Ministry of Higher Education and Scientific Research
Scientific Supervision and
Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department

Al-Huda University College

Curse Description

Fuel and Energy Technology Engineering Program

2026 - 2025

Course Description Form

Module Information

Module Title	Analytical chemistry	**Module Delivery**	
Module Type	C	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	**7**		
SWL (hr/sem)	**210**		

Module Level	1	**Semester of Delivery**	one
Administering Department	**Fuel and Energy Techniques Engineering Department**	**College**	AL-Huda University College
Module Leader	Dr. Maher Abdul Rahim Muhaimid	**e-mail**	
Module Leader's Acad. Title	Lecture	**Module Leader's Qualification**	Dr.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date		**Version Number**	

Relation with other Modules

Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. Introduction to Analytical Chemistry with a goal of teaching the reason for doing analytical 2. Chemistry and the basic steps of dealing with analytical issues present for a professional chemist. 3. Later the curriculum develops to learning the main units in regard to analytical chemistry and the relations between them and the ability to exchange them. Introducing students to the basic concepts related to descriptive analysis methods 4. Focusing on the method of sedimentation of elements in descriptive analytical chemistry and calculating their quantities
Module Learning Outcomes	The student able to: A- Cognitive goals. A1. Introduce students to the basic concepts related to descriptive analytical chemistry A2. Increasing awareness and educating students by solving problems related to segregation and sedimentation methods. B. The skills goals special to the course. B1. practical skills B2. Analytical and inferential skills B3. Development skills C- Knowledge and Understanding Introduce basic definitions and Introductory concepts of analytical chemistry. D. Show the different methods to prepare solutions with different concentrations and PH.
Indicative Contents	Indicative content includes the following. 1. introduction to main definitions for volumetric and gravimetric analysis 2. introduction to solubility and common ion effect. 3. Enabling students to solve problems related to the intellectual framework of the lecture material. 4. Enabling students to think intellectual questions from the lecture material 5. 5. Linking the lecture curriculum with practical applications, especially with our daily life.

Learning and Teaching Strategies

Strategies	1. Providing students with the basics and additional topics related to thinking outcomes 2. Discussing the topics of the lesson that require thinking and analysis 3. Raising a set of thinking questions during the lectures, which increases and motivates students to analyze and conclude 4. Giving students homework that requires self-explanations 5. Assessment methods 6. Oral exams for the previous lecture 7. Participation scores for competition questions related to the subject 8. Specific grades for homework 9. -Semester exams

Student Workload (SWL)

Structured SWL (h/sem)	116	**Structured SWL (h/w)**	8
Unstructured SWL (h/sem)	94	**Unstructured SWL (h/w)**	
Total SWL (h/sem)	210		

Module Evaluation

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

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Basic concept of qualitative and quantitative analysis

Week 2	Qualitative and quantitative analytical method and concentrations
Week 3	Principals of quantitative gravimetric analysis
Week 4	Stoichiometric of chemical analysis
Week 5	Chemical equilibrium and Chemical solubility
Week 6	Reactions of acids, bases
Week 7	pH for the acidic solutions
Week 8	Buffer solution
Week 9	Equilibrium in the precipitation, solubility, precipitation and partial precipitation.
Week 10	Equilibrium in the oxidation and reduction reactions, equations of oxidation and reduction, indicators of oxidation and reduction.
Week 11	Complex formation
Week 12	Drawing of reaction curves in aqueous solution, construction of titration curves of aqueous Solutions
Week 13,14	Methods and principles of spectrometric analysis
Week 15	Instrumental analysis for industry
Week 16	**Final exam**

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Safety in laboratory, laboratory tool , How to write a scientific report
Week 2,3	Measurement of the density by pycnometer and hydrometer
Week 4	Measure the melting point of compounds
Week 5	boiling point of compounds
Week 6,7	Recrystallization.
Week 8,9	TITRATION
Week 10	Molarity
Week 10.11	Normality
Week 11,12	pH Strong Acid, Strong Base, Salt of Strong A,cid and Strong Base

Week 13	Solubility
Week14	Preparatory week before the final Exam
Week15	final Exam

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	-Analytical chemistry, skoog 2nd edition Fundamentals of analytical chemistry, skoog 8th	yes
	edition Fundamentals of Analytical Chemistry 9e by Douglas A. Skoog"	
Recommended Texts	Flaschka. Quantitive Analytical Chemistry	no
Websites	http://www.acs.org/content/acs/en.html	

Grading Scheme

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

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

Course Description Form

Module Information

Module Title	**Mathematics1**	**Module Delivery**	
Module Type	**B**	☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	**6**		
SWL (hr/sem)	**180**		
Module Level	1	**Semester of Delivery**	1
Administering Department	Fuel and Energy Techniques Engineering Department	**College**	AL-Huda University College
Module Leader	Nazim Rajab Tawfiq	**e-mail**	
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	Ms.C
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date		**Version Number**	1.0

Relation with other Modules

Prerequisite module	Mathematics (2)		2
	Mathematics (3)	**Semester**	3
	Engineering Analysis		5
Co-requisites module	Numerical method	**Semester**	6
	None		

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. Recognize that mathematics permeates the world around us 2. Appreciate the usefulness, power and beauty of mathematics 3. Enjoy mathematics and develop patience and persistence when solving problems 4. Understand and be able to use the language, symbols and notation of mathematics 5. Develop mathematical curiosity and use inductive and deductive reasoning when solving problems 6. Become confident in using mathematics to analyses and solve problems both in school and in real-life situations 7. Develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics 8. Develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others 9. Develop a critical appreciation of the use of information and communication technology in mathematics 10. Appreciate the international dimension of mathematics and its multicultural and historical perspectives.
Module Learning Outcomes	1. Determinants and Grammar's rule 2. Trigonometric functions & relation Graphing of functions 3. Vectors. 4. Function of limits 5. Types of function
Indicative Contents	Indicative content includes the following. 1. Introduction to analytic geometry [12hr]. 2. Matrix and determinations [12hr]. 3. Vectors[12hr]. 4. Functions [24hr]. 5. Limits and continuity [24hr].

Learning and Teaching Strategies

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 examples involving some solving methods that are interesting to the students.

Student Workload (SWL)

Structured SWL (h/sem)	73	**Structured SWL (h/w)**	6
Unstructured SWL (h/sem)	107	**Unstructured SWL (h/w)**	
Total SWL (h/sem)	180		

Module Evaluation

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

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to analytic geometry The coordinate plan and straight lines: 1. Cartesian coordinates. 2. Slopes of line. 3. Slopes of non-vertical lines.
Week 2	Equations for lines, distance formula, and circle.
Week 3	Matrices and determents: 1. Symbols of matrix, order, types of matrices and operations of matrix (+,/, -, *).
Week 4	Determinations: definitions, order, properties of determinations, and Gramer's rule.
Week 5	Vectors: vector components, multiplication of a vector by scalar, vectors in X-Y plan, subtraction of vectors, and length of vector.
Week 6	Vectors: Unit vector, vector in space, sphere, two vector in (X-Y-Z) planes, product of vectors, and calculation of geometric area using vectors.
Week 7	Functions: Types of functions 1. Algebraic functions:(linear function, polynomial function, constant function and absolute value function) 2. Transcendental functions: trigonometric functions, properties of trigonometric functions, and the invers trigonometric functions.

Week 8	Exponential function, properties of the exponential function, and graph of exponential function.
Week 9	Logarithmic function, properties of the Logarithmic function, and graph of Logarithmic
Week 10	Hyperbolic trigonometric function, properties of the Hyperbolic trigonometric function, and invers of Logarithmic function.
Week 11	Limits: theorems of limits, sandwich theorem, and infinity as a limit.
Week 12	Continuity: continuity at an interior point, continuity at an end point.
Week 13	The continuity test: theorem II and theorem III.
Week 14	Applications: Velocity and acceleration and other rates of change.
Week 15	Final Exam

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	Ayres, F., & Mendelson, E. (2009). Calculus: Schaum's outlines.	yes
	G. Thomas & R. Finney, :Calculus and analytic Geometry.	
Recommended Texts	G. Stephenson: Mathematical Methods for Science Students. Longman hous,1981.	No
Websites	https://canterbury.libguides.com/math/websites	

Grading Scheme

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

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Course Description Form

Module Information

Module Title	Engineering Drawing	**Module Delivery**	
Module Type	B	☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	4		
SWL (hr/sem)	120		
Module Level		**Semester of Delivery**	
Administering Department	Fuel and Energy Techniques Engineering Department	**College**	AL-Huda University College
Module Leader	Adil Hatem Nawar	**e-mail**	adilhatem311@uoalhuda.edu.iq
Module Leader's Acad. Title	lecturer	**Module Leader's Qualification**	Dr.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date		**Version Number**	1

Relation with other Modules

Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	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	1- Define the Engineering Drawing - The Tools used in Engineering Drawing - Types of drawing sheets, types of lines 2- Introduction to AutoCAD and learning how to use the program interface 3- Learning how to use Draw toolbar and its content 4- Learning how to use modify toolbar and its content 5- Learning how to use dimension toolbar and its content and draw 2D exercises 6- Theory of projection, Theory of projection 1st angle 7- Theory of projection 3rd angle 7- Drawing the three projection views 8- Theory of Section and Drawing the three Section views 9- Learning 3D interface in AutoCAD and 3D tools, 3D exercises

Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in delivering this module is to courage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.
	YouTube channel for the teacher includes lessons to help the students in their studying https://www.youtube.com/channel/UCiUmlY4CLQn5ycY4von1P5g

Student Workload (SWL)			
Structured SWL (h/sem)	59	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	61	**Unstructured SWL (h/w)**	
Total SWL (h/sem)	120		

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

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Define the Engineering Drawing - The Tools used in Engineering Drawing - Types of drawing sheets, types of lines
Week 2	Introduction to AutoCAD and learning how to use the program interface
Week 3	Learning how to use Draw toolbar and its content
Week 4	Learning how to use Draw toolbar and its content
Week 5	Learning how to use modify toolbar and its content
Week 6	Learning how to use dimension toolbar and its content and draw 2D exercises
Week 7	Theory of projection, Theory of projection 1st angle
Week 8	Find the 3rd project view from 2 views

Week 9	Theory of projection 3rd angle
Week 10	Drawing the three projection views
Week 11	Theory of Section
Week 12	Drawing the three Section views
Week 13	Learning 3D interface in AutoCAD
Week 14	3D tools, 3D exercises
Week 15	**Final Exam**

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Engineering Drawings Booklet for the Baghdad Technical College of Engineering / Department of Engineering Materials Technology	yes
Recommended Texts	K. Venkata Reddy "Textbook of Engineering Drawing second edition" 2008	No
Websites	https://www.autodesk.com/	

Grading Scheme

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

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

Course Description Form

Module Information

Module Title	Computer Utilization 1		**Module Delivery**	
Module Type	S		**Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code				
ECTS Credits	4			
SWL (hr/sem)	120			
Module Level	UGI	**Semester of Delivery**	1	
Administering Department	Fuel and energy engineering techniques	**College**	AL-Huda University College	
Module Leader	Aseel Star Abdullah	**e-mail**	asil.sr@uoalhuda.edu.iq	
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	M.Sc.	
Module Tutor		**e-mail**	E-mail	
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	16/6/2023	**Version Number**	1	

Relation with other Modules

Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	Visual Basic The structure of VB is designed to allow programmers to use the environment to write executable files (exe files). Also, using VB, developers can create programs that can be utilized as a front end to databases. VB tools can help programmers develop applications or complete software while still allowing them to modify and revise their work accordingly. VB enables the rapid development of Windows based applications while also assisting in the access of databases by using ActiveX data objects (ADO) while allowing programmers to use ActiveX control and various objects.
Module Learning Outcomes	At the end of the module, students will be able to: For visual basic • Creation of the interface; • Creation of codes in the graphical environment; • The quick development of application; • Support in the development of games (commonly limited); • Easy to understand and use; • Very flexible and convenient.
Indicative Contents	The following is a list of topics that will be covered during this module: In a Visual Basic course, students might learn about the user interface, language syntax, program structure, and implementation of the programming language. The objective of such a course is to learn to create and use applications. To find out more about what a Visual Basic programming course teaches, read on.

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

Student Workload (SWL)

Structured SWL (h/sem)	59	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	61	**Unstructured SWL (h/w)**	6
Total SWL (h/sem)	120		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10%	2, 5, 9, 12	
	Assignments	1	10%		
	Projects / Lab.	1	10%	13	
	Report	1	10%		
Summative assessment	**Midterm Exam**	1hr	20%	7	
	Final Exam	2hr	40%	15	All
Total assessment			100%		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Visual Basic
Week 2	How to program in the Visual Basic language
Week 3	Features of the Visual Basic programming language
Week 4	Design practices of applications and Application programming
Week 5	Coding semantics and applications
Week 6	Introduction to Algorithm and flowcharts
Week 7	Introduction to Visual studio (introduction, symbols, types of flowcharts and exercises)
Week 8	Graphical user interface (toolbox and objects)
Week 9	Constants, variables, arrays, arithmetic operations, procedure and functions.
Week 10	Condition statements (If – Then)
Week 11	Loop statements (For – Next), (Do – While), (Exit loop) and (Stop statements)

Week 12	Debugging and Error Handling
Week 13	Mashed Error control, chart control and common dialog control
Week 14	Create applications for many subjects in the field of our study.
Week 15	Final Exam

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	The textbook for the Visual Basic computer applications curriculum at the Technical College of Engineering, Baghdad.	yes
Recommended Texts		no
Websites		

Grading Scheme

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

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

Course Description Form

Module Information

Module Title	**English language (1)**		**Module Delivery**	
Module Type	S		☒ **Theory** ☒ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code				
ECTS Credits	3			
SWL (hr/sem)	90			
Module Level	**UGI**	**Semester of Delivery**	**One**	
Administering Department	**Fuel and energy Engineering Techniques**	**College**	AL-Huda University College	
Module Leader	Ahmed Khaled Baraa	**e-mail**		
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	**M.Sc.**	
Module Tutor		**e-mail**		
Peer Reviewer Name	no	**e-mail**		
Scientific Committee Approval Date		**Version Number**		

Relation with other Modules

Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	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	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	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	
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)			
Structured SWL (h/sem)	45	**Structured SWL (h/w)**	3
Unstructured SWL (h/sem)	45	**Unstructured SWL (h/w)**	
Total SWL (h/sem)	90		

Module Evaluation

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

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Parts of speech, vocabulary and comprehension
Week 2	Verb to be, present simple, vocabulary and comprehension.
Week 3	Possessive adjective, possessives, verb to have, verb to do, vocabulary and comprehension.
Week 4	Definite Indefinite articles, pronouns, subject, object,
Week 5	This and that, expletive there, prepositions, vocabulary and comprehension
Week 6	Plurals, , expressions of quantity, , vocabulary and comprehension
Week 7	Simple past, modal verbs, auxiliary verbs,
Week 8	Question words, asking questions, vocabulary and comprehension.
Week 9	Negative and interrogative, I would like and I like, vocabulary and comprehension.
Week 10	Writing a composition, punctuation, vocabulary and comprehension.
Week 11	Present continues, vocabulary and comprehension
Week 12	Types of questions, (yes -no) questions and (wh) questions
Week 13	Simple past, vocabulary and comprehension
Week 14	Simple past, **revision**
Week 15	**Final Exam**

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Headway plus for beginners	Yes
Recommended Texts	Any Grammar and comprehension for technical learning	No
Websites	1- https://www.coursera.org/browse/physical-science-and-engineering/electrical-e ngineering 2- https://link.springer.com/book/10.1007/978-981-10-8624-3 3- https://progressivecollege.ie/courses/early-learning-and-care-qqi-level-5-major-award/?gad=1&gclid=EAIaIQobChMI_Nqu2tqA_wIVZ4VoCR2O0woLEAAYASAAEgI9Wv D_BwE	

Grading Scheme

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

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Course Description Form

Module Information					
Module Title	**Engineering workshops**			**Module Delivery**	
Module Type	B			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code					
ECTS Credits	6				
SWL (hr/sem)	**180**				
Module Level		1	**Semester of Delivery**		**1**
Administering Department		**Fuel and energy Engineering Techniques**	**College**	AL-Huda University College	
Module Leader	**Prof. Dr. Faiq Hamad Anter**		**e-mail**		
Module Leader's Acad. Title		**Engineers**	**Module Leader's Qualification**		**Dr.**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		15-6-2023	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	The student will be able to: 1. Using measuring tools, Using different kinds of hand tools, Getting a hand intelligent by applying a machining and Industrial operations. 2. Alloying, Contents of alloying workshops, Alloying sands and characteristics and Additives for improvement – Metals melts, Method of casting – Sand mold shaping, and Heat treatment. 3. Tools and machinery in the carpentry workshop, fundamental principles and types of wood and application samples preparation 4. Modes of car motor operation, Fuel feed pump and Electrical spark transfer device. 5. Pistons in cylinder as motion transfer device to the front, back wheels.
Module Learning Outcomes	1. Knowledge the different tools. Employed for surface preparation and methods of application correctly, Devices of measuring dimensions, Calipers, types and uses, Drill types and dimensions 2. Knowledge the measuring tools: Steel miler, Verner, Micrometer, Height & height gauge hand tools, Saws. 3. Knowledge the Hammers, Files, Scriber, Chisels, Taps and dies, Surface plate, Bench working. 4. Know the welding workshop content: Include recognition of tools, materials employed, Gas cylinder of oxy – Acetylene welding of surface – Electrical welding exercise and Welding spot. 5. Knowledge the Lathing Workshop content: lathe machine – Parts – Operation, Practice on longitudinal lathing – Making center – Puncturing, Making external teeth – Practice - Employing measuring tools–internal & external lath machining. 6. Knowledge the contents of alloying workshops. alloying sands and characteristics and Additives for improvement, metals melts, 7. Understanding the method of casting and Sand mold shaping 8. Understanding the Heat treatment. 9. Knowledge the carpentry tools. machinery in the carpentry workshop 10. Understanding the Fundamental principles and Types of wood and Knowledge the application samples preparation 11. Understanding the modes of car motor operation 12. Understanding the Fuel feed pump 13. Understanding the Electrical spark transfer device 14. Understanding the Pistons in cylinder as motion transfer device to the front, back wheels.
Indicative Contents	Indicative content includes the following: • Tools: Include recognition of different tools. Employed for surface preparation and methods of application correctly, Devices of measuring dimensions, Calipers, types and uses, Drill types and dimensions. (6 hr). • Measuring Tools: Steel miler, Verner, Micrometer, Height & height gauge hand tools, Saws. Hammers, Files, Scriber, Chisels, Taps and dies, Surface plate, Bench working. (6 hr). • Welding Workshop: Include recognition of tools, materials employed (6hr)

	• Gas cylinder of oxy – Acetylene welding of surface – Electrical.welding exercise and Welding spot(12hr) • Lathing Workshop: lathe machine – Parts – Operation. (6hr) • Practice on longitudinal lathing – Making center – Puncturing, Making external teeth – Practice - Employing measuring tools–internal & external lath machining. (12hr) • Alloying, Contents of alloying workshops, Alloying sands and characteristics and Additives for improvement – Metals melts. (6 hr) • Method of casting, Sand mold shaping, and Heat treatment. (6hr) • Tools and machinery in the carpentry workshop. fundamental principles, Types of wood and application samples preparation(12hr) • Modes of car motor operation, Fuel feed pump and Electrical spark transfer device. (6hr) • Pistons in cylinder as motion transfer device to the front, back wheels.(6hr)

Learning and Teaching Strategies

Strategies	Assessment is based on hand-in assignments, practical quizzes, reports, seminars, Practical testing.

