration of a Beam.
Week 7	Lab 7: How frictional clutch operate. Un-damped vibration absorber.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required 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.	
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	**Heat Transfer**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-303**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		3	**Semester of Delivery**		1
Administering Department		Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title		Professor	**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		02/10/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-202, HUC-ACR-203	**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	To develop students' fundamental knowledge into Heat transfer principles. To describe the physical principles and evolving technical capabilities of heat transfer To explain the heat transfer mechanisms, conduction, convection, and radiation. To describe the thermal resistance concept, conduction through multilayered plane

	wall, cylinders and spheres. To describe the Heat transfer from finned surfaces, fin equation, fin Efficiency, fin effectiveness. To explain the forced and natural convection heat transfer, boundary layer concepts. To describe the kinds of heat exchangers, heat exchangers design methods. To explain the heat transfer by radiation basic concepts.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Use the information of heat transfer principles. 2-Identify the heat transfer modes. 3-Demonstrate the forced and natural convection heat transfer. 4-Recognize the kinds of heat exchangers and design methods. 5-Recognize the heat transfer by radiation basic concepts. 6-Use the heat transfer principles in the practical applications.
Indicative Contents المحتويات الإرشادية	Heat transfer principles. Introduction to heat transfer mechanisms, conduction, convection, and radiation. Thermal resistance concept, conduction through multilayered plane wall, cylinders and spheres. Heat transfer from finned surfaces, fin equation, fin Efficiency, fin effectiveness. Forced and natural convection heat transfer, boundary layer concepts . Heat transfer by radiation basic concepts.
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	143	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction, Heat Transfer Mechanisms, Steady State general Heat Conduction equation in Rectangular, Cylindrical 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	Mid Term Examination, 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, Performance for Different Kinds of the Heat Exchangers.
Week 14	Heat Radiation, Introduction, Basic Concepts, Absorptivity, Reflectivity, and Transmissivity, Radiation Heat Transfer Between Two Black and Gray Surfaces.
Week 15	Final Examination

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?
Required Texts	Yunus C. Cengel,“ Heat and Mass Transfer”, 6th Edition, Mc Graw-Hill Education, 2020. J. P. Holman “Heat Transfer”, 10th Edition, Mc Graw-Hill Education, 2000.	
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

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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	**HUC-ACR-304**				
ECTS Credits	**10**				
SWL (hr/sem)	**250**				
Module Level	3		**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-204	**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	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 مخرجات التعلم للمادة الدراسية	1. To apply the knowledge of mathematics, science, and engineering fundamentals. 2. To model refrigeration and air conditioning engineering. 3. 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	**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. **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.) **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). **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. **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 130 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.

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	143	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	250		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-5
	Assignments	2	10% (10)	3, 11	LO # 1-5
	Lab.	10	10% (10)	continuous	LO # 1-5
	Homework	4	10%(10)	2,,4,7,10	LO #1-5
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
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.
Week 6	Air ducting (pressure loses in straight duct, duct fittings (sudden enlargement & contraction, branches, bends, ….etc)
Week 7	Mid Term Examination, 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.)
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)
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.

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, 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 15	Final Examination

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	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.	
Recommended Texts	1. Stanford III, Herbert W., and Adam F. Spach. Analysis and Design of Heating, Ventilating, and Air-Conditioning Systems. CRC Press, 2019.	
Websites		

Grading Scheme مخطط الدرجات				
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	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	**Mechanical Designs**	**Module Delivery**
Module Type	**C**	☐ **Theory** ☒ **Lecture**
Module Code	**HUC-ACR-305**	