Student Workload (SWL)

Structured SWL (h/sem)	90	**Structured SWL (h/w)**	6
Unstructured SWL (h/sem)	90	**Unstructured SWL (h/w)**	6
Total SWL (h/sem)	180		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
	Quizzes	6	10% (10)	2, 5, 8, 11,13,15	

Formative assessment	**Assignments**	6	10% (10)	2, 5, 8, 11,13,15	
	Projects /	6	10% (10)	Continuous	
	Report	1	10% (10)	14	
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	
	Final Exam	1hr	50% (50)	15	
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1-2	1. Tools: Include recognition of different tools. Employed for surface preparatio and methods of application correctly, 2. Devices of measuring dimensions, Calipers, types and uses, Drill types and di ensi 3. Measuring Tools: Steel miler, Verner, Micrometer, Height & height gauge ha d too Saws. Hammers, Files, Scriber , Chisels , Taps and dies , Surface plate , Bench working.
Week 3-5	1. Welding Workshop: Include recognition of Tools-Materials employed 2. Gas cylinder of oxy – Acetylene welding of surface – Electrical 3. welding exercise 4. Welding spot.
Week 6-8	1. Lathing Workshop: lathe machine – Parts – Operation 2. Practice on longitudinal lathing – Making center – Puncturing 3. Making external teeth – Practice - Employing measuring tools– 4. Internal & external lath machining.
Week 9-11	Alloying workshop 1. Alloying and contents of alloying workshops 2. Alloying sands, characteristics and Additives for improvement – 3. Metals melts and Method of casting 4. Sand mold shaping, and Heat treatment.
Week 12-13	Carpentry workshop 1. Tools and machinery in the carpentry workshop 2. Fundamental principles and Types of wood 3. Application samples preparation
Week 14-15	Car workshop 1. Modes of car motor operation, 2. Fuel feed pump 3. Electrical spark transfer device. 4. Pistons in cylinder as motion transfer device to the front, back wheels.

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	Practical training sheets	no
Recommended Texts		

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some erro s
	C - Good	جيد	70 - 79	Sound work with notable error
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomi gs
	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 ward
	F – Fail	راسب	(0-44)	Considerable amount of work equire

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for exar ple a of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a pol cy NO condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the a toma rounding outlined above.

Course Description Form

Module Information			
Module Title	**PRINCIPLES OF CHEMICAL ENGINEERING**	**Module Delivery**	
Module Type	C		☒ **Theory** ☐ **Lecture** ☒ **Tutorial** ☐ **Lab** ☐ **Practical** ☐ **Seminar**
Module Code			
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	1	**Semester of Delivery**	2

Administering Department	Fuel and Energy Techniques Engineering Department	**College**	AL-Huda University College
Module Leader	Rahma Dawod Salman	**e-mail**	
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	MSc
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date		**Version Number**	1

Relation with other Modules			
Prerequisite module	There is no prerequisite	**Semester**	-
Co-requisites module	There is no co- prerequisite	**Semester**	-

Module aims, learning outcomes and indicative contents	
module objectives	Course objectives will guide the participant to develop key concepts and techniques to design equipment in process plant. These key concepts can be utilized to make design and operating decisions, training, and development. Course such as these should be almost a requirement for engineers and can utilized as refresher for engineers with experience. 1. To introduce students, you to the principles concepts of thermal systems engineering using several contemporary applications. 2. To acquaint students with what material and energy balances are, and how to formulate and solve them. 3. To develop a fundamental understanding of chemical engineering processes. This objective is accomplished in three directions; • Conventional problems that reinforced students understanding of the basic concepts and principals (included in each lecture). • Most problems requiring significant numerical computations can be solved with a personal computer using either polymath or mathlab. • To develop creative skill. A number of homework problems have been included that are designed to enhance critical thinking skills.
Module learning outcomes	At the end of the course, the student will be able to: 1. As the design of the chemical process represents a productive and commercial goal, so we expect through this program that the engineer will be familiar with the most basic principles of chemical process engineering

	that he needs to reach the optimal design of the chemical process. 2. The student should be able to develop industrial, chemical or transformational processes used to produce and develop chemical, pharmaceutical and food products. 3. The engineer should be a pioneer in green engineering by choosing an economical and controlled chemical process without leaving an impact on the environment. 4. The ability to choose the industrial process and conduct a mathematical analysis to balance the materials and energies during it, its conditions, the chemicals used in it, and the equipment needed to complete it. 5. The ability to use some personal computer such as hysis, polymath and mathlab because some problems requiring significant numerical computations can be solved with these programs.
Indicative contents	**<u>Part one: introduction to chemical engineering processes</u>** 1. Introduction to chemical engineering processes (introductory aspect to chemical engineering, introductory aspect to chemical engineering industries, the plain of chemical process development) 2. Dimensions, units, and their conversion (units and dimensions, operations with units, conversion of units and conversion factors, force, dimensional consistency (homogeneity), significant figures) 3. Moles, density, and concentration (the mole, density, specific gravity, flow rate, mole fraction and mass fraction, analysis of multicomponent solutions and mixture, concentration) 4. Choosing a basis, teperature, pressure and its conversion (choosing a basis, temperature, pressure) **<u>Part two: material balance</u>** 5. Introduction to material balances/terminologies (the concept of a material balance, open and closed systems, steady-state and unsteady-state systems, multiple component systems) 6. General strategy for solving material balances (accounting for chemical reactions in material balances, material balances for batch and semi-batch processes, a general strategy for solving material balance problems) 7. Solving material balance problems for single units without reaction (analyze a problem statement, apply the general strategy for solving material balance problem) 8. The chemical reaction equation and stoichiometry (stoichiometry, stoichiometric coefficients terminology for applications of stoichiometry) 9. The chemical reaction equation and stoichiometry/ other terminologies (limiting and excess reactants, conversion and degree of completion, selectivity, yield) 10. Material balances for processes involving reaction by species material balances (species material balances for processes involving a single reaction, species material balances for processes involving multiple reactions) 11. Material balances for processes involving reaction by element material balances (element material balances for processes involving multiple reactions) 12. Material balances for single unit's processes involving combustion (terminologies of combustion, examples on combustion) 13. Material balances for processes involving recycle with out chemical reaction (introduction, recycle without chemical reaction) 14. Material balances for processes involving recycle with chemical reaction (recycle with chemical reaction, overall fraction conversion, single - pass

	fraction conversion) 15. Material balances for processes involving bypass and purg with and without chemical reaction

Learning and Teaching Strategies	
Strategies	Through the Chemical Process Engineering Curriculum-I, the student learns about the most important technologies used in chemical process engineering calculations for the purpose of operating production devices and thus for the entire chemical process, as well as energy conservation and rationalization, and thus realizing all the causes behind manufacturing problems. In this part of the course, the student learns how to apply the law of conservation of mass to elements, devices, and units by material balances for the quantities entering and leaving the device. The aim of these calculations is to calculate the capacity of the different units and to shorten the devices needed to measure and design these quantities. And all this is done in the absence or presence of a chemical reaction.

Student Workload (SWL) Calculated for 15 weeks			
Structured SWL (h/sem)	73	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	102	**Unstructured SWL (h/w)**	6
Total SWL (h/sem)	**175**		

Module Evaluation					
		Time /Number (hr)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	1	20% (20)	5, 10	LO 1 to 2
	Assignments	2	5% (5)	2,5,12	LO 1 to 4
	Special Problem	2	5% (5)	13	LO 4 to 5
Summative assessment	**Midterm Exam**	2	10% (10)	12	LO 1 to 4
	Final Exam	3	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction To Chemical Engineering Processes
Week 2	Dimensions, Units, And Their Conversion
Week 3	Moles, Density, And Concentration
Week 4	Choosing A Basis, Teperature, Pressure And Its Conversion
Week 5	Introduction To Material Balances/ Terminologies
Week 6	General Strategy For Solving Material Balances
Week 7	Solving Material Balance Problems For Single Units Without Reaction
Week 8	The Chemical Reaction Equation And Stoichiometry
Week 9	The Chemical Reaction Equation And Stoichiometry/ Other Termenologies
Week 10	Material Balances For Processes Involving Reaction By Species Material Balances
Week 11	Material Balances For Processes Involving Reaction By Element Material Balances
Week 12	Material Balances For Single Units Processes Involving Combustion
Week 13	Material Balances For Processes Involving Recycle With Out Chemical Reaction
Week 14	Material Balances For Processes Involving Recycle With Chemical Reaction
Week 15	Material Balances For Processes Involving Bypass And Purge With Out Chemical Reaction And With Chemical Reaction
Week 16	**Final Examination**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	D. M. Himmelbiau, J. B. Riggs. Basic Principles and Calculations in Chemical Engineering (7th Ed.), Practice Hall (2004).	Yes
Recommended Texts	-	-
Websites		

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

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

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

Course Description Form

Module Information					
Module Title	**Engineering Mechanics**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code					
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1 1		**Semester of Delivery**	2	
Administering Department	Fuel and energy Engineering Techniques		**College**	AL-Huda University College	
Module Leader	Prof. Dr. Faiq Hamad Anter		**e-mail**		
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	The goals of this course are to enable students to: 1. To understand and use the general techniques of force vectors and

	equilibrium of particle and rigid body 2. To understand and use the general techniques of structural analysis and internal force and friction 3. To be able to isolate and analyze a mechanical system using free body diagrams techniques 4. To understand and use the general ideas of center of gravity, centroids and moments of inertia
Module Learning Outcomes	By the end of successful completion of this course, the student will be able to: 1. An understand of the basic principles of mechanics and to apply them to different or new situations 2. An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium. 3. Knowledge of internal forces and moments in members. 4. An ability to calculate centroids and moments of inertia. 5. An ability to solve the problems involving dry friction in any mechanical system.
Indicative Contents	Indicative content includes the following. 1. Review of force System: Force, rectangular components, moment, resultant couple (two and three dimensional systems). 2. Equilibrium: Mechanical systems, isolation and equilibrium conditions for two and three dimensional systems. 3. Structures: Plane trusses, method of joints, method of sections, frames. 4. Friction: Types of friction, dry friction, application of friction. 5. Centre forms: Centre of gravity, moment of inertia of the space

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

Student Workload (SWL) Calculated for 15 weeks			
Structured SWL (h/sem)	73	**Structured SWL (h/w)**	2
Unstructured SWL (h/sem)	77	**Unstructured SWL (h/w)**	2
Total SWL (h/sem)	**100**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (20)	3 and 10	LO #1, #2 and #3, #4,#5
	Assignments	1	5% (5)	2 and 12	LO #1, #2 and #3, #4,#5
	Projects.Lab	1	0% (0)	2-14	
	Report	1	0 % (0)	1-15	
Summative assessment	**Midterm Exam**	2hr	15% (15)	7	LO #1, #2 and #3
	Final Exam	3hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Units, Force Systems & Resultant, Components of Force, Vectors
Week 2	Rectangular Components in Space
Week 3	Rectangular Components in Space
Week 4	Quiz
Week 5	Vector Products, Moment of forces, Rectangular Components of a Moment
Week 6	Rectangular Components of a Moment, Moment of a Couple, Couple Vectors
Week 7	First Exam
Week 8	Rigid Bodies: Equivalent Systems: Resultants
Week 9	Rigid Bodies: Equivalent Systems: Resultants
Week 10	Rigid Bodies: Equivalent Systems: Resultants
Week 11	Progress Exam
Week 12	Analysis of Structure: Frames & Machines
Week 13	Analysis of Structure: Trusses
Week 14	Centre of Area
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	"Vector Mechanics for Engineers, Static and Dynamics" Beer. Ninth Addition	Yes
Recommended Texts	1 – ENGINEERING MECHANICS STATICS, HIGDON 2- ENGINEERING MECHANICS: STATIC, HIBBLER	Yes
Websites	-	

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

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

Course Description Form

Module Information			
Module Title	Mathematic II	**Module Delivery**	
Module Type	B	☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	**Semester of Delivery**	2
Administering Department	Fuel and energy Engineering Techniques	**College**	AL-Huda University College
Module Leader	Nazim Rajab Tawfiq	**e-mail**	
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	M.Sc.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	

Scientific Committee Approval Date		**Version Number**	…..

Relation with other Modules			
Prerequisite module	Mathematics 1	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	By the end of successful completion of this course, the student will be able to: 1. Evaluate of definite, indefinite and improper integrals by using different integration techniques. 2. Determine arc length, surface area and volume by using the applications of integration techniques. 3. Define polar coordinate graphs and solve related problems including area, arc length and volume. 4. Identify the properties of sequences and their limits with identifying standard convergent operations of power series.
Module Learning Outcomes	1. Fundamentals of Integrals. 2. Definite and indefinite integrals. 3. Integration techniques -integration by parts. 4. Integration techniques- trigonometric integrals. 5. Integration techniques- partial fractions. 6. Applications of integrals- arc length and surface area. 7. Applications of integrals- volumes (Disk, Washer, Shell). 8. Polar coordinates - common polar coordinate graphs. 9. Polar coordinates - tangents with polar coordinates, curves defined by parametric equations. 10. Principles of sequences and series.
Indicative Contents	

Learning and Teaching Strategies	
Strategies	The most important strategies that will be adopted in delivering this module are: - Allow students to actively participate in the learning process with class discussions and exercises that support the initiative. - Incorporate flexible seating into my classroom - Knowledge application and Extended critical thinking - **Do Summative Assessments** Occurs at end of chapter - **Do** Formative Assessment occurs through chapter to Covers complete content areas

	- Case-Based Learning.

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

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (20)	4, 9	LO # 1, 2,3,9 and 10
	Assignments	2	5% (5)	3, 12	LO # 4,5 and 6
	Report	1	5% (5)	13	LO # 7 and 8
	Midterm Exam	3 hr	10% (10)	7	LO # 1-7
Summative assessment	**Final Exam**	3 hr	50% (60)	16	All

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Integral
Week 2	Integral
Week 3	Integration Techniques -Integration by Parts.
Week 4	Integration Techniques- Trigonometric Integrals.
Week 5	Integration Techniques- Partial Fractions
Week 6	**Exam**
Week 7	Applications of Integrals-Infinite Integral,Areas
Week 8	Applications of Integrals- Arc Length, Surface area
Week 9	Applications of Integrals- Volumes (Disk, Washer, Shell)
Week 10	Polar Coordinates - Common Polar Coordinate Graphs
Week 11	Polar Coordinates - Tangents with Polar Coordinates, Curves defined by parametric equations.
Week 12	**Exam**
Week 13	Sequences and Series
Week 14	Sequences and Series
Week 15	**Final Exam**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. Stewart, J., Clegg, D. K., & Watson, S. (2020). Calculus: early transcendentals. Cengage Learning.	
Recommended Texts	2. Thomas, G. B., Haas, J., Heil, C., & Weir, M. (2018). Thomas' Calculus. Pearson Education Limited.	
Websites		

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

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

Course Description Form

Module Information					
Module Title	**Human Rights & Democracy**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code					
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	1 1		**Semester of Delivery**	2	
Administering Department			**College**	Engineering	
Module Leader	Basim Abd Hamad		**e-mail**		
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	15/06/2023		**Version Number**	1	

Relation with other Modules			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	This course is designed to give the student a definition of human rights and democracy idiomatically, the legitimacy of the origin of the right in the view of Islamic law, the pillars of the right and its types, personal freedom, intellectual freedom, economic rights and freedoms, Islam and slavery, the goals of human rights, the use of freedom and the general legitimate right, the right of a Muslim to His Muslim brother, the rights of parents, the right neighbor, the right of women, human rights in the divine religions, religious tolerance in Islam. thinking skills 1. Work on developing the intellectual property of the student. 2. Ensuring the student's personal development at the academic level. 3. Drawing ways of intellectual success to achieve personality building on the (family, social, academic, and professional) levels. 4. Learn the art of dealing with the above character building levels.
Module Learning	1. Explain the concept of "human rights and democracy"

Outcomes	2. The status of human rights and freedoms in Islam 3. Define and describe the relationship between human rights and democracy
Indicative Contents	**Course Topics:** 1. Introducing human rights, democracy and the principle of freedoms. [Two hours] 2. The origin of right and freedom from the point of view of Islamic law, and the general concept. [3 hours] 3. Elements and types of human rights and freedoms. [8 hours] 4. Economic and political rights and freedoms. [3 hours] 5. Islam and slavery. [1 hour] 6. The objectives of human rights and democracy. [4 hours] 7. The project of using freedom and public right. [2 hours] 8. The right of a Muslim and humanity. [2 hours]

Student Workload (SWL)			
Structured SWL (h/sem)	33	**Structured SWL (h/w)**	2
Unstructured SWL (h/sem)	17	**Unstructured SWL (h/w)**	1
Total SWL (h/sem)	50		

Learning and Teaching Strategies	
Strategies	Raise the intellectual level of students, which is the importance of human rights when it is reflected on the individual, society and the state

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	3, 10	LO #4, 6, 8 and 10
	Assignments	0			
	Projects / Lab.	0			
	Report	2	10% (10)	13	LO # 5, 7 and 13
Summative assessment	**Midterm Exam**	2 hr	20% (20)	7	LO # 1-7
	Final Exam	3hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	The Universal Declaration of Human Rights and other countries speak of human rights over the individual, society and the state. Clarifying the meaning of right, duty, responsibility and guarantees of human rights before the judiciary.
Week 2	Sections of human rights in law and Sharia, statement of the rights of God Almighty and guarantees of human rights. It includes sections of the rights of the individual over society such as the right to protect life, honor and mind, and the right to protect money and property.
Week 3	The right to equality before the law and the right to equality and justice among individuals. The right of the individual to work, learn, express his opinion and freedom of thought.
Week 4	Clauses of preserving the freedoms contained in the Universal Declaration of Human Rights, and the impact of the study. Explanation of the meaning of freedom and democracy and the types and divisions of freedoms.
Week 5	Freedoms related to the material rights of an individual, including personal freedom. Freedoms related to the material rights of an individual, including civil liberties.
Week 6	Freedom of movement, residence and ownership. Freedoms related to the moral rights of the individual.
Week 7	Mid-term Exam + Unit-Step Forcing, Forced Response, the RLC Circuit.
Week 8	Statement of the sanctity of the home and the right of the individual to move. The rights of society over the individual include the right to freedom of belief and life, the right to honor protection, work and education.
Week 9	Ensuring equality before the law and the judiciary, freedom of opinion and thought, and protection of the mind The right to protection of property and travel.
Week 10	The rights of the individual over the individual, including social rights. Financial rights and its importance in ensuring social life.
Week 11	Finally, emphasizing the importance of commitment to applying human rights and their impact on the individual, society and the state.
Week 12	Freedom of belief, freedom of opinion and expression, and freedom of education. Political freedom, the culture of dialogue and its impact on proving freedom of opinion.
Week 13	One of the heroes of enslaving people and proving freedom for individuals. Highlighting the freedom of women and beautifying them in adhering to the teachings of faith and proving the importance of applying the principle of freedoms among individuals.
Week 14	Individual and international interest in applying the principle of freedoms. Rights and freedoms are two interrelated principles. The role of the individual, society and the state in establishing the principle of human rights and freedoms. And a statement of the negatives in the event of non-application of the principle of freedoms.
Week 15	Iraq and international treaties in the field of human rights and Iraq's position in eliminating dictatorship and racism and work to preserve public rights and public money and eliminate financial and administrative corruption.
Week 16	Preparatory week before the final Exam.