ECTS Credits	**5**			☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
SWL (hr/sem)	**125**				
Module Level		3	**Semester of Delivery**		2
Administering Department		Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title		Professor	**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		02/10/2023	**Version Number**		1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	HUC-ACR-205	**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	Learning the design process of mechanical components, for different design considerations, such like strength, stiffness, and stability. Transfer real life mechanical systems to analytical models and analyze them and deal with design codes and standards. To be able to solve open-ended design problems, cope with decision making and satisfy competing objectives. Use and integrate the fundamentals studied previously towards the goal of analyzing and designing mechanical components to achieve satisfactory levels of safety and life. To improve competence in multi-axis stress analysis. To obtain a knowledge in the use of the proper failure theories under steady and variable loadings. To develop the design skills of mechanical components under steady and variable

	loadings.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	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 different mechanical parts.
Indicative Contents المحتويات الإرشادية	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. Torsional and Bending Stresses in Machine Parts, Shafts in Series and Parallel. Determination of Principal Stresses for a Member Subjected to Bi-axial Stress, Theories of Failure Under Static Load. 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. 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. Design of keys and Splines, Effect of Keyways, Types of Shafts Couplings. 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. Types of Welded Joints, Basic Weld Symbols, Strength of Transverse Fillet Welded Joints, Strength of Parallel Fillet Welded Joints. Classification of Pressure Vessels, Hoop and Longitudinal Stress, Spherical Shells, Compound Cylindrical Shells. Types of Screw Threads, Efficiency of Threaded Screws, Efficiency of Self-Locking Screws.

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	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-9
	Assignments	2	10% (10)	3, 11	LO #1-9
	Lab.	10	10% (10)	continuous	LO # 1-9
	Project	1	10%(10)	12	LO #1-9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	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	Mid Term Examination, 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	Final Examination

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	A Textbook of Machine Design by R.S.KHURMI AND J.K.GUPTA	
Recommended Texts	Shigley's Mechanical Engineering Design (McGraw-Hill Series in Mechanical Engineering) 10th Edition	
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**
Module Code	**HUC-ACR-306**	

ECTS Credits	**10**			☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
SWL (hr/sem)	**250**				
Module Level	3		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-304	**Semester**	L3, 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	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. Diagnose air conditioning and heating failures and make the required repairs. 3. the student have ability to install Refrigeration and air conditioning equipment, perform pipe welding , vacuum and charge, installation problems. 4. The student able to troubleshoot for central air conditioning systems, Refrigeration and Oil Chemistry and Management—Recovery, Recycling, Reclaiming, and Retrofitting

	5. Study the Mechanical and Electrical troubleshooting of Refrigeration and air conditioning system and water chillers 6. Study the Conventional air conditioning system (mechanical and electrical components, features, installation, connection, commissioning, maintenance, and control. 7. Study the Compressors (types, applications, maintenance, assembly and dis assembly, test and commissioning). 8. Study the Evaporators ,Condensers, Expansion devices and air washer (types, applications, maintenance, assembly and dis assembly, test and commissioning). 9. Study Cooling tower (types, applications, maintenance, assembly and dis assembly, test and commissioning). 10. Pumps (types, applications, maintenance, assembly and dis assembly, test and commissioning). 11. Refrigeration and air conditioning components cleaning by using chemical materials.
Indicative Contents المحتويات الإرشادية	1. General Safety Practices. 2. Tools and equipment. 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 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	143	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	250		

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

Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1- 11
	Assignments	2	10% (10)	3, 11	LO # 1-11
	Lab.	10	10% (10)	continuous	LO # 1-11
	Project	1	10%(10)	10	LO # 1-11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	15	All
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 Retrofitti
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	Mid Term Examination, 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). Refrigeration and air conditioning components cleaning by using chemical materials.

Week 15	Final Examination
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 connection
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. 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	
Recommended Texts	Modern refrigeration and air conditioning maintenance	
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	**Air Conditioning Systems Drawing**	**Module Delivery**
Module Type	**C**	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial**
Module Code	**HUC-ACR-307**	
ECTS Credits	**7**	

SWL (hr/sem)	**175**			☐ **Practical** ☐ **Seminar**	
Module Level	3		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	HUC-ACR-304	**Semester**	L3, 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	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	1-Making site survey and drawing the architectural plans. 2-Estimate the cooling load of buildings by Rule of Thumb method. 3-Estimate the required ventilation of buildings by Rule of Thumb method. 4-Using the Duct Sizer software to design the ducting network. 5-Drawing the ducting network by AutoCAD MEP or Revit software. 6-Selection of chillers, boilers, AHU's, package units, fan coils and cooling towers of

	deferent brand. 7-Using the Pipe Sizer software to design the piping network of the air conditioning system. 8-Drawing the piping network by AutoCAD MEP or Revit software. 9-Designing the VRV/VRF system by the selection software of some manufacturer brands.
Indicative Contents المحتويات الإرشادية	Part A Drawing Plans Walls, columns, doors, windows, stairs, shafts, elevation. Part B – Ducting Drawing Load estimation, specify ventilation, units' selection, duct design and drawing. Part C – Piping Drawing Chillers, boilers, pumps selection, piping design and drawing, VRF system drawing. Part D – Electrical Drawing Chillers, boilers, pumps, VRF system electrical drawing.

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	115	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-9
	Assignments	2	10% (10)	3, 11	LO #1-9
	Lab.	10	10% (10)	continuous	LO #1-9

	Project	1	10%(10)	13	LO #1-9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	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	Mid Term Examination, Design ducting network by Duct Sizer
Week 8	Drawing ducting network
Week 9	Chillers, boilers, cooling towers and pumps selection
Week 10	Design piping system by Pipe Sizer
Week 11	Drawing the piping system
Week 12	VRV/VRF system design and drawing
Week 13	Drawing the electrical and control diagram of central air conditioning system
Week 14	Drawing the electrical and control diagram of VRV/VRF systems
Week 15	Final Examination
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. 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	
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	**Electrical and Electronic Engineering**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-308**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	3		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-105	**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	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: 1-Be able to analyze DC motor 2-Calculate the current and voltage of Motor then calculate the Torque 3-Compare between single phase and three phase motor

مخرجات التعلم للمادة الدراسية	
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	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	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	Mid Term Examination, 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 , Operational amplifier 741.
Week 15	Final Examination

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, Zener diode

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Principle of Dc Motor and types	
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	**English Language III**		**Module Delivery**	
Module Type	**S**		☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-309**			
ECTS Credits	**2**			
SWL (hr/sem)	**50**			
Module Level	3	**Semester of Delivery**	2	
Administering Department	Department of Air Conditioning and Refrigeration	**College**	**HUC**	

		Technologies			
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title		Professor	**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		02/10/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-207	**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	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	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	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	All
	Assignments	2	10% (10)	3, 11	All
	Homework	4	10%(10)	4,6,8,10	All
	Report	1	10% (10)	13	All
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	All
	Final Exam	2hr	50% (50)	15	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	Mid. Term examination, 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

ar revisions
l Revision
xamination

Learning and Teaching Resources
مصادر التعلم والتدريس

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

Grading Scheme
مخطط الدرجات

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

l places above or below 0.5 will be rounded to the higher or lower full mark (for example a ounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT ss fails" so the only adjustment to marks awarded by the original marker(s) will be the utlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Air Conditioning Systems Design**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-401**				
ECTS Credits	**10**				
SWL (hr/sem)	**250**				
Module Level	4		**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-304	**Semester**	L3, 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	Study the type of all types of refrigeration system. 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. Introduces theories and operations of heating and air conditioning system. Includes design of HVAC system
Module Learning Outcomes	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.

مخرجات التعلم للمادة الدراسية	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	Air distribution systems. Room air distribution, conditioned room air distribution. Refrigeration and air conditioning equipment classification. Piping's systems and accessories. Advanced applications on psychometric charts. Conventional air condition system(mechanical and electrical components)

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	143	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	250		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-5
	Assignments	2	10% (10)	3, 11	LO #1-5
	Lab.	10	10% (10)	continuous	LO # 1-5
	Project	1	10%(10)		LO #1-5
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-3
	Final Exam	3hr	50% (50)	15	All
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	Mid. Term examination, 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. Evaluations and commercial analysis for air conditioning systems.
Week 15	Final Examination

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Design Project (continuous)
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- "Refrigeration aaand 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	
Recommended Texts	"Refrigeration and Air Conditioning" By W. F. Stoecker, and J. W. Jones	
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

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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	**HUC-ACR-402**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	4		**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-203	**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	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 مخرجات التعلم للمادة الدراسية	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 the performance of a power plant.
Indicative Contents المحتويات الإرشادية	Studying different thermodynamics vapor and gas power cycles (Ideal and actual) performance in addition to the different components of each cycle.