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Lectures on human rights, freedoms and democracy	Yes
Recommended Texts	1. Human rights and freedoms. Prof. Dr. Mustafa Al-Zalmi. 2. Some contemporary published research involving human rights and books on the Universal Declaration of Human Rights	Yes
Websites		

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

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

Course Description Form

Module Information		
Module Title	**Organic Chemistry**	**Module Delivery**
Module Type	**C**	☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**
Module Code		
ECTS Credits	**7**	
SWL (hr/sem)	**175**	

Module Level	1 1	**Semester of Delivery**	2
Administering Department	Fuel and Energy Techniques Engineering Department	**College**	Al-Huda University College
Module Leader	Dr. Maher Abdul Rahim Muhaimid	**e-mail**	
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	PhD
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	01/06/2023	**Version Number**	1.0

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	The goals of this course are to enable students to: 1. explore the scope of organic chemistry and its importance to chemical engineering education. 2. Provide a thorough understanding and principles of organic chemistry. 3. Provide a thorough understanding practical applications of chemical and chemical properties of aliphatic organic compounds, aromatic organic compounds. Preparation and reaction of Organic compounds.
Module Learning Outcomes	By the end of successful completion of this course, the student will be: 1. Able to differentiate between different types of organic materials and structures. 2. Able to relate materials properties and performance to the structure. 3. Able to demonstrate knowledge about Bonding and isomerism. Alkanes and cycloalkanes. Alkenes and alkynes. 4. Understanding different property of organic and aromatic material. 5. Apply physics and chemistry to relate materials structure to their properties.
Indicative Contents	Indicative content includes the following.

	1. Introduction & Classification Organic Chemistry. Recognize chemical safety and hazardous materials icons, and apply laboratory safety rules. 2. Introduction & Classification Organic Chemistry. Aliphatic compounds. Describe laboratory instruments and some basic techniques used in the chemistry laboratory, including balances and standard volumetric equipment. 3. Alkyl halides properties, preparation and reactions. Describe and use UV/VIS spectrophotometric methods of analysis**.** 4. Bonding and isomerism. Describe how to Prepare accurate laboratory reports. of their experimental results 5. Alkanes and cycloalkanes. (Physical properties, nomenclature, preparing, Reactions 6. Alkanes and cycloalkanes (Physical properties, nomenclature, preparing, Reactions. 7. Alkenes. (Physical properties, nomenclature, preparing, Reactions 8. Alkynes (Physical properties, nomenclature, preparing, Reactions. 9. Aromatic compounds. (Physical properties, nomenclature, preparing, Reactions 10. Aromatic compounds. (Physical properties, nomenclature, preparing, Reactions 11. phenols and thiols. (Physical properties, nomenclature, preparing, Reactions. 12. Ethers. (Physical properties, nomenclature, preparing, Reactions 13. Aldehydes and ketones. (Physical properties, nomenclature, preparing, Reactions 14. Carboxylic acids and their derivatives. (Physical properties, nomenclature, preparing, Reactions). 15. Amines, (Physical properties, nomenclature, preparing, Reactions).

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

Student Workload (SWL) Calculated for 15 weeks			
Structured SWL (h/sem)	115	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	60	**Unstructured SWL (h/w)**	6

Total SWL (h/sem)	**175**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	20% (20)	3 and 10	LO #1, #2 and #3, #4
	Presentation	1	10% (10)	2 and 12	LO #5, #6
	Projects / Lab.	1	10% (10)	Continuous	LO #1, #2 and #3, #4
	Report	0	0 % (0)	-	-
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1, #2 and #3, #4, #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction & Classification Organic Chemistry.
Week 2	names of organic compounds.
Week 3	Aliphatic compounds.
Week 4	alkyl halides properties, preparation and reactions.
Week 5	Alkanes and cycloalkanes
Week 6	Alkanes and cycloalkanes
Week 7	Alkenes
Week 8	Alkynes
Week 9	Aromatic compounds
Week 10	Alcohols
Week 11	Ethers and epoxies
Week 12	Amines
Week 13	Aldehydes and ketones.
Week 14	Carboxylic acids and their derivatives
Week 15	**Preparatory week before the final Exam**

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

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. Morrison, R. Thornton; Boyd, R. Neilson "Organic Chemistry" 6th edition, 2001.	Yes
Recommended Texts	-William H. Brown, Introduction to Organic Chemistry, Second Edition, John Wiley and Sons, INC., U. S. A. 2002.	No
Websites	Chemistry 3 by Andrew Burrows: 2nd edition	

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

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

Course Description Form

Module Information				
Module Title	**Arabic Language**		**Module Delivery**	
Module Type	**S**		☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code				
ECTS Credits	**2**			
SWL (hr/sem)	**50**			
Module Level	1	**Semester of Delivery**	1	
Administering Department	Fuel and Energy Techniques Engineering Department	**College**	AL-Huda University College	
Module Leader	Basim Abd Hamad	**e-mail**		
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	PhD	
Module Tutor		**e-mail**	E-mail	
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	15/06/2023	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	This course aims to build students' knowledge and competence in the Arabic language, rhetoric, and Arabic literature of all kinds, to increase their ability to appreciate literature and develop their awareness of its concepts through the study of poetry, novels, and short stories. story. C- thinking skills: 1. Work on developing the intellectual property of the student. 2. Ensuring the personal development of the student at the academic level.
`Module Learning Outcomes	1. Develop academic essay writing proficiency

	2. Apply reading skills 3. Expand academic vocabulary through reading 4. Improve critical thinking skills 5. Developing the student's intellectual property in the field of the Arabic language, to acquire verbal and actual ability and skill.
Indicative Contents	Study the text of the Quran and analyze its language, spelling, and rules. [5 hrs] the rules of writing the hamza, Written verbatim by Arab and of number and numerical adjective. [15 hrs] punctuation. [5 hrs] the method of detection for words in Arabic Dictionaries, the applications of grammar and language- the actor and his deputy, Debutante and the news Acts missing, The case and exception. [10 hrs] Ancient literary studies, Definition of literature and its importance, Ages historical Arabic literature – Modern Literary Studies, Study the texts of poetic eras (pre-Islamic, Islamic, Umayyad, Abbasid, Andalusia), Study of ancient prose texts (speeches, messages), examine the texts of modern poetry and contemporary, examine the texts of modern prose (drama, novel, article). [10 hrs

Learning and Teaching Strategies	
Strategies	Raise the students' linguistic level, and build their intellectual progress by highlighting the importance of the Arabic language in their lives as their mother tongue.

Student Workload (SWL)			
Structured SWL (h/sem)	33	**Structured SWL (h/w)**	2
Unstructured SWL (h/sem)	17	**Unstructured SWL (h/w)**	1
Total SWL (h/sem)	50		

Module Evaluation

		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	4, 10	LO #4, 6, 8 and 10
	Assignments	2			
	Projects / Lab.	1			
	Report	1	10% (10)	13	LO # 5, 8 and 13
Summative assessment	**Midterm Exam**	2 hr	20% (20)	7	LO # 1-7

	Final Exam	3hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Arabic grammar
Week 2	Arabic grammar
Week 3	Arabic grammar, Arabic grammar, its importance and place in the language.
Week 4	Arabic grammar, Hamza al-Wasl sites and parts.
Week 5	Dictionaries of the Arabic language, And ways to reveal the meanings of words in dictionaries
Week 6	The rules of number and number, the rule of distinguishing the number and its formulation, the definition of the number and how to read it
Week 7	Mid-term Exam + Unit-Step Forcing, Forced Response, the RLC Circuit
Week 8	Arabic literature / the most prominent features and characteristics of Arabic literature.
Week 9	Arabic literature / Historical eras of Arabic literature.
Week 10	Arabic literature / **The novel and its elements.**
Week 11	Rhetoric/ Truth and metaphor.
Week 12	Rhetoric/ The arts of rhetoric
Week 13	Rhetoric/ The arts of rhetoric
Week 14	Rhetoric/ Poetry / Muallaqat poets and some contemporary poets.
Week 15	Rhetoric/ Poetry / Muallaqat poets and some contemporary poets.
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Lectures in the Arabic language.	Yes
Recommended Texts	Meanings of grammar / Prof. Dr. Fadel Al-Samarrai	No
Websites		

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria

Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

Course Description Form

Module Information

Module Title	**Mass Balance and Energy Balance**	**Module Delivery**	
Module Type	**C**	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	**6**		
SWL (hr/sem)	**150**		

Module Level	2	**Semester of Delivery**	1
Administering Department	Fuel and energy engineering techniques	**College**	AL-Huda University College
Module Leader	Yassen Mahmood Tayib	**e-mail**	yaseen.m@uoalhuda.edu.iq
Module Leader's Acad. Title	Ass. Lecturer	**Module Leader's Qualification**	MSc
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	15/06/2023	**Version Number**	1.0

Relation with other Modules

Prerequisite module	Principles of chemical engineering	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Objectives	The goals of this course are to enable students to: 1. Scientific reasoning and quantitative analysis. Our majors will be able to apply chemical concepts to solve qualitative and quantitative problems. 2. Laboratory practice and safety. In order to learn the ways in which new scientific knowledge is created, our majors will experience how chemists interpret chemical and physical phenomena through experimental investigation. They will develop and apply the appropriate lab skills and instrumentation to solve chemical problems.
Module Learning Outcomes	By the end of successful completion of this course, the student will be able to: 1. Define the structure of atoms in terms of the nucleus with protons, neutrons, & electrons. 2. Write and balance chemical equations, name inorganic compounds and ions and describe the properties of the main group elements. 3. Carry out chemical calculations, including mass relations in chemical reactions, limiting reagent & reaction yield calculations, and calculations of reactions taking place in solution. 4. Understand the concept of oxidation-reduction, calculate oxidation numbers, and balance redox reactions. 5. Apply the ideal gas law in solving problems involving the gas phase 6. Solve problems in chemical thermodynamics and calorimetry. 7. Predict the electronic structure of atoms and ions from quantum theory, and9) relate the position of an element in the periodic table to its electronic structure and to the physical and chemical properties of the elements. 8. Describe the principles of chemical bonding and write Lewis structures. 9. Predict the geometry of the electron pairs and the shape of molecules using VSEPR theory, predict bond polarity and molecular dipoles. 10. Describe the valence bond theory, predict the hybridization of atoms in molecules, and describe bonding in molecules with single, double and triple bonds in terms of and π bonds, and delocalized molecular orbitals.
Indicative Contents	Indicative content includes the following. Part A: 1- Handling Numbers. Dimensional Analysis in Solving Problems Recognize chemical safety and hazardous materials icons 2- Atomic Number. Mass Number. and isotopes. The Periodic Table. Molecules and Ions. Describe laboratory instruments and some basic techniques used in the chemistry laboratory, including balances and standard volumetric equipment 3- Chemical Formulas. Naming Compounds. Atomic Mass. Vogadro's number and Molar Mass of an Element.

	4- Chemical Reactions and Chemical Equations. 5- Describe how to Prepare accurate laboratory reports of their experimental results; Amounts of Reactants and Products; limiting Reagent Calculations; Reaction Yield; General Properties of Aqueous Solutions. Precipitation Reactions. Acid-Base Reactions; Oxidation-Reduction Reactions; Concentration of Solutions. 6- Acid-Base Titrations, Cases Pressure. 7- The Ideal Gas Equation; Gas Stoichiometry; Partial Pressures; The Nature of Energy and types of energy 8- Energy Changes in Chemical Reactions; introduction to Thermodynamics. Enthalpy of Chemical Reactions; Calorimetry; 9- Standard Enthalpy of Formation and Reaction from Classical Physics to Quantum Theory; Bohr's Theory of the Hydrogen Atom; Quantum Numbers; Atomic OrbitalsElectron Configuration; 10- Development of the Periodic Table; Periodic Classification of the Elements; Periodic Variation in Physical Properties; Ionization Energy; Electron Affinity Lewis Dot Symbols; The ionic Bond; The Covalent Bond; Electro negativity; Writing Lewis structure Formal Charge and Lewis Structures. 11- The Concept of Resonance. Exceptions to the Octet Rule Bond Energy 12- Molecular Geometry; Dipole Moment; Spectrophotometric Analysis of tetracycline; Valence Bond Theory. Hybridization of Atomic Orbital's. Hybridization in Molecules Containing Double and Triple Bonds. Delocalized Molecular Orbital's Part B: 1- Types of analysis in analytical chemistry and their uses. Units for expressing concentration. 2- preparing solutions, standard solution, amounts of reactants and products. 3- Chemical equilibrium and reversible reactions, thermodynamics & chemical equilibrium 4- Equilibrium constants for chemical reactions. 5- Describe how to Prepare accurate laboratory reports of their experimental results 6- Equilibrium constants for chemical reactions 7- Electrochemistry, relationship between cell potential and the equilibrium constants relationship between ΔG, K, and E0 cell . the Nernst equation. 8- Volumetric analysis their uses and classification, titrimetric analysis calculations. 9-Acid-base titration 10- Precipitation titration 11- Complexometric titration 12- Oxidation-reduction titration 13- Gravimetric analysis. 14- Introduction and applications of industrial analysis method.

Learning and Teaching Strategies

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

Student Workload (SWL)
Calculated for 15 weeks

Structured SWL (h/sem)	73	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	77	**Unstructured SWL (h/w)**	6
Total SWL (h/sem)	**150**		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	3 and 10	LO #1, #2 and #3, #4
	Assignments	1	10% (10)	2 and 12	LO #5, #6
	Projects / Lab.	1	10% (10)	Continuous	LO #1, #2 and #3, #4
	Report	0	0 % (0)	-	-
Summative assessment	**Midterm Exam**	2hr	20% (20)	7	LO #1, #2 and #3, #4, #5
	Final Exam	3hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	MEASUREMENTS IN CHEMISTRY
Week 2	Problem Solving in Chemistry - Dimensional Analysis
Week 3	Atoms, Molecules and Ions
Week 4	Mass Relationships in Chemical Reactions
Week 5	Reactions in Aqueous Solutions
Week 6	Gasses
Week 7	Thermochemistry
Week 8	Quantum Theory and the Electronic Structur of Atoms
Week 9	Chemical Bonding
Week 10	Electrochemistry
Week 11	Volumetric Methods of Analysis
Week 12	Titrations Based on Acid-Base Reactions
Week 13	Titrations Based on Precipitation Reactions
Week 14	Titrations Based on Complexation Reactions
Week 15	**Titrations Based on Redox reactions**
Week 16	**Gravimetric Methods of Analysis**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Introductory Chemistry Essentials, Nivaldo J. Tro	

Recommended Texts	Chemistry. Steven S. Zumdahl, Susan A. Zumdahl, Donald J. DeCoste	
Websites		

Grading Scheme

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

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

Course Description Form

Module Information

Module Title	**Thermodynamic I**	**Module Delivery**	
Module Type	C	☒ **Theory** ☒ **Lecture** ☒ **Tutorial** ☒ **Lab** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	**Semester of Delivery**	1
Administering Department	Fuel and energy engineering techniques	**College**	AL-Huda University College
Module Leader	Noor Shafiq Obiad	**e-mail**	
Module Leader's Acad. Title	Ass. Lecturer	**Module Leader's Qualification**	MSc
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	15/06/2023	**Version Number**	1

Relation with other Modules

Prerequisite module		**Semester**	
Co-requisites module	There is no co- prerequisite	**Semester**	-

Module Aims, Learning Outcomes and Indicative Contents

Module Objectives	Course objectives will guide the participant to develop key concepts and techniques to design equipment in development process plant. These key concepts can be utilized to make design and operating decisions, training, and. Course such as these should be almost

	a requirement for engineers and can utilized as refresher for engineers with experience. ❖ To introduce students to the principles concepts of thermal systems engineering using several contemporary applications. ❖ Enable students to gain access to the science of thermodynamics by understanding how engineering analysis is done How to deal with laws, equations, illustrations, and other data, and link the data to reach the outputs and enable the student to be able to analyze, elicit and draw conclusions ❖ Enable students to gain access to the science of thermodynamics by understanding how engineering analysis is done
Module Learning Outcomes	At the end of the course, the student will be able to: 1. As the design of the chemical process represents a productive and commercial goal, so we expect through this program that the engineer will be familiar with the most thermal systems engineering that he needs to reach the optimal design of the chemical process. 2. That the student be able to distinguish between engineering thermal systems and the mechanism of linking them and their uses in the field of applied work. 3. The chemical engineer has the ability to differentiate between the laws of engineering thermodynamics and apply them mathematically and physically in the treatment and design of practical applications. 4. The engineer should be a pioneer in green engineering by choosing an economical and controlled Design without leaving an impact on the environment.