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)	143	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10

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

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to power cycles and main equations in thermodynamics..
Week 2	Power Plant Steam Cycles, Main Cycles.
Week 3	Carnot cycle and its efficiency and all performance.
Week 4	Steam table and its calculations.
Week 5	Ideal Rankine cycle and colocations its performance.
Week 6	Reheat cycle.
Week 7	Mid. Term examination, Regenerative cycle with open feed water heater.
Week 8	Regenerative cycle with closed feed water heater.
Week 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. .
Week 10	Combustion and Fuels, Complete and Incomplete Combustion, Correct Air/Fuel Ratio, Access Air Supplied, Heat Generation, Boiler Efficiency, pinch principle.

Week 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.
Week 12	Steam Nozzles, Applications, Steam Expansion, Discharge, Velocity of Steam Through Nozzles, Values of Critical Pressure, Diameters of Throat and Exit for Maximum.
Week 13	Steam Condensers, Kinds, Direct Contact Condensers, Surface Condenser, Design and Manufacturing.
Week 14	Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency, Reaction Turbine, Reaction Ratio, Installation, Multi Stage Blades, 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
Week 15	Final Examination

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-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.	
Recommended Texts		

Websites	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	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 III**			**Module Delivery**	
Module Type	**S**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-403**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	4		**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	HUC-ACR-206	**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	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 Mechanical 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	Part 1 – 3d solids Drawing the basic components of 3d solids in space. Part 2 – 3d operations 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, sweep and loft), 2d drawings 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	59	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	16	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	All
	Assignments	2	10% (10)	3, 11	All
	Lab.	10	10% (10)	continuous	All
	Homework	4	10%(10)	4,6,8,11	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	15	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 (origin, face and objects) with examples.
Week 7	Mid. Term examination, 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 offset).
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), surface (torus and wedge) with examples.
Week 15	Final Examination

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	Mid Term Examination, 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 offset
Week 12	Advanced solid editing/face (taper, delete, copy, color,).material, undo and exit
Week 13	Applied examples.
Week 14	examples on 3d surface (box, cone, dome and mesh)

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the**

		Library?
Required Texts	Autocad user manual	
Recommended Texts	Introduction to Autocad	
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	**Industrial Engineering and Management**		**Module Delivery**	
Module Type	**S**		☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-404**			
ECTS Credits	**3**			
SWL (hr/sem)	**75**			
Module Level	4	**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**	

Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title		Professor	**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		02/10/2023	**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	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	3
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	75		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO # All
	Assignments	2	10% (10)	3, 11	LO # All
	Projects	2	10%(10)	5,10	LO # All
	Report	1	10% (10)	13	LO # All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # All
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

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	Mid Term Examination, 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 Examination

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	**Graduation Project**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-400**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	1	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Use the gained scientific knowledge from all modules.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Design and construct a cooling system
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	129	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	21	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #all
	Assignments	2	10% (10)	3, 11	LO # All
	Lab.	14	10% (10)	continuous	LO # All
	Report	1	10%(10)	8	LO # All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # All
	Final Exam	3hr	50% (50)	15	All

Total assessment	100% (100 Marks)		

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	**Refrigeration Systems**	**Module Delivery**
Module Type	**C**	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial**
Module Code	**HUC-ACR-405**	
ECTS Credits	**10**	