Indicative Contents	1. What is thermal systems engineering? 2. Getting started in thermodynamics: introductory concepts and definitions 3. Concepts of unit and dimention and fundemental variables 4. Using energy and the first law of thermodynamics/mechanical concepts of energy 5. Energy and the first law of thermodynamics/broadening our understanding of mechanical work 6. Evaluating properties of pure substance 7. The first law of thermodynamics for closed systems 8. The first law of thermodynamics for open systems ((introduction, conservation of mass for a control volume open systems) 9. The first law of thermodynamics for open systems conservation of energy for a control volume open systems) 10. General applications of the first law of thermodynamics for open systems (nozzles and diffusers, turbines, compressors and pumps) 11. General applications of the first law of thermodynamics for open systems (throttling devices, heat exchangers evaporator, condenser, and boiler) 12. The ideal gase laws and ideal gas mixtures (the ideal gas laws 13. The real gase laws and real gas mixtures (compressibility) 14. The real gase laws and real gas mixtures (equation of state)

earning and Teaching Strategies	
Strategies	The objective of this course is to organize the ideas of students about energy into forms suitable for engineering analysis. The presentation begins with a review of energy concepts from mechanics. The thermodynamic concept of energy is then introduced as an extension of the concept of energy in mechanics. The student studies energy and its transformations and the relationship between the properties of physical materials that are affected by these transformations from an engineering point of view, which takes into account the linkage between fluid mechanics, heat transfer and energy sources, as well as preparing the student to use engineering thermodynamics in his engineering practices effectively and successfully. Accurate proofs are used in these lectures to enable students to tackle various design issues to explore the wonders of this exciting science.

Student Workload (SWL) **Calculated for 15 weeks**			
Structured SWL (h/sem)	73	**Structured SWL (h/w)**	6

Unstructured SWL (h/sem)	52	**Unstructured SWL (h/w)**	4
Total SWL (h/sem)	**125**		

Module Evaluation

		Time /Number (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	1	20% (20)	5, 10	LO 1 to 2
	Assignments	2	5% (5)	2,5,12	LO 1 to 4
	Lab.	2	10% (10)	13	LO 4
	Tutorials	2	5% (5)		
Summative assessment	**Midterm Exam**	2	10% (10)	12	LO 1 to 4
	Final Exam	3	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	what is thermal systems engineering?
Week 2	getting started in thermodynamics: introductory concepts and definitions
Week 3	concepts of unit and dimention and fundemental variables
Week 4	using energy and the first law of thermodynamics/mechanical concepts of energy

Week 5	energy and the first law of thermodynamics/broadening our understanding of mechanical work
Week 6	evaluating properties of pure substance
Week 7	the first law of thermodynamics for closed systems
Week 8	the first law of thermodynamics for open systems
Week 9	the first law of thermodynamics for open systems conservation of energy for a control volume open systems)
Week 10	general applications of the first law of thermodynamics for open systems
Week 11	general applications of the first law of thermodynamics for open systems (nozzles and diffusers, turbines, compressors and pumps)
Week 12	the ideal gase laws and ideal gas mixtures
Week 13	the real gase laws and real gas mixtures
Week 14	the real gase laws and real gas mixtures (equation of state)
Week 15	what is thermal systems engineering?
Week 16	**final examination**

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	***1.*** J. M. Smith, H.C.Van Ness, M.M. Abbott ***(Introduction to Chemical Engineering Thermodynamics) ,*** Seventh Edition, McGraw- Hall (2005) ***2.*** J.W. Tester, M. Modell, (***Thermodynamics and its Application),*** 3rd Edition, Printice Hall, (1997)	Yes
Recommended Texts	-	-
Websites		

Grading Scheme

Group	**Grade**	التقدير	**Marks %**	**Definition**

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

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

Course Description Form

Module Information

Module Title	**Physical Chemistry**	**Module Delivery**	
Module Type	**C**	☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	**6**		
SWL (hr/sem)	**150**		

Module Level	2	**Semester of Delivery**	1
Administering Department	Fuel and Energy Techniques Engineering Department	**College**	Al-Huda University College
Module Leader	Dr. Maher Abdul Rahim Muhaimid	**e-mail**	
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	P.hD
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	15/06/2023	**Version Number**	1.0

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	The goals of this course are to enable students to: 3. explore the scope of physical chemistry and its importance to chemical engineering education. 4. develop a fundamental understanding of the basic principles of physical chemistry. 5. develop problem-solving ability based on relevant laws, mathematical equations and graphical relationships.
Module Learning Outcomes	By the end of successful completion of this course, the student will be: 6. able to demonstrate an understanding of gas behavior using different equations of state and kinetic molecular model. 7. able to demonstrate an understanding of thermodynamics laws and their applications. 8. able to demonstrate knowledge about kinetics laws, define the rate of reaction and the rate constant. 9. skilled in problem solving and analytical reasoning as applied to scientific problems. 10. recognize how catalysts work in homogeneous and heterogeneous catalysis. 11. summarize what is meant by Nanotechnology and how we characterize them.
Indicative Contents	Indicative content includes the following. <u>Part A - Thermodynamics</u> 1. Introduction to Physical Chemistry 2. Review of gas behavior from both theory and empirical viewpoints - The perfect gas: states of gases, the gas laws - Real gases: the Van der Waals equation 3. The First law of Thermodynamics: the basic concepts - Work, heat, energy - The Internal energy - Expansion work - Heat transactions (Heat Capacities) - Enthalpy - Adiabatic changes 4. Thermochemistry - Standard enthalpy changes - Standard enthalpies of formation - The temperature dependence of reaction enthalpies

	5. The Second law of Thermodynamics - The dispersal of Energy - Entropy - Entropy change accompanying specific processes (Expansion, Phase transition, Heating) 6. The Third law of Thermodynamics: - The Nernst theorem - The Third law Entropies 7. Gibbs Free Energy (and Helmholtz Free Energy) - Criteria of spontaneity - Maximum work - Maximum non-expansion work - Standard molar Gibbs energies - (Properties of the Gibbs Energy [23 hrs] **Part B – Chemical Kinetics** 1. Chemical equilibrium 2. Chemical Kinetics: - The rates of reactions (a) The definition of rate (b) Rate laws and rate constants (c) Reaction order (d) The determination of the rate law - Integrated rate laws (a) First-order reactions (b) Second-order reactions - The Arrhenius equation (a) A first look at the energy requirements of reactions (b) The effect of a catalyst on the activation energy 3. Transport in Gases (definitions) - Diffusion - Effusion 4. Motion of liquids - Liquid viscosity - (electrolyte solutions) 5. Electrical conductance 6. Electrolytes 7. Catalysis: Homogeneous & Heterogeneous Catalysts definitions 8. Nanotechnology in Chemical Engineering. [22 hrs]

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

	that are interesting to the students.

Student Workload (SWL)

Calculated for 15 weeks

Structured SWL (h/sem)	101	**Structured SWL (h/w)**	6
Unstructured SWL (h/sem)	49	**Unstructured SWL (h/w)**	4
Total SWL (h/sem)	**150**		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (20)	3 and 10	LO #1, #2 and #3, #4
	Presentation	1	10% (10)	2 and 12	LO #5, #6
	Projects / Lab.	1	10% (10)	Continuous	LO #1, #2 and #3, #4
	Report	0	0 % (0)	-	-
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1, #2 and #3, #4, #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Physical Chemistry
Week 2	Review of gas behavior from both theory and empirical viewpoints
Week 3	The First law of Thermodynamics 1: the basic concepts (Work, heat, energy, the Internal energy)
Week 4	The First law of Thermodynamics 2: Expansion work, Heat transactions (Heat Capacities), Enthalpy
Week 5	Thermochemistry: **(i)** Enthalpies of Physical Changes. **(ii)** Enthalpies of Chemical Change
Week 6	The Second law of Thermodynamics: The dispersal of Energy, Entropy and Entropy change accompanying specific processes (Expansion, Phase transition, Heating)
Week 7	The Third law of Thermodynamics: The Nernst theorem, The Third law Entropies
Week 8	Gibbs Free Energy (and Helmholtz Free Energy): Criteria of spontaneity, Maximum work , Maximum non-expansion work, Standard molar Gibbs energies (Properties of the Gibbs Energy)
Week 9	Chemical equilibrium
Week 10	Chemical Kinetics: The rates of reactions (a) The definition of rate (b) Rate laws and rate constants (c) Reaction order (d) The determination of the rate law
Week 11	- Integrated rate laws: (a) First-order reactions. (b) Second-order reactions - The Arrhenius equation (a) A first look at the energy requirements of reactions (b) The effect of a catalyst on the activation energy
Week 12	Catalysis: Homogeneous & Heterogeneous Catalysts definitions
Week 13	Electrolytes
Week 14	An Introduction to Nanotechnology
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Atkin's Physical Chemistry: 9th or 10th edition	Yes
Recommended Texts	- Chemistry by Raymond Chang - Chemistry 3 by Andrew Burrows: 2nd edition	No
Websites	Chemistry 3 by Andrew Burrows: 2nd edition	

Grading Scheme

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings

	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required

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

Course Description Form

Module Information

Module Title	**Mathematic III**	**Module Delivery**	
Module Type	**B**	☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	**Semester of Delivery**	1
Administering Department	Fuel and Energy Techniques Engineering Department	**College**	Al-Huda University College
Module Leader		**e-mail**	
Module Leader's Acad. Title	Assist. Lecturer	**Module Leader's Qualification**	M.Sc.
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	15/06/2023	**Version Number**	1.0

Relation with other Modules

Prerequisite module	Mathematics 1 , Mathematics 2	**Semester**	1,2 , (1st year)
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Objectives	The Objectives of this course are to enable students to: 1. 1- To understand these concepts of applications and how to evaluate volumes, surface area, and to understand analytic geometry. 2. 2-To provide practice at developing critical thinking skills, solving open ended

	problems and to work in teams 3. 3-To develop a deep understanding of issues related to the basic principles of polar Coordinates, vector analysis, determinants, Matrices and how to solve problems in chemical engineering.
Module Learning Outcomes	By the end of successful completion of this course, the student will be able to: 1. Perform calculus operations on vector-valued functions, including derivatives, integrals curvature, displacement, velocity, acceleration, and torsion. 2. Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals. 3. Find extrema and tangent planes. 4. Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, The Divergence Theorem and Stokes' Theorem. 5. Apply the computational and conceptual principles to the solutions of real-world problems.
Indicative Contents	Indicative content includes the following: A-Vectors and the Geometry of Space, Three-Dimensional Coordinate Systems Vectors, The Dot Product, The Cross Product, Lines and Planes in Space. B- Vector-Valued Functions and Motion in Space, Curves in Space and Their Tangents , Integrals of Vector Functions; Projectile Motion, Arc Length in Space, Curvature and Normal Vectors of a Curve, Tangential and Normal Components of Acceleration. C- Partial Derivatives Functions of Several Variables, Partial Derivatives, The Chain Rule, Directional Derivatives and Gradient Vectors, Tangent Planes and Differentials, Extreme Values and Saddle Points. D- Multiple Integrals, Double and Iterated Integrals over Rectangles, Double Integrals over General Regions, Area by Double Integration, Triple Integrals in Rectangular Coordinates and matrices.

Learning and Teaching Strategies

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

Student Workload (SWL) Calculated for 15 weeks			
Structured SWL (h/sem)	59	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	66	**Unstructured SWL (h/w)**	6
Total SWL (h/sem)	**125**		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	10% (10)	3,7 and 10	LO #1, #2 and #4
	Assignments	2	10% (2)	2 and 12	LO #1, #2 and #3
	Projects / Lab.		10% (10)		
	Report		10% (10)		
Summative assessment	**Midterm Exam**	2hr/2	10% (25)	7,10	LO #1 - #5
	Final Exam	3hr	50% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered

Week 1	Vectors and Properties of Vectors
Week 2	Geometry of Spaces
Week 3	Vector-Valued Functions
Week 4	Tangent and Normal Vectors and, Arch Length and Curvature
Week 5	Function of Several Variables
Week 6	Triple integrals and Applications
Week 7	Partial Derivatives and Chain Rules for Functions of Several Variables
Week 8	Tangent Planes and Normal Lines and, Extrema of Functions of Two Variables
Week 9	Iterated Integrals and Area in Plane
Week 10	Double Integrals and Volume
Week 11	Triple integrals and Applications
Week 12	Vector Field and Line Integrals
Week 13	Conservative Vector Field, Independent of Path and, and complex number
Week 14	Matrix
Week 15	Matrix
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Thomas' Calculus Early Transcendentals 12th Edition.by George B. Thomas Jr. (Author), Maurice D. Weir (Author), Joel R. Hass (Author).	Yes
Recommended Texts	Calculus, by H. Anton, I. Bivens, and S. Davis, 8th Edition, 2002, Wiley.	No
Websites		

Grading Scheme

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

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

Course Description Form

Module Information

Module Title	**Computer Utilization 2**	**Module Delivery**	
Module Type	**S**	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	**4**		
SWL (hr/sem)	**100**		
Module Level	2	**Semester of Delivery**	1
Administering Department	Fuel and energy engineering techniques	**College**	AL-Huda University College
Module Leader	Aseel Sattar Abdullah	**e-mail**	asil.sr@uoalhuda.edu.iq
Module Leader's Acad. Title	Ass. Lecturer	**Module Leader's Qualification**	MSc
Module Tutor		e-mail	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	15/06/2023	**Version Number**	1.0

Relation with other Modules

Prerequisite module	**Computer Utilization 1**	**Semester**	1 , 1ST St.
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Objectives	This course presents an overview of fundamental computer science topics and an

	introduction to computer programming. Overview topics include an introduction to computer science and its history, computer hardware, operating systems, digitization of data, computer networks, office and application.
Module Learning Outcomes	Students can: • Analyze, design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs. • Identify problems and formulate solutions for systems. • Communicate effectively with a range of audience. • Work effectively as part of a team to develop and deliver quality software artifacts. • Design solutions using approaches that integrate ethical, social, legal, and economic responsibilities 1.
Indicative Contents	Indicative content includes the following. General Definitions. System, Computer System, Program, Hardware, Software, …etc. - Hardware Components. CPU, Main Memory, I/O, System Bus. CPU Structure (ALU, Registers, Control Unit, CPU Interconnection). Basic Computer Functions (Data Processing,) - Memory System Input/ output. Input Devices. Output Devices (Display Screens, Printers, Speakers). Mass Storage or External Storage - Representation of Information on Computer. Numeric Data. Number System (Decimal, Binary, Octal, Hexadecimal). Computer safety and licenses. Operating systems. Microsoft word, Microsoft PowerPoint, introduction to excel sheet: creation and manipulation. Advanced Microsoft word. Basic applications of Internet

Learning and Teaching Strategies

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

Student Workload (SWL) Calculated for 15 weeks			
Structured SWL (h/sem)	63	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	37	**Unstructured SWL (h/w)**	2.5
Total SWL (h/sem)	**100**		

Module Evaluation

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

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction, Structural and Functional Modelling, Software Development Life cycle. Requirements determination, feasibility analysis, final specifications
Week 2	hardware and software study system (design –implementation –evaluation– modification). Role of systems analyst – attributes of a systems analyst – tools used in system analysis

Week 3	Types of information: operational, tactical, strategic and statutory – why do we need information systems – management structure – requirements of information at different levels of management
Week 4	functional allocation of management – requirements of information for various functions – qualities of information – small case study
Week 5	Algorithms and Flowcharts
Week 6	Introduction, Symbols, Types of flowchart, Exercise.
Week 7	Introduction to Visual studio
Week 8	Platform, Environment, Menu Bar, Toolbars, Tool Box, Project explorer, Properties window, Form designer, Form layout. Design time and run time
Week 9	Toolbox and objects: Graphical User Interface, Command Buttons, Label, text box, check box, option, list box, Timer.
Week 10	Constants, Variable and Procedures Constants and Variable, Arrays, Arithmetic operators, Expressions - Events, Properties, Methods - Procedures and Functions – Menus
Week 11	Control Flow Statements: Condition Statement: If-Then, Select Case. Loop statement: For-Next, Do-while, Do-Loop While, Exit Loop. Exit and stop statements
Week 12	Mashed edit control - Chart controls - Rich text box - Slider - Tabbed Dialog - Multiple forms - common dialog control.
Week 13	Creating executable file Creating executable file by Package & Deployment Wizard
Week 14	Applications Create the applications for Fluid calculation, Trial and error calculation, Enthalpy calculation, non-linear equations, and matrix inverse
Week 15	Exaam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: Introduction to Operating System Applications
Week 2	Lab 2: Word Applications
Week 3	Lab 3: Word Applications
Week 4	Lab 4: Power Point Applications
Week 5	Lab 5: Power Point Applications
Week 6	Lab 6: Excel Applications
Week 7	Lab 7: Excel Applications

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	**Computer Basics and Office Applications Book**	No
Recommended Texts		
Websites		

Grading Scheme

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

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

Course Description Form

Module Information

Module Title	**English II**	**Module Delivery**	
Module Type	**C**	☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	**2**		
SWL (hr/sem)	**50**		

Module Level	2	**Semester of Delivery**	1
Administering Department	Fuel and energy Engineering Techniques	**College**	AL-Huda University College
Module Leader	Ahmed Khaled Baraa	**e-mail**	
Module Leader's Acad. Title	Ass. Lecturer	**Module Leader's Qualification**	M.Sc.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	15/06/2023	**Version Number**	1.0

Relation with other Modules

Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. Expand vocabulary and enhance communication in everyday situations. 2. Improve grammar skills for more accurate speaking and writing. 3. Develop better listening comprehension abilities. 4. Enhance spoken English fluency, accuracy, and pronunciation.

	5. Improve reading comprehension and extract key information from texts. 6. Strengthen writing skills for well-structured and grammatically accurate compositions. 7. Increase cultural awareness of English-speaking societies and customs.
Module Learning Outcomes	By the end of successful completion of this course, the student will be able to: 1. Develop academic writing 2. Apply reading skills 3. Expand academic vocabulary through reading 4. Speak through group discussions and debates
Indicative Contents	Indicative content includes the following. • Tenses; Vocabulary (Jobs); Question forms; Writing (informal letter) • Present simple; Present continuous; Have/have to; Writing (Linking words +Describing a person) • Past simple; Past continuous; Have + noun; Writing (a story 1) • Count and noncount nouns; Expression of quantity; Articles; Vocabulary (clothes); Writing (filling in forms); • Verb patterns; Would like and like; Will and going to; Writing (postcard) • What … like? Comparative and superlatives; Vocabulary (adjective formation); Writing (relative closes) • Present perfect; Tense revision; Vocabulary (men and women); Writing (a biography) • have to & got to; have to & should & must; Vocabulary (job description); Writing (formal letter) • Present simple or will; Conditional clauses; Time clauses; Writing (discussing ideas) • Verb patterns; used to; Infinitives; Writing (formal letters) • The passive form; Active and passive; Vocabulary (words with more than one meaning); Writing (email) • Second conditional; might; Vocabulary (phrasal verbs); Writing (a story 2) ●Present perfect continuous, word formation, Adverbs, writing letters ●Past perfect, Hot verbs, writing a story
Learning and Teaching Strategies	
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, speaking interactive activities and by considering type of activities that are interesting to the students.