SWL (hr/sem)	**250**			☐ **Practical** ☐ **Seminar**	
Module Level	4		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-204	**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	Enhance the students' knowledge of the principles of vapor compression refrigeration systems and its analysis. Provide the students the basic design of all components for vapor refrigeration system. Studying types of refrigeration units and cryogenic refrigeration.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-To understand the principles of work of refrigeration systems, and main advantages, disadvantages and application of each them. 2-To investigate the general design of condenser, evaporator, expansion device and cooling tower. 3-To understand the basic calculations of the all type of refrigeration systems.
Indicative Contents المحتويات الإرشادية	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. 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. 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. 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. Absorption refrigeration system: relation between vapor compression and absorption refrigeration units, the absorption refrigeration system, temperature and concentration properties of LiBr-water solution, calculations of mass flow rates in the absorption cycle, enthalpy of LiBr-water solutions, thermal analysis of simple cycle, absorption cycle with heat exchanger, crystallization, capacity control, aqua-ammonia system . Adsorption system : the relation between adsorption and absorption, absorption and vapor 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. 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. Thermoelectric refrigeration: working principle, types of thermoelectric refrigeration systems, electro-acoustic refrigeration, working principle, types. 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. Vortex tube: Types and working principle. Heat Pipe: Types and working principle.

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	143	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	250		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10% (10)	4,8,10,12	LO #1-3
	Assignments	2	10% (10)	3, 11	LO # 1-3
	Lab.	10	10% (10)	continuous	LO # 1-3
	Homework	4	10%(10)	4,,6,8,10	LO # 1-3
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-3
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	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	Mid Term Examination, Absorption refrigeration system: relation between vapor compression and

	absorption refrigeration units, the absorption refrigeration system, temperature and concentration properties of LiBr-water solution, calculations of mass flow rates in the absorption cycle, enthalpy of LiBr-water solutions, thermal analysis of simple cycle, absorption cycle with heat exchanger, crystallization, capacity control, aqua-ammonia system .
Week 8	Adsorption system : the relation between adsorption and absorption, absorption and vapor 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, Heat Pipe: Types and working principle.
Week 15	Final Examination

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Project, continuous.
Week 2	
Week 3	
Week 4	

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	
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	**Renewable Energies**	**Module Delivery**	
Module Type	**C**	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-406**		
ECTS Credits	**10**		
SWL (hr/sem)	**250**		
Module Level	4	**Semester of Delivery**	2
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**
Module Leader	Name	**e-mail**	E-mail
Module Leader's Acad. Title	Professor	**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		02/10/2023	**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. 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	Part 1 – Solar energy 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. Part 2 - Photovoltaic 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. Part 3 – Wind energy 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. Part 4- Water energy Hydro energy with hydro turbines. Types of hydro-power plant. Ocean energy with different power plants. Tidal energy and tidal power plants. Part 5- Geothermal energy Types and applications of geothermal energy, geothermal heating systems, and		

	geothermal power plants. Part 6 – Bioenergy Types and applications of bioenergy, biomass biogas and biofuel.

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	143	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	10
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	250		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	4,8,12	LO #1-5
	Assignments	2	10% (10)	3, 11	LO # 1-5
	Lab.	10	10% (10)	continuous	LO # 1-5
	Report	2	10%(100	5,9	LO # 1-5
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3hr	50% (50)	15	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	Mid. Term examination, 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. Tidal energy. Tidal power plants. Wave energy. Wave power plants.
Week 15	Final Examination