Student Workload (SWL)

Structured SWL (h/sem)	45	**Structured SWL (h/w)**	3
Unstructured SWL (h/sem)	5	**Unstructured SWL (h/w)**	3
Total SWL (h/sem)	50		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	5% (10)	5, 10	LO #1, and 2
	Assignments	5	10% (10)	2, 4, 6, 8, 9, and 10	LO # 1-3
	participations	5	5% (1)	Through lectures	LO# 4
	Report	-	-	-	-
Summative assessment	**Midterm Exam**	2 hr	20% (20)	7	LO # 1-3
	Final Exam	2hr	60% (60)	After 16	LO # 1-3
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered	
Week 1	●Tenses ●Using a bilingual dictionary	● Questions ● Social expressions-1
Week 2	●Present tenses ●Collection: daily life	● Have/ have got ● Making conversation
Week 3	●Past tenses ●Time expressions	● Word formation ● Personal information
Week 4	●Much/ many- ●a few, a little, a lot of ●Shopping	● some/ any ● Articles ● Prices
Week 5	●Verb patterns-1 ●Hot verbs	● Future forms ● How do you feel?
Week 6	●What ……. Like? ●Synonyms and antonyms	● Comparatives and superlatives ● Directions
Week 7	**Mid-term Exam**	
Week 8	●Present perfect	● For, since

Delivery Plan (Weekly Syllabus)

	Material Covered	
	●Adverbs word pairs	● Short answers
Week 9	●Have (go) to ●Words that go together	● Should/ must ● At the doctor's
Week 10	●Time clauses ●Hot verbs	● If ● In the hotel
Week 11	●Verb patterns-2 ●-ed/ -ing adjectives	● Manage to, used to ● Exclamations
Week 12	●Passives ●Notices	● Verbs and nouns that go together
Week 13	●Second conditional ●Phrasal verbs	● Might ● Social expressions-2
Week 14	●Present perfect continuous ●word formation	● Adverbs ● writing letters
Week 15	●Past perfect ● Hot verbs	● writing a story
Week 16	**Preparatory for final exam**	

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	John & Liz Soars, "New Headway Plus- Pre-Intermediate Student's Book", 10th ed 2012	Yes
Recommended Texts	-Raymond Murphy; "English Grammar in Use", 4th edition 2012 Understanding and Using English Grammar, Vol. A, 4th Edition 4th Edition	No
Websites	https://sachtienganhhn.net/pdf-embed/life-pre-intermediate-b1-student-book.html https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_style_introduction.html	

Grading Scheme

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.

Course Description Form

Module Information

Module Title	**Thermodynamics II**	**Module Delivery**	
Module Type	**C**	☒ **Theory** ☒ **Lecture** ☒ **Tutorial** ☒ **Lab** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	**6.0**		
SWL (hr/sem)	**150**		
Module Level	2	**Semester of Delivery**	4
Administering Department	Fuel and Energy Engineering Techniques	**College**	AL-Huda University College
Module Leader	Noor Shafiq	**e-mail**	
Module Leader's Acad. Title	Ass. Lecturer	**Module Leader's Qualification**	M.Sc.
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	15/06/2023	**Version Number**	1

Relation with other Modules			
Prerequisite module	Thermodynamic I	**Semester**	3
Co-requisites module	There is no co- prerequisite	**Semester**	-

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	Course objectives will guide the participant to develop key concepts and techniques to design equipment in development process plant. These key concepts can be utilized to make design and operating decisions, training, and. Course such as these should be almost a requirement for engineers and can utilized as refresher for engineers with experience. 1. To introduce students to the principles concepts of thermal systems engineering using several contemporary applications. 2. Enable students to gain access to the science of thermodynamics by understanding how engineering analysis is done How to deal with laws, equations, illustrations, and other data, and link the data to reach the outputs and enable the student to be able to analyze, elicit and draw conclusions 3. Enable students to gain access to the science of thermodynamics by understanding how engineering analysis is done
Module Learning Outcomes	At the end of the course, the student will be able to: 1. As the design of the chemical process represents a productive and commercial goal, so we expect through this program that the engineer will be familiar with the most thermal systems engineering that he needs to reach the optimal design of the chemical process. 2. That the student be able to distinguish between engineering thermal systems and the mechanism of linking them and their uses in the field of applied work. 3. The chemical engineer has the ability to differentiate between the laws of engineering thermodynamics and apply them mathematically and physically in the treatment and design of practical applications. 4. The engineer should be a pioneer in green engineering by choosing an economical and controlled Design without leaving an impact on the environment.
Indicative Contents	1. **The second law of thermodynamics and entropy** (introducing the second law:, identifying irreversibility's:, applying the second law to thermodynamic cycles, analysis of carnot heat engines, analysis of carnot refrigerators and heat pumps) 2. **Using entropy** (introducing entropy, entropy change in internally reversible

	processes, entropy balance for closed systems, entropy rate balance for control volumes, isentropic processes, isentropic efficiencies of turbines, nozzles, compressors, and pumps**)** **3. Analysis of engineering systems based on the second law of thermodynamics** (analysis of **closed** system according to 2nd law of thermodynamics, analysis of **open** system according to 2nd law of thermodynamics) **4. Applications of second law in vapor power cycles** (production of power from heat, kind of power cycles, modeling vapor power systems, analyzing vapor power systems-carnot and rankine cycle) **5. Deviation of actual vapor power cycles from ideal rankine cycles** (introduction, mathematical analysis deviation of actual vapor power cycles from ideal rankine cycles) **6. Modification methods of the steam rankine cycles**(using economizer, increase pressure in the boiler, decrease pressure in the condenser, increase temperature of superheated steam in the boiler, reheated cycle, the regenerative cycle) **7. Nuclear power system cycles** (kind of nuclear power system cycle, analysis of nuclear system cycles based on 2nd law of thermodynamics) **8. Applications of second law in gas power cycles** (reciprocating combustion engines) **9. Applications of second law in gas power cycles** (gas turbine brayton engine cycle) **10. Applications of second law in refrigration and liquefaction cycles** (air refrigeration system) **11. Applications of second law in refrigration and liquefaction cycles** (vapor compression system) **12. Applications of second law in refrigration and liquefaction cycles** (vapor absorption system) **13. Applications of second law in refrigration and liquefaction cycles** (refrigerants) 14. **Vapor liquid equilibrium** (duhem's theorem, phase behavior for vapor –liquid system, vle qualitative behavior, vle by modified raoults law)

Learning and Teaching Strategies

Strategies	The objective of this course is to organize the ideas of students about **THE SECOND LAW OF THERMODYNAMICS AND ENTROPY**. In this semester, we decided to analyze systems on the basis of the second principle of thermodynamics, and this analysis included steam, gas, nuclear power cycles, cooling, and liquefaction cycles, which are practical applications of the second principle of thermodynamics. The second law is a powerful tool in improving the performance of engineering devices, and we start our study in the concept of available work, and irreversible work, as well as studying the concept of irreversibility's due to various losses. Finally, we apply all the previous concepts to the open and closed system in the steady and unsteady state.

Student Workload (SWL)

Calculated for 15 weeks

Structured SWL (h/sem)	78	**Structured SWL (h/w)**	5
Unstructured SWL (h/sem)	72	**Unstructured SWL (h/w)**	5
Total SWL (h/sem)	**150**		

Module Evaluation

		Time /Number (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	1	20% (20)	5, 10	LO 1 to 2
	Assignments	2	5% (5)	2,5,12	LO 1 to 4

	Lab.	2	10% (10)	13	LO 4
	Tutorials	2	5% (5)		
Summative assessment	**Midterm Exam**	2	10% (10)	12	LO 1 to 4
	Final Exam	3	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	**the second law of thermodynamics and**
Week 2	**using entropy**
Week 3	**analysis of engineering systems based on the second law of thermodynamics**
Week 4	**applications of second law in vapor power cycles**
Week 5	**deviation of actual vapor power cycles from ideal rankine cycles**
Week 6	**modification methods of the steam rankine cycles**
Week 7	**nuclear power system cycles**
Week 8	**applications of second law in gas power cycles**
Week 9	**applications of second law in gas power cycles**
Week 10	**applications of second law in refrigration and liquefaction cycles**
Week 11	**applications of second law in refrigration and liquefaction cycles**
Week 12	**applications of second law in refrigration and liquefaction cycles**
Week 13	**applications of second law in refrigration and liquefaction cycles**
Week 14	**vapor liquid equilibrium**
Week 15	**general review**

Week 16	**final examination**

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	***3.*** J. M. Smith, H.C.Van Ness, M.M. Abbott ***(Introduction to Chemical Engineering Thermodynamics) ,*** Seventh Edition, McGraw- Hall (2005) ***4.*** J.W. Tester, M. Modell, (***Thermodynamics and its Application),*** 3rd Edition, Printice Hall, (1997)	Yes
Recommended Texts	-	-
Websites		

Grading Scheme

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

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

Course Description Form

Module Information

Module Title	**Oil Refining**	**Module Delivery**	
Module Type	**C**	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	**7**		
SWL (hr/sem)	**175**		
Module Level	2	**Semester of Delivery**	4
Administering Department	Fuel and Energy Engineering Techniques	**College**	AL-Huda University College
Module Leader	Dr. Ahmed N. Awad	**e-mail**	Ahmed.fet@uoalhuda.edu.iq
Module Leader's Acad. Title	Lecture	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	15/06/2023	**Version Number**	1.0

Relation with other Modules

Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	General refinery and petrochemical operations, their products and economic importance; Individual process units covering separation, treatment and conversion of crude oil

	into refined hydrocarbon products; Selected process units for the production of petrochemicals; Important utilities such as steam and power generation together with factors affecting energy consumption and carbon dioxide emissions; Strengths, weaknesses, opportunities and threats for the industry to 2050.
Module Learning Outcomes	1. recognize the significance of petroleum fuels in the U.S. energy supply; 2. express the overall objectives of petroleum refining; 3. identify the economic and environmental drivers of petroleum refining;
Indicative Contents	describe the overall approach to petroleum refining and categorize refinery processes and products; portray chemical constitution of petroleum.

Student Workload (SWL)

Structured SWL (h/sem)	102	**Structured SWL (h/w)**	7
Unstructured SWL (h/sem)	73	**Unstructured SWL (h/w)**	5
Total SWL (h/sem)	175		

Learning and Teaching Strategies

Strategies	Raise the intellectual level of students, which is the importance of human rights when it is reflected on the individual, society and the state

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	3, 10	LO #4, 6, 8 and 10
	Assignments	0			
	Projects / Lab.	0			
	Report	2	10% (10)	13	LO # 5, 7 and 13
Summative assessment	**Midterm Exam**	2 hr	20% (20)	7	LO # 1-7
	Final Exam	3hr	60% (60)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	History and Development of Refining Processes, Kinds of Refineries, Refinery feed stocks and products
Week 2	Classification and Evaluation of crude petroleum and its derivatives
Week 3	Processing of Petroleum Liquids: Stabilization dehydration, tube still heaters
Week 4	Atmospheric and Vacuum Fractionation towers. Material and Energy Balances, Refluxes,
Week 5	Temperature Distribution in Fractionation Tower.
Week 6	Upgrading the Distillates: Alkylation and Isomeric transformation,
Week 7	Catalytic polymerization, Thermal cracking processes, Catalytic polymerization
Week 8	Removal of Acid Gases, Sweetening Processes, Improvement in Performance and Storage Stability
Week 9	Light End Fractioning. Refinery products and their characteristics
Week 10	Vapor Pressure, Octane Number
Week 11	Viscosity, Flash Point
Week 12	Aniline Point and Pour Point.
Week 13	Petroleum distillates additives: Anti knocking, Anti-oxidant
Week 14	Anti-corrosion, Anti-vaporization, Combustion inhibitors,
Week 15	Coking and treatment of bottom of the barrel, Residue upgrading
Week 16	Preparatory week before the final Exam.

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Grading Scheme

Group	**Grade**	التقدير	**Marks (%)**	**Definition**

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

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Course Description Form

Module Information

Module Title	**Properties of Engineering Materials**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code					
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Fuel and Energy Engineering Techniques		**College**	AL-Huda University College	
Module Leader	Yassen Mahmood Tayib		**e-mail**	Yaseen.m@uoalhuda.edu.iq	
Module Leader's Acad. Title	Ass. Lecturer		**Module Leader's Qualification**	MSc	
Module Tutor			e-mail		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	Egineering Mechanic (Static), Calculus I, Calculus II	**Semester**	COE 2208, COE 1202, COE 1205
Co-requisites module	There is no co- prerequisite	**Semester**	-

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	Course objective: The main objective of these lectures is to provide the student with a clear and thorough presentation of the theory and application of strength of materials. These objectives are accomplished in two directions; 1. Generous collection of detailed examples featuring a structured problem-solving approach that encourages systematic thinking. 2. To develop creative skill. a number of homework problems have been included that are designed to enhance critical thinking skills. 3. Experimental lab is used to develop practical experience for students.
Module Learning Outcomes	At the end of the course, the student will be able to: 5. Distinguish between Engineering Material. 6. To introduce students How to analysis of Particle's. 7. To introduce students How to analysis of Rigid Body. 8. Distinguish between Stress, Simple Stress, Bearing Stress, distinguish between Tube and Spherical Pressure Vessels, Bearing Stress Thermal stress, 9. study the relationships among the various forms of material deformation under load 10. How to draw Shear force, and bending moment diagram, Shear force, and bending moment diagram 11. distinguish between Analytical and graphical deflection, buckling

Indicative Contents	15. Distinguish between Engineering Materials 16. STRUCTURE OF MATERIALS **(Atomic structure, Subatomic structure (level), Macroscopic structure, Microscopic structure)** **17.** CLASSIFICATION OF MATERIALS **(Metals, Ceramics, Polymers, Composites)** **18.** ADVANCED MATERIALS **(Semiconductors, Biomaterials, Smart Materials, Nanomaterials)** 19. introduce students How to analysis of Particle's (**External loads, Joint Load, Member Load, Analysis of Internal Forces)** 20. introduce students How to analysis of Rigid Body **21.** What is a stress, simple stress? **(Definition of Stress, Simple, Stresses, Normal stress, Solved Examples in Normal Stress)** **22.** What is a shearing stress? **(Definition of Shearing Stress, Solved Examples in Shearing Stress)** **23.** What is a Bearing Stress? **(Definition of bearing Stress, Solved Examples in bearing Stress)** **24.** distinguish between tube and spherical pressure vessels **(Thin-Walled Cylinder Pressure Vessels, Spherical Shell, Solved Examples in Thin-Walled Pressure Vessels)** **25.** study the relationships among the various forms of material deformation under load (**Axial deformation and strain, Stiffness, K, Multiple axial load, Solved Examples in axial deformation)** **26.** What is a thermal stress? **(Analysis of Thermal Stress, Solved Examples in Thermal Stress)** 27. How to draw shear force, and bending moment diagram? 28. How to use Deformation of Members? 29. distinguish between Analytical and graphical deflection, buckling 30. Special Topic

earning and Teaching Strategies	
Strategies	10. Course overview: The course includes an introduction to introduce you to : Introduction to material science and Engineering, Analysis of Forces in Strength of Materials - Particle's, Analysis of Forces in Strength of Materials – Rigid Body , Stress, Simple Stress, Normal Stress, Shearing Stress, Bearing Stress, Thin-Walled Pressure Vessels, Strain (Simple strain, Strain -Stress diagram, Hook's Law, Poisson's ratio), Thermal stress, Axial Force, Shear force, and bending moment diagram, Axial Force, Shear force, and bending moment diagram, Deformation of Members under Axial load, Analytical and graphical deflection, buckling

Student Workload (SWL) Calculated for 15 weeks			
Structured SWL (h/sem)	48	**Structured SWL (h/w)**	3
Unstructured SWL (h/sem)	52	**Unstructured SWL (h/w)**	3
Total SWL (h/sem)	**100**		

Module Evaluation

		Time /Number (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	1	20% (20)	5, 10	LO 1 to 2
	Assignments	2	5% (5)	2,5,12	LO 1 to 10
	Lab.	2	10% (10)	13	LO 5,6
	Tutorials	2	5% (5)	2-12	
Summative assessment	**Midterm Exam**	2	10% (10)	12	LO 1 to 4
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to material science and Engineering

Week 2	Structurr of materials
Week 3	Classification of materials
Week 4	Advanced materials
Week 5	Analysis of Forces in Strength of Materials - Particle's
Week 6	Analysis of Forces in Strength of Materials – Rigid Body
Week 7	What is a stress, simple stress?
Week 8	What is a shearing stress?
Week 9	What is a Bearing Stress?
Week 10	distinguish between tube and spherical pressure vessels
Week 11	Thin-Walled Pressure Vessels
Week 12	Strain (Simple strain, Strain -Stress diagram, Hook's Law, Poisson's ratio)
Week 13	Axial Force, Shear force, and bending moment diagram
Week 14	How to use Deformation of Members
Week 15	Analytical and graphical deflection, buckling
Week 16	**Final examination**

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Tensile Test
Week 2	Bending Test
Week 3	Compressive Strength Test
Week 4	Impact Strength Test
Week 5	Shear Test

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	***5.*** Singer "strength of materials" 3rd edition,1980 and 4th edition R.C.Hibbeler " Mechanics of Materials" 8th edition,2008 R.J.Hearn "Mechanics of Materials " 3rd edition,1997 Textbook Popov " Engineering Mechanics of Solids",1990. J.W. Tester, M. Modell, (***Thermodynamics and its Application),*** 3rd Edition, Printice Hall, (1997)	Yes
Recommended Texts	-	-
Websites		

Grading Scheme

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

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Course Description Form

Module Information

Module Title	**Engineering Statistics**		**Module Delivery**	
Module Type	**B**		☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code				
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	2	**Semester of Delivery**	2	
Administering Department	Type Dept. Code	**College**	Type College Code	
Module Leader	Ahmed Fadil	**e-mail**	Ahmed Fadil @uoalhuda.edu.iq	
Module Leader's Acad. Title	Ass. Lecturer	**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)	**e-mail**	E-mail	
Peer Reviewer Name		**e-mail**		
Scientific Committee Approval Date	15/06/2023	**Version Number**	1.0	

Relation with other Modules

Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	The Objectives of this course are to enable students to: 1. Understand the differentiate between a random process and a deterministic process. 2. Solve probability problems and its applications by to determine the sampled data; analyze it graphically.

	3. Understand the relationship between both discrete and continuous random variables. 4. Understand the theoretical of the normal distribution with many populations in practice. 5. Learn statistical hypotheses by carrying statistical tests, using different significance levels
Module Learning Outcomes	On completion of this course, the student should be able to: 1. Use a number of methods and techniques for collecting and presentation the sets of data. 2. Calculation and demonstration the center tendency and variation of data 3. Compute the probabilities in a simple cases and using the rules of probability in computing; 4. Give an account of the concept random variable and be able to use some common probability distributions; 5. Understand the meaning of the central limit theorem; 6. Use point and interval estimates for some typical statistical problems; 7. Apply elementary regression for fitting measured data
Indicative Contents	Indicative content includes the following. **1 Fundamentals (Introduction to Statistics)** Introduction, Variables and Types of Data, Data Collection and Sampling Techniques, Observational and Experimental Studies. **2-Presentation of a Statistical Data** Introduction, Organizing Data, Grouped Frequency Distributions or Frequency Distributions Table, Graphs: Histograms, Frequency Polygons, Other Types of Graphs. 3- **Data Description** Measures of Central Tendency (Mean, Median and Mode), Measures of Variation, Population Variance and Standard Deviation, Sample Variance and Standard Deviation, Variance and Standard Deviation for Tabulated. **4-Probability and Counting Rules** Sample Spaces and Probability, Tree diagram, Basic Probability Rules, Conditional Probability **5-Discrete Probability Distributions** Probability Distributions, Mean, Variance, Standard a Deviation, The Binomial Distribution. The Poisson Distribution **6-Continuous Probability Distributions** **The Normal Distribution**. Applications of the Normal Distribution. Normal Distributions Formula. The Standard Normal Distribution. Finding Areas Under the Standard Normal Distribution Curve (Table Method). A Normal Distribution Curve as a Probability Distribution Curve. Applications of the Normal Distribution **7-confidence Intervals and Sample Size** Confidence Intervals for the Mean When σ is Known. A point estimate.

	Confidence Intervals. Sample Size. t-Distribution. Confidence Intervals for the Mean When σ is Unknown. The chi-square Distribution **8-Hypothesis Testing** Steps in Hypothesis Testing—Traditional Method. The null hypothesis (H_0) , The alternative hypothesis (H_1) . The level of significance. z Test for a Mean . P-Value Method for Hypothesis Testing. t Test for a Mean. z Test for a Proportion. X_2 Test for a Variance or Standard Deviation **9-testing the Difference between Two Means, Two Proportions, and Two Variances** **10Correlation and Regression**

Learning and Teaching Strategies

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)

Structured SWL (h/sem)	48	**Structured SWL (h/w)**	3
Unstructured SWL (h/sem)	52	**Unstructured SWL (h/w)**	3
Total SWL (h/sem)	100		

Module Evaluation

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

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

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	**1 Fundamentals (Introduction to Statistics)**
Week 2	**2-Presentation of a Statistical Data**
Week 3	3- **Data Description**
Week 4	**Probability and Counting Rules** Sample Spaces and Probability, Tree diagram,
Week 5	Basic Probability Rules, Conditional Probability
Week 6	**Discrete Probability Distributions** Probability Distributions, Mean, Variance, Standard an Deviation
Week 7	, The Binomial Distribution. The Poisson Distribution
Week 8	**Continuous Probability Distributions**
Week 9	**The Normal Distribution**. Applications of the Normal Distribution. Normal Distributions Formula. The Standard Normal Distribution. Finding Areas Under the Standard Normal Distribution Curve (Table Method).
Week 10	A Normal Distribution Curve as a Probability Distribution Curve. Applications of the Normal Distribution
Week 11	**confidence Intervals and Sample Size**
Week 12	**Hypothesis Testing** Steps in Hypothesis Testing—Traditional Method. The null hypothesis (H_0) , The alternative hypothesis (H_1) .
Week 13	The level of significance. *z* Test for a Mean . P-Value Method for Hypothesis Testing. t Test for a Mean. z Test for a Proportion. X_2 Test for a Variance or Standard Deviation
Week 14	**testing the Difference between Two Means, Two Proportions, and Two Variances**
Week 15	**Correlation and Regression**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

	Text	**Available in the**

		Library?
Required Texts	1. Elementary Statistics A Step by Step Approach, Eighth Edition, By Allan G. Bluman	no
Recommended Texts	2. Probability and Statistics For Engineers and Scientists, Fourth Edition, By Sheldon Ross	No
Websites		

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
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Course Description Form

Module Information

Module Title	**Environment Pollution & Indut. Safety**	**Module Delivery**	
Module Type	**S**	☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	**4**		
SWL (hr/sem)	**100**		
Module Level	3	**Semester of Delivery**	6

Administering Department	Type Dept. Code	**College**	Type College Code
Module Leader	Maher Abdul Rahim Muhaimid	**e-mail**	
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	E-mail
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date		**Version Number**	1.0

Relation with other Modules

Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Objectives	The goals of this course are to enable students to: 3. Scientific reasoning for how to protect water quality, emphasizing fundamental principles. **4.** The theory and conceptual design of systems for treating municipal wastewater and drinking water, as well as reactor theory, process kinetics, and models. 5. Physical, chemical, and biological processes are presented, including sedimentation, filtration, biological treatment, disinfection, and sludge processing. Finally, there is a discussion of engineered and natural processes for wastewater treatment.
Module Learning Outcomes	By the end of successful completion of this course, the student will be able to: 1. An ability to apply knowledge of mathematics, science, and engineering 2. An ability to design a system component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. 3. An ability to identify, formulate and solve engineering problems. 4. The broad education necessary to understand the impact of engineering solutions in a global economic and environmental and societal context.

	5. Recognition of the need for, and an ability to engage in life-long learning. 6. Knowledge of contemporary issues. 7. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Indicative Contents	Indicative content includes the following. 1. BOILER water and cooling water 2. Concept 3. – Importance 4. – Location 5. – Commonly used desalination process 6. – Distillation – Electrodialysis 7. – Reverse osmosis 8. – Freezing 9. – Solar distillation- 10. Purpose – 11. Problem associated with water quality and equipment 12. – Steam system fundamentals 13. – Hot water closed system 14. – Measurement and control of pH, corrosion, fouling 15. – Microbial analysis 16. – Ozone control 17. – Study of microorganism 18. – Energy efficient operations and maintenance. 19. WASTE water treatment 20. - Home and Agriculture 21. – Various waste water treatment processes 22. – Optimization 23. – Benefits and costs 24. – Microbial and sanitation water treatment 25. – Biofilm formation and removal 26. – Microbial trend analysis 27. – Pretreatment system and equipment.

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

	that are interesting to the students.

Student Workload (SWL) Calculated for 15 weeks			
Structured SWL (h/sem)	45	**Structured SWL (h/w)**	3
Unstructured SWL (h/sem)	55	**Unstructured SWL (h/w)**	3
Total SWL (h/sem)	**100**		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (20)	3 and 10	LO #1, #2 and #3, #4
	Assignments	1	10% (10)	2 and 12	LO #5, #6
	Projects / Lab.	0	0% (0)	Continuous	LO #1, #2 and #3, #4
	Report	0	0 % (0)	-	-
Summative assessment	**Midterm Exam**	2hr	20% (20)	7	LO #1, #2 and #3, #4, #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Water Supply and Wastewater
Week 2	Why Treat Water and Wastewater?
Week 3	Water Quality Parameters.
Week 4	Aerobic and Anaerobic Decomposition
Week 5	Effect of Pollution on Stream
Week 6	Sedimentation-Flocculation; Filtration; Chemical Treatment
Week 7	Effect of Pollution on Groundwater
Week 8	Measurement of Water Quality
Week 9	SETTLING
Week 10	Primary conditions in filter design
Week 11	Solid Analysis
Week 12	Properties and Contamination of Water
Week 13	Sedimentation Tank
Week 14	Reactor Tanks - Mixed Tanks, First-order Kinetics, Plug Flow.
Week 15	Reactor Tanks - Dispersed Flow
Week 16	Softening; Chemical Treatment - Adsorption and Ion Exchange

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered

Week 1	-
Week 2	-
Week 3	-
Week 4	-
Week 5	-
Week 6	-
Week 7	-

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Environmental Engineering, Ruth F. Weiner and Robin Matthews	
Recommended Texts	Fundamental of Wastewater Treatment and Engineering, Rumana Riffat	
Websites		

Grading Scheme

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

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

Course Description Form

Module Information

Module Title	Fluid Mechanics	**Module Delivery**	
Module Type	C	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code			
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	**Semester of Delivery**	4
Administering Department	Fuel and Energy Engineering Techniques	**College**	AL-Huda University College
Module Leader	Adil H. Nawar	**e-mail**	
Module Leader's Acad. Title	Lecture	**Module Leader's Qualification**	PhD
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date		**Version Number**	

Relation with other Modules

Prerequisite module		**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Objectives	The goals of this course are to enable students to: 1- Provide a thorough understanding and practical applications fluid mechanics analysis for determinate the solution in petrochemical engineering problems. 2- Testing and examine fluid mechanics under different load conditions to find the solution behavior.

	3- Understanding and applying mathematical model for the solution of indeterminate fluid flow problems.
Module Learning Outcomes	By the end of successful completion of this course, the student will be able to: 1. Have a working knowledge of the basic properties of fluids and understand of viscosity, the consequences of the frictional effects it causes in fluid flow and calculate the capillary rise (or drop) in tubes due to the surface tension effect. 2. Analyze and determine the pressure distribution in fluid static problems under different load conditions. 3. Determine the manometer pressure for different shapes and locations. 4. Determine the magnitude, direction and location of pressure force on submerged body. 5. Find the magnitude and direction forces produced from fluid flow motion. 6. Apply energy equation along stream line, then find the resultant pressure. 7. Use control volume analysis to determine the forces associated with fluid flow, and volume analysis to determine the moments caused by fluid flow and the torque transmitted.
Indicative Contents	Indicative content includes the following. CHAPTER-ONE INTODUCTION and FUNDAMENTAL CONCEPTS [12 hr] Introduction 1 Definition of Stress Definition of Fluid Fluid Properties Viscosity Causes of Viscosity Application of Viscosity Concept Compressibility Surface Tension of Liquids Surface Tension Phenomenon Capillarity Dimensions and Units CHAPTER TWO PRESSURE DISTRIBUTION in FLUIDS [20 hr] Forces a fluid Elements Pressure on a Stationary fluid Pressure Forces on a Fluid Element

	Incompressible Fluid Compressible Fluid Pressure Measurements Manometers Piezometer Tube U-Tube Manometers to Measure Pressure Difference Inverted Tube Manometer Hydrostatic Forces on Submerged Plan Surface Hydrostatic Forces on Curved Surface Buoyancy and Stability of Floating Body Buoyancy Force Stability Stability Related to Water Line Fluid in Rigid – Body Motion Acceleration on a Straight Path Rotation in a Cylindrical Container CHAPTER THREE FLUID FLOW – BASIC CONCEPT [10 hr] Definitions Description of Fluid Motion Variation of Flow Parameters in Time and Space Material Derivative and Acceleration Streamline, Path Lines, Stream Tube, Streak Lines Streamline Path Line Stream Tube Streak Line Movement of Fluid Element Pure Translation Linear Deformation Rate of Deformation in the Fluid Element Rotation CHAPTER FOUR DYNAMICS of FLUID FLOW [21 hr] Introduction Definitions Types of System Basic Laws Conservation of Mass- The Continuity Equation Continuity Equation – Differential Form Continuity Equation (C.E)- Vector From Free Body Method

	Energy Equation of Ideal Flow a long a Stream Line Conservation of Momentum Linear Momentum (L.M) The Application of Momentum Theorem Angular Momentum (Moment of Momentum) Radial – Flow Devices

Learning and Teaching Strategies	
Strategies	Leads students toward a clear understanding and firm grasp of the basic principles of fluid mechanics..Encourages creative thinking and development of a deeper understanding and intuitive feel for fluid mechanics .The best way to learn is by practice. Special effort is made throughout the above contents to reinforce the material that was presented. Many of the illustrated example problems and at the end of each chapter problems are comprehensive and encourage students to review and revisit concepts and intuitions gained previously.

Student Workload (SWL) Calculated for 15 weeks			
Structured SWL (h/sem)	87	**Structured SWL (h/w)**	7
Unstructured SWL (h/sem)	38	**Unstructured SWL (h/w)**	3
Total SWL (h/sem)	**125**		

Module Evaluation

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

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Definitions of Stress on Fluid elements and fluid properties
Week 2	Dynamics viscosity , shear forces and shear stress. Distinction between Newtonian and NonNewtonian Fluid
Week 3	Compressibility, Surface tension of Liquids, Units and Dimensions
Week 4	Forces on Fluid element, Normal Stress in Stationary Fluid
Week 5	Fundamental equation of fluid static
Week 6	Hydrostatic Thrust on Submerged Surfaces
Week 7	Stability of Unconstrained bodies
Week 8	Applications solution of problems
Week 9	Scalar &Vector fields flow field description of fluid motion
Week 10	Variation of flow parameters in time and space material & acceleration, Applications
Week 11	Stream line, path lines, one, two and three dimensional flow
Week 12	Conservation of energy, Bernoulli’s equation
Week 13	System, Conservation of mass, Conservation of momentum Applications

Week 14	Applications solution of problems
Week 15	**Preparatory week before the final Exam**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	Calibration of Bourdon Gauge
Week 5	Center of Pressure
Week 6	Stability of s Floating Body
Week 7	

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	1- White, _Frank_M._-_Fluid_Mechanics_7th_Ed_[McGraw_Hill] 2- F L U I D M E C H A N I C S Fundamentals And Application, By Yunus A. Çenge And John M. Cimbala	No
Recommended Texts	Fundamentals of fluid mechanics, 2nd edition by Dr. Mustafa B. Al-hadithi	Yes
Websites		

Grading Scheme

Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria

Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

Course Description Form

1. Course Name:	
Thermodynamics	
2. Course Code:	
FS301	
3. Semester / Year:	
Annual/ Stage: third	
4. Description Preparation Date:	
23/7/2025	
5. Available Attendance Forms:	
Face to face	
6. Number of Credit Hours (Total) / Number of Units (Total)	
175/7	
7. Course administrator's name (mention all, if more than one name)	
Name: Noor Shafeeq Obeid	
8. Course Objectives	
Course Objectives	1. Introducing students to the basic concepts of the first and second laws thermodynamics and their applications to engineering problems. 2. Developing practical skills in solving energy balance problems, with minimal work.
9. Teaching and Learning Strategies	

Strategy	The main strategy that will be followed in delivering this unit is to encourage stude participation in the following exercises: 1. Group work 2. Visualization 3. Inquiry-based teaching 4. Student-led classroom 5. Technology application in the classroom 6. Auditory strategies 7. Reading and writing

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week (1)	2	Basic concepts: Thermodynamic terms, thermodynamic variables a quantities.	Introduction	direct	Feedback
Week (2-6)	2	_Classification of systems and processes, energy classifications: transitional energy, heat and work, reversible and irreversible processes, phase rule. _The first law of thermodynamics: the first l and internal energy. _Statements of the first law for non-flowing and flowin systems.	Introduction to thermodynamic systems and processes and their applications, types systems and their importance, types energy and their properties, the concept of the first law of thermodynamics a its applications	direct	Classroom activity
		_The limits of the first law enthalpy and heat capacity _The second law of thermodynamics:	The concept of the limits of enthalpy a heat capacity of th first law, the secon law of		

Week (7-9)	2	Expressions of the second law of thermodynamics, available and unavailable energies, the entropy function, and applications the second law. _Thermodynamic formulas Measurable quantities, bas energy relationships, Maxwell's relationships, thermodynamic formulas f calculating enthalpy.	thermodynamics, i properties and applications, findir the general relationship of energies through derivations.	direct	Short test
Week (10-14)	2	_Understand and interpret entropy function and its applications. _ Distinguish between different formulations of th second law of thermodynamics.	Applications of the entropy function to the second law. Thermodynamic formulations, measurable quantities, basic energy relations, Maxwell's relation Thermodynamic properties of real gases, kinetic behavior of fluids, corresponding law of states and the equation.	direct	Home work
Week (15)	2	_Analyze basic energy relationships. _ Apply Maxwell's relationships to transform complex partial derivatives into measurable ones. _ Explain the importance o these relationships in engineering and physical applications.	The concept of the limits of enthalpy a heat capacity of the first law, the secon law of thermodynamics, Applications of the entropy function o the second law. Thermodynamic formulations,	direct	midterm exam

			measurable quantities, basic energy relations, Maxwell's relation		
Week (16-20)	2	_Analyze the thermodynar properties of real gases. _ Identify and apply partia molar properties. _ Distinguish between idea and non-ideal solutions. _ Derive the (Gibbs-Duher equation from basic concep	Thermodynamic properties of real gases, partial mola properties, ideal ar non-ideal solutions Gibbs-Duhem equation, phase equilibria.	direct	Short test
Week (21-23)	2	_Application of the phase rule (Lifshoff-Gibbs rule). _ Vapor-Liquid Equilibriu (VLE) analysis. _ Analysis of systems with miscibility gap. _ Identify single-phase and dual-phase (liquid + vapor regions using these diagran	Application of the phase rule, vapor-liquid equilibrium, phase diagrams for homogeneous systems and syster with a miscibility gap. Effect of temperature and pressure on azeotro composition, liquid liquid equilibrium, and ternary liquid-liquid equilibrium.	direct	Work assignme
Week (24-27)	2	- Analyze the relationship between phase equilibrium and chemical equilibrium. - Understand the equilibriu conditions of chemical reactions. - Apply equilibrium principles to analyze industrial systems. - Determine whether a reaction favors reactants o products with a change in temperature.	Relationship betwe phase equilibria, equilibria of chemi reactions, effect of temperature on the equilibrium consta relationship betwe equilibrium consta and composition (gas-phase and liquid-phase reactions).	direct	Home work

Week (28-30)	2	- Understand the concept o equilibrium conversion. - Analyze Equilibria of multiple reactions. - Apply the principle of energy balance in closed thermodynamic cycles. - Compare different refrigeration cycles.	Equilibrium conversion, multip reaction equilibria, cycle, comparison refrigeration cycle	direct	midterm exam

11.Course Evaluation

First semester exam: 10 points

Midterm exam: 15 points

Second semester exam: 10 points

Classroom activities and assignments: 5 points

Practical activities and projects: 10 points

Final exam (end of year): 50 points

Total: 100 points

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	1. Abbott, Michael M., Joseph M. Smith, and Hendrick C. Van Ness. "Introduction to chemica engineering thermodynamics." McGraw-Hill. 2. Elliott, J. Richard, and Carl T. Lira. “Introductory chemical engineering thermodynamics”. Upper Saddle River, NJ: Prentice Hall PTR.
Main references (sources)	Fundamentals of Engineering Thermodynamics, Michael J. Moran
Recommended books and references (scientific journals, reports...)	Narayanan, K. V.A chemical engineering thermodynamics. PHI Learning Pvt. Ltd..
Electronic References, Websites	Nothing

Course Description Form

1. Course Name:
Heat Transfer
2.Course Code:
FS302
3. Semester / Year:
Annual / Third Level
4. Description Preparation Date:
22/07/2025
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)
175/7
7. Course administrator's name (mention all, if more than one name)
Name: Yaseen Mahmood Tayib Email: yaseen.m@uoalhuda.edu.iq

8. Course Objectives	
Course Objectives	• Analyses heat conduction, forced convection and Free convection. • Explain basic physical processes of condensation and boiling. • Analyses basic heat transfer experiments. • Analyses heat transfer by radiation using shape factors and networks. • Use LMTD and NTU-Effectiveness methods to predict the size and performance of heat exchangers. • Design of heat exchangers.
9. Teaching and Learning Strategies	
Strategy	The assessment is based on assignments, written exams, quizzes, reports, and seminars.