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, 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.	
Recommended Texts	Solar Energy Thermal Processes, fourth edition. Duffie, John A	
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	**Ethics of Profession**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-407**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	4		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023	**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.وصف للاخلاق 2.وصف للعمل والمهنة 3.وصف لاخلاقيات المهنة 4.وصف لقيم واخلاقيات المهنة ٥.وصف لانماط السلوك الغير اخلاقي في المهنة ٦.وصف لوسائل واساليب ترسيخ قيم اخلاقيات المهنة ٧. وصف لاخلاقيات ممارسة المهن الهندسية
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	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. ٦. ممارسة اخلاقيات المهن الهندسية
Indicative Contents المحتويات الإرشادية	مفهوم الاخلاق ومنشأها ، القواعد العامة للاخلاقيات، مصادر الاخلاق، القيم الاخلاقية، اهمية الاخلاق للفرد والمجتمع العمل والمهنة :العمل واهميته، سلوكيات العمل، مفهوم المهنة، تعريف المهنة، الفرق بين مفهوم العمل والمهنة والحرفة، المعايير التي يجب ان تقوم عليها المهنة. اخلاقيات المهنة :ماهي اخلاقيات المهنة ، المردودات الايجابية للالتزام باخلاقيات المهنة، خصائص اخلاقيات العمل، صفات اخلاقيات المهنة، خطوات المستوى المقبول من اخلاثيات المهنة . القيم واخلاقيات المهنة :الامانة الصدق التصح العدل حسن التعامل، اتقان العمل انماط السلوك الغير اخلاقي في المهنة :الفساد الاداري تعريفه وانواعه، الرشوة تعريفها وانواعها واسبابها، الغش مفهمه وطبيعته ومظاهره في اداء الوظيفة. وسائل واساليب ترسيخ قيم اخلافيات المهنة. اخلاقيات ممارسة المهن الندسية.

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	٣٥	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٢
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	١
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	٥٠		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-6
	Assignments	2	10% (10)	3, 11	LO # 1-6
	Projects	1	10%(10)	12	LO #1-6
	Report	1	10% (10)	13	LO # 1-6
Summative assessment	**Midterm Exam**	1hr	١0% (10)	7	LO # 1-6
	Final Exam	2hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	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 وبين بينها الفرق المهنة، عليها تقوم التي المعايير المهنة، وتعريف مفهوم ، العمل سلوكيات واهميته، العمل :والمهنة 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, Mid. Term examination
Week 8	اداء في ومظاهره وطبيعته مفهومه والغش والدوافع، واسبابها وانواعها تعريفها الرشوة :المهنة في اخلاقي الغير السلوك انماط 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 ، النظرة الاسلامية لاخلاقيات المهنة مقارنة بالنظرة الغربية والامريكية.
Week 15	Final Examination

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	كتاب اخلاقيات المهنة : مقرر منهجي الناشر الجامعة التقنية الوسطى	
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	**Control and Measurements**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-408**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	2	
Administering Department	Department of Refrigeration and Air Conditioning Engineering Technologies		**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**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	02/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-304	**Semester**	L3, 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	Students become familiar with various types of sensors which have been used in HVAC control systems. Knowing the aims of the control systems and their importance in the HVAC. Providing enough details to understand each element in the HVAC control system. Providing a more in-depth understanding of troubleshooting HVAC control systems. The student will be able to follow and read wiring diagrams.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	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 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	115	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	35	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,8,12	LO #1-6
	Assignments	2	10% (10)	3, 11	LO #1-6
	Lab.	10	10% (10)	continuous	LO # 1-6
	Homework	4	10%(100	3,6,9,12	LO # 1-6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3hr	50% (50)	15	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	Mid. Term examination, 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, Troubleshooting HVAC control systems.
Week 15	Final Examination

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	Mid Term Examination, 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., 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.	
Recommended Texts	Montgomery, Ross, and Robert McDowall. *Fundamentals of HVAC control systems*. Elsevier, 2008	
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 Language IV**	**Module Delivery**	
Module Type	**S**	☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HUC-ACR-409**		
ECTS Credits	**2**		
SWL (hr/sem)	**50**		
Module Level	4	**Semester of Delivery**	2

Administering Department		Department of Refrigeration and Air Conditioning Engineering Technologies	**College**	**HUC**	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title		Professor	**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		02/10/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	HUC-ACR-309	**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	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	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	4,8,12	LO # All
	Assignments	2	10% (10)	3, 11	LO # All
	Homework	4	10%(10)	4,6,8,10	LO # All
	Report	1	10% (10)	13	LO # All
Summative assessment	**Midterm Exam**	1hr	10% (10)	7	LO # All
	Final Exam	2hr	50% (50)	15	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	Mid Term Examination, 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 Examination

Learning and Teaching Resources
مصادر التعلم والتدريس

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