10. Course Structure

Week	Hours	Required Learning	Unit or subject	Learning	Evaluation

		Outcomes	name	method	method
(1-2)	2	Define heat transfer modes and explain thermal conductivity.	Introduction, heat transfer – Units, types of heat transfer, thermal conductivity	Direct	Feedback
(3-6)	2	Analyze conduction through plane, cylindrical and spherical walls using thermal resistance models.	Conduction heat transfer: definitions, thermal resistance, electric analog, conduction through plane, cylinder and spherical walls	Direct	Quiz
(7-11)	2	Compute temperature distribution, overall heat transfer coefficient, and evaluate insulation effects.	Temperature distribution through plane, cylindrical, and spherical walls, composite walls, heat transfer coefficient, overall heat transfer coefficient, insulations, critical thickness	Direct	Practical Assignment
(12-14)	2	Analyze fin performance, calculate efficiency and effectiveness.	Fins: types, temperature distribution along fins, annular fin calculation, applications	Direct	Homework
(15-17)	2	Apply analytical and numerical methods for 2D conduction problems.	2D conduction: analytical and numerical solutions	Direct	Midterm Exam
(18-21)	2	Analyze forced convection using correlations and practical applications.	Forced convection: flow over flat plate, applications, dimensionless numbers, thermal and velocity boundary layers, internal pipe flow (laminar and turbulent)	Direct	Quiz
(22)	2	Explain free convection and use empirical relations.	Free convection: thermal and velocity boundary layers	Direct	Practical Assignment
(23-25)	2	Analyze and design heat exchangers using LMTD and NTU methods.	Heat exchangers: types, LMTD, multi-pass and plate heat exchangers, effectiveness, NTU	Direct	Homework

			design method, fouling factors and Wilson's plot		
(26-28)	2	Explain boiling and condensation phenomena and apply empirical correlations.	Boiling: types, boiling curve, empirical relations; condensation: types, empirical relations	Direct	Midterm Exam
(29-30)		Analyze radiative heat transfer using view factors and networks.	Thermal radiation: black body, Stefan-Boltzmann law, grey body, radiation between surfaces	Direct	Homework

11. Course Evaluation

- First midterm exam: 10 marks
- Midyear exam: 15 marks
- Second midterm exam: 10 marks
- Class activities and assignments: 5 marks
- Design exercises or projects: 10 marks
- Final exam (end of year): 50 marks

12. Learning and Teaching Resources

Required textbooks	• Hollman J.P., Heat Transfer, McGraw Hill • Kern D.Q., Process Heat Transfer, McGraw Hill.
Main references (sources)	• Hollman J.P., Heat Transfer, McGraw Hill
Recommended books	• None
Websites	• None.

Course Description Form

1. Course Name:
Internal Combustion Engines
2. Course Code:
FA303
3. Semester / Year:
Year / Third Class
4. Description Preparation Date:
25/7/2025
5. Available Attendance Forms:
In person
6. Number of Credit Hours (Total) / Number of Units (Total)
150/7
7. Course administrator's name (mention all, if more than one name)
Name: Email:
8. Course Objectives

Course Objectives	• Understanding the Engine Operation: Studying how chemical energy is converted into mechanical energy in internal combustion engines. • Improving Efficiency and Performance: Analyzing and enhancing fuel consumption efficiency and reducing harmful emissions. • Developing Sustainable Technology: Studying modern trends in engine development to improve environmental performance and adapt to alternative energy sources.

9. Teaching and Learning Strategies

Strategy	Assessment is based on submitted assignments, written tests, quizzes, reports, and seminars.

10. Course Structure

Week	Hours	Required	Unit or subject name	Learning	Evaluation

		Learning Outcomes		method	Method
1	2	Introduction	Introduction to internal combustion engine. Terminology, TDC & BDC, Stroke &swept volume, compression ratio	Direct	Review
2	2	I.C.E. Classification	Engine components and basic engine nomenclature. I.C. Engines classifications. Four stroke SI Engines. Four stroke CI Engines. Two stroke Engines. Fundamental differences between SI Engines and CI engines. Application of IC Engines. First law analysis of engine cycleenergy balance.	Direct	Homework
3-4	2	Air Standard Cycles	Introduction. Ideal or air standard cycles. Useful thermodynamic relations. The Carnot cycle. The Otto cycle. The Diesel cycle. The dual combustion cycle. Comparison of Otto, Diesel, and dual combustion cycles.	Direct	Quiz
5-6	2	Operating Characteristic (Indicated and Effective values	Engine Parameters. Work. Mean Effective Pressure. Torque and Power. Air-Fuel Ratio and	Direct	Experimental test

			Fuel-Air Ratio. Specific Fuel Consumption. Engine Efficiencies. Volumetric Efficiency. Emissions.		
7-8	2	Fuels and Combustion	Hydrocarbon Fuels-Gasoline. Some Common Hydrocarbon Components. Self-Ignition and Octane Number. Diesel fuel. Chemical equilibrium. Combustion temperature. Adiabatic flame temperature. Liquid and gaseous combustion.	Direct	Homework
9-11	2	Mixture Preparation in S Engines	Carburetion. Mixture requirements for steady state operation. Distribution. Transient mixture requirements. A simple or elementary carburetor. Complete carburetor. Carburetor types. Theory of simple carburetor. Aircraft carburetor. Petrol injection. The Lucas petrol injection. Electronic fuel injection. Advantage and disadvantage of petrol injection.	Direct	Quiz

12-13	2	Fuel Injection	Heat release pattern and fuel injection. Requirements of a diesel injection system. Types of injection systems. Fuel pump. Types of fuel injectors. Injection nozzles. Quantity of fuel per cycle, size of nozzle orifice. Spray formation. Spray direction. Injection timing.	Direct	Homework
14-15	2	Ignition	Ignition system requirements. Battery ignition system. Magneto ignition system. Ignition Timing. Spark plugs. Disadvantage of conventional system. Electronic ignition system. Factors affecting spark plug operation.	Direct	First Exam
16-17	2	Combustion in Spark Ignition Engines	Stages of combustion in S.I.E. Abnormal combustion. Ricardo's theory of combustion chamber. Basic types of combustion chamber in S. I. Engines.	Direct	Mid-year Exam
18-19	2	Combustion in Compression Ignition Engine	Combustion stages in C.I engines. Factors effecting on ignition delay. Type of combustion chamber in C.I engines.	Direct	Homework
20-21	2	Lubrication	Lubrication	Direct	Quiz

		System in I.C Engines	principles. Function of lubrication. Properties of lubricating oil. Classification of lubricating oils. Oil Filters. Lubrication systems. Engine performance and lubrication.		
22-23	2	Cooling System IC Engines	Necessity of Engine cooling. Air Cooling. Water-cooling. Comparison of air and water-cooling systems. Radiators.	Direct	Homework
24-26	2	Supercharging	Objects of supercharging. Thermodynamic cycle with supercharging. Supercharging of spark ignition engine. Supercharging of C.I engine. Supercharging limits. Methods of supercharging. Turbo charging. Methods of Turbo charging. Limitations of Turbo charging.	Direct	Quiz
27-28	2	Rotary Engines	The working principle. Features of the rotary engines. Engine geometry. Combustion in rotary engines. Applications of rotary engines.	Direct	Experimental test
29-30	2	Air Pollution	Pollutants from gasoline engines. Emission control for	Direct	Second Exam

			Gasoline engine. Diesel emission. Diesel smoke and control. Comparison of diesel and gasoline emissions. Air pollution from gas turbine.		

11.Course Evaluation

First Exam (10 Marks).

Mid-year Exam (15 Marks).

Second Exam (10 Marks).

HomeWorks (5 Marks).

Experimental part (10 Marks).

Final Exam (50 Marks)

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	• Engineering fundamentals of the inter combustion engines by Willard P. • Internal combustion engines, by Mathur a Sharma
Main references (sources)	• Internal combustion engines applied ther sciences by Colin F. and Allan T.
Recommended books and references (scientific journals, reports...)	• Introduction to I.C.E by J.B Heywood.
Electronic References, Websites	None

Course Description Form

1. Course Name:
Gas Technology
2. Course Code:
FA304
3. Semester / Year:
Annual/Third stage
4. Description Preparation Date:
23/7/2025
5. Available Attendance Forms:
In-person
6. Number of Credit Hours (Total) / Number of Units (Total)
5/150
7. Course administrator's name (mention all, if more than one name)
Name: MS.C. Rahma Dawood Salman Email: rahmadawoodsalman@gmail.com
8. Course Objectives

Course Objectives	1. General look on the importance of natural gas and its reverse 2. Natural Gas, Natural Gas kinds and gas reservoir characteristics, Phase Behavior, Chemical and Physical Properties. 3. Gas Compression, Compressions of Natural Gas, Types of gas compressors: Rotary, Jet, and Reciprocating natural gas compressors.

9. Teaching and Learning Strategies	
Strategy	Assessment is based on hand-in assignments, written exam, quizzes, reports, seminars, Practical testing and Online testing.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1	2	General look on the importance of natural gas and its reverse	Introduction	Direct	Feedback
2-4	2	Natural Gas kinds and gas reservoir characteristics, Phase Behavior, Chemical and Physical Properties.	Natural Gas	Direct	Short Test
5-6	2	Compressions of Natural Gas, Types of gas compressors: Rotary, Jet, and Reciprocating natural gas compressors	Gas Compression	Direct	work class
7-9	2	Separators, The removal of solid, water and condensates, Stabilization process, Drying of gaseous fuel by adsorption and absorption	Gas Physical Separation:	Direct	Homework
10-15	2	Sweetening by adsorption and absorption, Gas Flaring Reduction	Sweetening of Gaseo fuel:	Direct	midterm exam
16-20	2	NGL fractionation: de-ethanizer, de-propanizer, de-butanizer	Natural Gas Liquefaction(NGL)	Direct	Short Test

21-23	2	LPG methods, process, and description. Some problems associated with Natural Gas treatment and production. Hydrate control in gas production causes. Occurrence and control	Liquefied Petroleum Gas (LPG)	Direct	Homework
24-25	2	Methods, process, and description.	Law Temperature Separation	Direct	work class
26		Pipe Line Design Calculation and Economics, Gas flow in serious, Parallel and Looped Pipeline	Gas Gathering and Transportation	Direct	Homework
27-30		Hydrogen production, methods, process, and description.	Hydrogen productio	Direct	midterm exam

11.Course Evaluation

First semester exam: 10 marks

Midterm exam: 13 marks

Second semester exam: 10 marks

Classroom activities and assignments: 7 marks

Final exam: 60 marks

Total: 100 marks

12.Learning and Teaching Resources

Required textbooks (curricular books,	1. Shreve's "Chemical Process Industries" 5th edition

if any)	(2001). 2. Joseph F. Hilyard " the oil and gas industry, a nontechnical guide
Main references (sources)	___
Recommended books and references (scientific journals, reports...)	___
Electronic References, Websites	_____

Course Description Form

1. Course Name:
Mass Transfer
2. Course Code:
FS305
3. Semester / Year:
Year/ 3rd. stage
4. Description Preparation Date:
22/7/2025
5. Available Attendance Forms:
In-person lecture
6. Number of Credit Hours (Total) / Number of Units (Total)

150/7

7. Course administrator's name (mention all, if more than one name)

Name: Ahmed Nafa Awad

Email: ahmed.fet@uoalhuda.edu.iq

8. Course Objectives

Course Objectives	To introduce the basic principles of chem engineering separation processes and mass tran and then proceed to study the design and operatio separation processes units operation such distillation, gas-liquid absorption and stripp liquid-liquid extraction, adsorption crystallization.

9. Teaching and Learning Strategies

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

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1	2	Type and definition of diffusion.	Introduction	Direct	Back feed
Week (2-7)	2	1- Solve simple problems involving diffusion. 2. Apply analogies to obtain transport coefficients.	Diffusion: Mechanism ar Theory Diffusion in a Stagnant Layer, Equimol and Unequimolar Counte Diffusion, Diffusion Through Varying Area, Multi-component diffusi prediction of diffusivity, Diffusion in gases and liquids.	Direct	short exam
Week (8-12)	2	Use stage equations to perform calculation in binary distillation and gas absorption designs.	Distillation Introduction distillation, Binary Flash Distillation, Fractionatio Distillation, Feed Conditions, Number of stages by McCabe-Thiele and Lewis-Sorel Method Number of stages at total reflux and Minimum Ref Ratio, Distillation Efficiency	Direct	First semeste exam

Week (13-15)	2	Calculate number of stages in multi-components distillation column	Multi-component Distillation: Exact Computation and Short C Method, bubble and dew point calculations.	Direct	Midterm exam
Week (16-23)	2	Choose suitable methods to calculate number of stages or height of distillation and gas absorption column.	Gases Absorption and Stripping Two Film Theo Mass Transfer Coefficien Number of Stages in Absorption Column, Des of Absorption Column using Height of Transfer Unit, Minimum Liquid Flow Rate. Stripping Column, Height of Packe bed and Number of Stage in Stripping Column.	Direct	Second semester exam
Week (24-30)	2	Calculate number of stages in liquid extraction tower.	Liquid-liquid Extraction Ternary system of extraction, Extraction calculations of partial solubility and non-solubl liquids, Design of co-current and counter-curre extraction for miscible ar immiscible liquids	Direct	Short test

11.Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc.

First semester exam: 10 points

Midterm exam: 15 points

Second semester exam: 10 points

Classroom activities and assignments: 5 points

Design exercises or projects: 10 points

Final exam (end of year): 50 points

Total: 100 points

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	• T.K.Sherwood, R.L.Pigford and C.R.Wi

	Mass Transfer, McGrawHill, • Coulson & Richardson's ,"Chem Engineering" volume 2 , (2003) • Binay K. Dutta "Principle of Mass Tran and Separation Processes" • Treybal, R.E., 'Mass Transfer Operatio 3rd edition, 1980, McGraw Hill.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Numerical and Engineering Analysis
2. Course Code:
EA306
3. Semester / Year:
Year / Third Stage
4. Description Preparation Date:
2025/7/22
5. Available Attendance Forms:
On-Campus lecture
6. Number of Credit Hours (Total) / Number of Units (Total)
4/100
7. Course administrator's name (mention all, if more than one name)
Name: Email:
8. Course Objectives

Course Objectives	**Solving equations using analytical methods** (Fourier, Laplace, matrices). **Applying numerical methods** for solving, approximation, and error estimation.

9. Teaching and Learning Strategies

Strategy	Assignments, written exams, quizzes, reports, and seminars

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1	**2**	Revision Ordinary Differential Equations	Using theory and Eng. Methods	In- Class	Quizzes and HWs.
2	**2**	Chapter One: Fourier Series/Periodic Functions	Using theory and Eng. Methods	In- Class	Quizzes and HWs.
3	**2**	Chapter One: Fourier Series/non-Periodic Functions	Using theory and Eng. Methods	In- Class	Quizzes and HWs.
4	**2**	Chapter One: Fourier Series/Even and Odd Functions	Using theory and Eng. Methods	In- Class	Quizzes and HWs.
5	**2**	Chapter Two: Laplace Transform/Introduction	Using theory and Eng. Methods	In- Class	Quizzes and HWs.
6	**2**	Chapter Two: Laplace Transform of Functions	Using theory and Eng. Methods	In- Class	Quizzes and HWs.
7	**2**	Chapter Two: Laplace /Inverse Laplace Transform	Using theory and Eng. Methods	In- Class	Quizzes and HWs.
8	**2**	Chapter Three: Errors and Data Uncertainly	Using theory and Eng. Methods	In- Class	Quizzes and HWs.

9	**2**	Chapter Four: Numerical Solution /Linear Algebraic	Using theory and Eng. Methods	In- Class	Quizzes and HWs.
10	**2**	Chapter Four: Numerical Solution /Direct Methods	Using theory and Eng. Methods	In- Class	Quizzes and HWs.
11	**2**	Chapter Four: Numerical Solution /Indirect Methods	Using theory and Eng. Methods	In- Class	Quizzes and HWs.
12	**2**	**1st Month Exam**			
13	**2**	Chapter Five: Roots Finding of Nonlinear Equations	Using theory and Num. Methods	In- Class	Quizzes and HWs.
14	**2**	Chapter Five: Roots Finding of Nonlinear Equations	Using theory and Num. Methods	In- Class	Quizzes and HWs.
15	**2**	Chapter Six: Interpolation and Curve Fitting	Using theory and Num. Methods	In- Class	Quizzes and HWs.
16	**2**	Chapter Six: Interpolation and Curve Fitting	Using theory and Num. Methods	In- Class	Quizzes and HWs.
17	**2**	Chapter Seven: Numerical Solution of Differentiation	Using theory and Num. Methods	In- Class	Quizzes and HWs.
18	**2**	Chapter Seven: Numerical Solution of Integration	Using theory and Num. Methods	In- Class	Quizzes and HWs.
19	**2**	Chapter Eight: Numerical Solution of (ODE)/Initial Value Problem	Using theory and Num. Methods	In- Class	Quizzes and HWs.
20	**2**	Chapter Eight: Numerical Solution of (ODE)/Euler's Method	Using theory and Num. Methods	In- Class	Quizzes and HWs.
21	**2**	Chapter Eight: Numerical Solution of (ODE)/Runge-Kutta Method	Using theory and Num. Methods	In- Class	Quizzes and HWs.
22	**2**	Chapter Eight: Numerical Solution of (ODE)/Error Estimation	Using theory and Num. Methods	In- Class	Quizzes and HWs.
23	**2**	Chapter Nine: Numerical Solution of (PDE)/Finite Element Method	Using theory and Num. Methods	In- Class	Quizzes and HWs.

24	**2**	**2nd Month Exam**			
25	**2**	Chapter Nine: Numerical Solution of (PDE)/Hyperbolic Conservation Laws	Using theory and Num. Methods	In- Class	Quizzes and HWs.
26	**2**	Chapter Ten: Numerical Optimization/Unconstrained Optima. Problems	Using theory and Num. Methods	In- Class	Quizzes and HWs.
27	**2**	Chapter Ten: Numerical Optimization/Si-mplex,Gradient,Newton line Methods	Using theory and Num. Methods	In- Class	Quizzes and HWs.
28	**2**	Chapter Ten: Numerical Optimization/Trust-region Newton method	Using theory and Num. Methods	In- Class	Quizzes and HWs.
29	**2**	Chapter Ten: Numerical Optimization/La-grangian methods	Using theory and Num. Methods	In- Class	Quizzes and HWs.
30	**3**	**Final Exam**			

11.Course Evaluation

First Month Exam: 10 marks

Midterm Exam (Half-Year): 15 marks

Second Month Exam: 10 marks

Class Activities, Homework, or Projects: 5 marks

Final Exam (End of Year): 60 marks

Total: 100 marks

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	-Higher Engineering Mathematics (2014),7th Edition, John Bird. -Numerical Methods for Engineers (2005) , 5th Edition . McGraw-Hill. S.C. Chapra & R.p.Canale
Main references (sources)	-Higher Engineering Mathematics (2014),7th Edition, John Bird. -Numerical Methods for Engineers (2005) , 5th Edition . McGraw-Hill. S.C. Chapra & R.p.Canale

Recommended books and references (scientific journals, reports...)	-
Electronic References, Websites	-

Course Description Form

1. Course Name:
Computer Programming
2. Course Code:
EA207
3. Semester / Year:
Year/ Third Stage
4. Description Preparation Date:
23/7/2025
5. Available Attendance Forms:
In Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
120/4
7. Course administrator's name (mention all, if more than one name)
Name: MS.c Aseel Satar Abdullah
8. Course Objectives

Course Objectives	MATLAB is one of the languages used by engineers and scientists to create Programs for engineering and scientific calculations. MATLAB allows la amounts of Data to be analyzed very efficiently. And dealing with variables, Dealing with matrices operations, making functions, making graphs building .

9. Teaching and Learning Strategies

Strategy	Lectures and computer exercises using Matlab

10. Course Structure

Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
Week (1)	3	Introduction	Environment of MATLAB	Direct	Feedback

Week (2-6)	3	Arithmetic Expressions .	Mathematical functions, Logical Operators, Relational Operators.	Direct	Practical
Week (7)	3	Vectors and Matrices	Matrix operations, transpose and inverse of Matrix	Direct	Feedback
Week (8-10)	3	polynomials .	Working with polynomials (manipulating polynomials, derivatives roots, eigen values).	Direct	Exam
Week (11-12)	3	Linear Equations	Solve System of Linear Equations by Gauss Elimination Method	Direct	Mid exam
Week (13-14)	3	M-file .	Create in an M-file, function calling in MATLAB	Direct	Practical exam

Week (15-19)	3 2	.	Programming with MATTAB, Use of Built-in Functions, Input Output, Structured Programming, Nesting and Indentation .	Direct	Practical
Week (20-21)	3	Dealing with Errors and Pitfalls.	Syntax Errors. Incompatible vector sizes. Name hiding. Logic and Rounding Error.	Direct	Practical
Week (22-24)	3	Graphic plot	Graphics two-dimensions plots, Log-log and semi-log plots, Histograms plots. .	Direct	Practical exam
Week (25-28)	3	Linear Regression, Curve fitting.	Conditions and loops statements Functions: if, else, else if, while, for, switch, break Loop function: for-next, do-while…end	Direct	Feedback

Week (29-38)	3	Applications	One and two dimensions Interpolation by algebraic polynomials • Roots Finding of Nonlinear Equations (Bisection and Newton Raphson method). • Numerical Integration by Trapezoidal Rule and Simpson's Rule • Ordinary differential equations (Numerical Solutions using Modified Euler and Runge Kutta Methods) • Calculate the Laplace Transform and inverse Laplace Transform	Direct	Short exam
Week (39-43)	3	Optimization Toolbox	What Is the Optimization Toolbox? Unconstrained and constrained Optimization. Multi-objective Optimization. Large-Scale Algorithms.	Direct	Final / practical Exam
11. Course Evaluation					

First semester exam: 10 points

Midterm exam: 15 points

Second semester exam: 10 points

Classroom activities, assignments, and reports: 5 points

Practical: 10 points

Final exam (end of year): 50 points

Total: 100 points

12.Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	Mark E. Davis "Numerical method and modelling for chemical engineer
Recommended books and references (scientific journals, reports...)	Mathew J.H., Numerical Methods for Mathematics, Science and Engineering. Advanced Engineering Mathematics, 10th Edition" Erwin Kreyszig, Wiley, 2011
Electronic References, Websites	Nothing

Course Description Form

1. Course Name:
Resources of Energy
2. Course Code:
FS308
3. Semester / Year:
Yearly / 3rd
4. Description Preparation Date:

23/7/2025

5. Available Attendance Forms:

Available

6. Number of Credit Hours (Total) / Number of Units (Total)

7

7. Course administrator's name (mention all, if more than one name)

Name: Omar Sami Thiab

Email: thiabo@yahoo.com

8. Course Objectives

Course Objectives	• **Classify major energy resources** as renewable or non-renewable and desc their characteristics, availability, and global distribution. • **Understand the fundamental principles** of energy generation, conversion, efficiency across various energy systems. • **Evaluate the environmental, economic, and social impacts** of different ene sources, including fossil fuels, nuclear, and renewable energy technologies.

9. Teaching and Learning Strategies

Strategy	Theoretical Lectures, Exercises, and Practical Experiments

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	The importance of energy	Introduction	theoritical	Discussion
2-4	6	Fuel,fuel classifications, Energy, renewable and non-renewable energy, characteristics of energy resources, energy conversion.	Fuel	Theoretical + lab.	Quiz
5-8	8	Petroleum, oil reservoirs, compositions, volumetric calculation of oil reserve and recovery factor	Non Renewable Sources of Energy	theoritical	Quiz

9-12	8	Definitions, Characteristics, kinds, Coal analysis, Heating value calculation for coal. Wood Characteristics, kinds, and Wood Heating value	Solid fossil fuel	Theoretical + lab.	Quiz + seminars
13-16	8	Definitions, characteristics, kinds, Heating value for gaseous fuel.	Natural Gas	Theoretical + l	Quiz + seminars
17-20	8	Methods of Hydrogen generations, Hydrogen storage and fuel cells, applications	Hydrogen Energy	Theoretical + l	Quiz + seminars
21-25	10	Biogas, Biogas utilization units, Biodiesel, Recycling Energy corps, Applications and limitations of Bio energy	Biomass Energy	Theoretical + l	Quiz + seminars
26-28	6	Kinds of nuclear energy, Kinds of Nuclear reactors, applications	Nuclear Energy:	Theoretical + l	Quiz + seminars
29-30	4	the interaction between energy resources, markets, technologies, and public policy.	Energy Economics	Theoretical + l	Quiz + seminars

11.Course Evaluation

Mid-term exam : 10

Half Year exam : 20

2nd Mid term exam : 10

Laboratory : 10

Final exam : 50

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	Bansal N.K., Kleeman M. & Meliss M., Renewable Energy Sources & Conversion Tech.,Tata ,McGraw Hill
Main references (sources)	Goldmberg J., Johansson, Reddy A.K.N. , Energy for a Sustainable World, John Wiley
Recommended books and references (scientific	Johansson, T. B., Kelly, H., Reddy, A. K. N., &

journals, reports...)	Williams, R. H. (Eds.). (1993). *Renewable energy: Sources for fuels and electricity*. Island Press.
Electronic References, Websites	

Course Description Form

13.Course Name:	
Environmental Pollution and Industrial Safety	
14.Course Code:	
FG309	
15.Semester / Year:	
Year/ Third Stage	
16.Description Preparation Date:	
23/7/2025	
17.Available Attendance Forms:	
In Attendance	
18.Number of Credit Hours (Total) / Number of Units (Total)	
100/ 4	
19.Course administrator's name (mention all, if more than one name)	
Name: Dr. Maher Abdel Rahim	
20.Course Objectives	
Course Objectives	• Identify the types, sources, and effects of pollution. • Understand the principles and importance of industrial safety. • Develop students' awareness of the risks involved. • Acquire multiple industrial skills
21.Teaching and Learning Strategies	
Strategy	Theoretical lectures, field visits to the safety and firefighting unit in industrial facilities
22. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week (1)	2	Environmental Pollution	Introduction	Direct	Feedback
Week (2)	2	.	Geometrical checking an its aims, Neglecting of geometrical checking.	Direct	Feedback
Week (3)	2		Checking method and the employed instruments	Direct	Short Exam
Week (4-5)	2		Radioactivity effect	Direct	Mid Exam
Week (6-7)	2	.	biological effects	Direct	Homework
Week (8-10)	2		Safety and chemical material dangerous	Direct	Short exam

Week (11-12)	2		Mechanical , chemical and electrical dangerous	Direct	Feedback
Week (13-14)	2		Fuel - Explosions – fires and protection methods.	Direct	Short Exam
Week (15)	2		Safety and security systems. .	Direct	Feedback
Week (16)	2	Industrial Safety	Foundation of industrial safety and avoiding the accidents	Direct	Practical exam

Week (17)	2		Hazards Related to Oil and Gas Industries	Direct	Feedback
Week (18-19)	2		Safety of fire accidents	Direct	Short exam
Week (20-21)	2		Noise and Hearing Loss Prevention	Direct	Practical
Week (22)	2		Natural gas safety regarding	Direct	Short exam
Week (23)	2		Prevention and Safety of Oil Spill	Direct	Feedback

Week (24-25)	2		Safety and chemical material dangerous	Direct	Feedback
Week (26-28)	2	Ergonomics	Problem statement of musculoskeletal disorders	Direct	Short exam
Week (29-30)	2		Hazards control/Personal Protective Equipment	Direct	Final Exam

23.Course Evaluation

First semester exam: 10 points

Midterm exam: 15 points

Second semester exam: 10 points

Classroom activities, assignments, and reports: 10 points

Final exam (end of year): 50 points

Total: 100 points

24.Learning and Teaching Resources

Required textbooks (curricular books, if any)	.
Main references (sources)	Ruth F.Weiner "Environmental Engineering", 4th edition. 1. K.B.Schnelle & C.A.Brown, Air Pollution Control Technology Handbook, • Daniel A. Crowl. Chemical Process Safety fundamentals with applications, 3rd edition

Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	Nothing

Course Description Form

13. Course Name:
Process of Unit operation
14. Course Code:
FA401
15. Semester / Year:
Year/ 4rd. stage
16. Description Preparation Date:
22/7/2025
17. Available Attendance Forms:
In-person lecture
18. Number of Credit Hours (Total) / Number of Units (Total)
150/7
19. Course administrator's name (mention all, if more than one name)
Name: Ahmed Nafa Awad Email: ahmed.fet@uoalhuda.edu.iq

20.Course Objectives

Course Objectives	• Boundary layer that develops in many Chemical Engineering processes such as falling film absorbers which enables the engineer to understand how the equipment works. • The Momentum, heat, and mass transfer analogies to understand the similarities between these phenomena so one would be able to predict one phenomenon in terms of other measurable quantities (usually heat transfer). • Introduction and applications of: Evaporation, drying (, extraction, leaching, crystallization, and adsorption. These are all separation processes that exist in the chemical industry so the student will be prepared to handle these pieces of equipment in the future.

21.Teaching and Learning Strategies

Strategy	Lecture, Demonstration, Discussion, Question and Answer, Drill and Practice, Prob Solving.

22. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week (1-5)	2	1- Integrate the knowledge and understanding in designing separation columns with other unit	Humidification and Air Conditioning Adiabatic saturation temperature. humidity data for air-water system, psychometric chart,	Direct	Feedback

		operation. 2. Explain the theoretical ba of processes involving Humidification / dehumidification, drying, evaporation, crystallization membrane separation.	temperature-humidity and enthalpy-humidity charts , Determination of humidity, methods of increasing humidity, Cooling towers, Design of natural-draught towers. Evaporation loss of water in cooling tower.		
Week (6-10)	2	1- Integrate the knowledge and understanding in designing separation columns with other unit operation. 2. Explain the theoretical ba of processes involving Humidification / dehumidification, drying, evaporation, crystallization membrane separation.	Drying Steps of drying, rate of drying, time of drying. Heat and mass transfer in dryers. Drying characteristics of materials. Solids handling, adiabatic and non-adiabatic dryers, temperature patterns in dryers, Drying equipment, design and performance of various drying equipment , Drying of petroleum gases	Direct	First exam
Week (11-15)	2	1- Integrate the knowledge and understanding in designing separation columns with other unit operation. 2. Explain the theoretical basis of processes involving Humidification / dehumidification, drying, evaporation, crystallization and membrane separation.	Evaporation Material and energy balances in the evaporators, Types of evaporators, Single and multiple effect evaporators, Performance of evaporators.	Direct	Midterm Exam
Week (16-19)	2	1- Integrate the knowledge and understanding in designing separation columns with other unit operation.	Filtration Theory and Classification of Filtration, Constant rate Filtration , Constant Pressure Filtration, Filtration equipment: Plate and frame filter	Direct	Homework

		2. Explain the theoretical basis of processes involving Humidification / dehumidification, drying, evaporation, crystallization and membrane separation	press and Rotary filters.		
Week (20-22)	2	1- Integrate the knowledge and understanding in designing separation columns with other unit operation. 2. Explain the theoretical basis of processes involving Humidification / dehumidification, drying, evaporation, crystallization and membrane separation	Centrifugal Separation Centrifugal pressure, Separation of immiscible liquids of Different densities, Centrifugal equipment	Direct	Short test
Week (23-26)	2	1- Integrate the knowledge and understanding in designing separation columns with other unit operation. 2. Explain the theoretical basis of processes involving Humidification / dehumidification, drying, evaporation, crystallization and membrane separation	Sedimentation Separation Stokes Law, Gravitational Sedimentation, Sedimentation equipment	Direct	Second semes Exam
Week (27-30)	2	1- Integrate the knowledge and understanding in designing separation columns with other unit operation.	Membranes Separation Theory and Classification of Membranes Separation, Porous membranes, pressure driven processes, Concentration or partial pressure driven processes,	Direct	Short exam

		2. Explain the theoretical basis of processes involving Humidification / dehumidification, drying, evaporation, crystallization and membrane separation	dense membranes, Reverse Osmosis.		

23.Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc.

First semester exam: 10 points

Midterm exam: 15 points

Second semester exam: 10 points

Classroom activities and assignments: 5 points

Design exercises or projects: 10 points

Final exam (end of year): 50 points

Total: 100 points

24.Learning and Teaching Resources

Required textbooks (curricular books, if any)	•Geankoplis C J, 1995, 'Transport Process and U Operations', Prentice-Hall. • Mc.Cabe W L, Smith J C, 1993, 'Unit Operations Chemical Engineering', McGraw-Hill. • Seader & Henley, 2006, 'Separation Process Princip John Wiley & Son. • Coulson J M, Richardson J F, 'Chemical Engineering Vo Butterworth-Heinemann. • Pabby, A.K., Rizwi, S. and Sastre, A.M., 2009 Handbool Membrane Separations.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Reactor Design
2. Course Code:
FA402
3. Semester / Year:
Annual/Fourth stage
4. Description Preparation Date:
23/7/2025
5. Available Attendance Forms:
In-person
6. Number of Credit Hours (Total) / Number of Units (Total)
5/150
7. Course administrator's name (mention all, if more than one name)
Name: MS.C. Rahma Dawood Salman Email: **rahmadawoodsalman@gmail.com**
8. Course Objectives

Course Objectives	• Express reactor design equations for plug flow, CSTR & batch reactors and determine the size of reactor required for single or multiple reactors with different arrangements. • Express energy equation & evaluate effect of heat on rate of reaction and reactor size and identify multiple steady state phenomena.

9. Teaching and Learning Strategies	
Strategy	Lecture, Demonstration, Discussion, Question and Answer, Drill and Practice, Problem Solving.

10. Course Structure

Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**

1-2	2	Thermodynamics of Chemical Reaction	Revision	Direct	Feedback
3-7	2	Order and rate of chemical reactions, Ideal reactor: batch reactor, CSTR, and PFR. Non-isothermal reactors (adiabatic of batch reactor, exothermic reactions in CSTR, adiabatic and non-adiabatic of PFR).	Kinetics of Chemical Reaction:	Direct	Short Test
8-12	2	Single reaction reactors, system of single reactor, connection of PFRs in series or in parallel, connection of CSTRs with the same or different volumes in series, connection of different types of reactors in series	Design of Isothermal–Id Reactor	Direct	classwork
13-15	2	Recycle reactor and Self-catalytic reactor	Design of catalytic reactors	Direct	Homework
16-19	2	Maximizing the desired product for one reactant or two reactants, Multiple reactions in CSTR and PFR	Multiple Reactions	Direct	midterm exam

20-22	2	Catalysis and adsorption; Classification and preparation of catalysts; Promoters and inhibitors. Analysis of the reactor (solid-fluid), height of the reactor unit, catalyst activity ; Hougen Watson and power law models	Heterogeneous processes	Direct	Short Test
23-25	2	Catalyst characterization: Surface area and pore size distribution;	Design of reactors with heterogeneous reactions	Direct	Homework
26-30	2	Isothermal and adiabatic fixed bed reactors; Staged adiabatic reactors; No isothermal non-adiabatic fixed bed reactors; Fluidized bed reactors; slurry reactors; Trickle bed reactors; Reactors with novel configurations radial flow reactors, honeycomb reactors, membrane reactors	Design of catalytic reacto	Direct	midterm exam

11.Course Evaluation

First semester exam: 10 marks

Midterm exam: 13 marks

Second semester exam: 10 marks

Classroom activities and assignments: 7 marks

Final exam: 60 marks

Total: 100 marks

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	Elements of Chemical Reaction Engineering, H. Scott Fogler, Prentice Hall, 2001
Main references (sources)	Levenspiel O., Chemical Reaction Engineering, John Wiley
Recommended books and references (scientific journals, reports...)	1. Chemical Reactor Analysis and Design, Gilbert F. Froment, Kenneth B. Bischoff, John Wiley & Sons, 1990 2. Octave Levenspiel (1999),CHEMICAL REACTOR ENGINEERING, 3rd edition, John Wiley & Sons Inc., USA ISBN: 9780471254249 3. J.M. Smith (1987), CHEMICAL ENGINEERING KINETI 3rd edition, McGraw-Hill International Editions, Singapore. ISBN: 9780070587106
Electronic References, Websites	http://websites.umich.edu/~elements/5e/

Course Description Form

1. Course Name:	
Plant and Equipment Design	
2.Course Code:	
FS304	
3. Semester / Year:	
Annual / Fourth Level	
4. Description Preparation Date:	
22/07/2025	
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	
200/8	
7. Course administrator's name (mention all, if more than one name)	
Name: Yaseen Mahmood Tayib Email: yaseen.m@uoalhuda.edu.iq	
8. Course Objectives	
Course Objectives	• Synthesize a layout plan for a given process plant with all the major components. • Select main controlling and monitoring requirements for a given product or utility line.
9. Teaching and Learning Strategies	

Strategy	The assessment is based on assignments, written exams, quizzes, reports, and seminars

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
(1)	2	Distinguishing between design types (process design – mechanical design – design using codes and standards).	Introduction	Direct	Feedback
(2–5)	2	- List types of heat exchangers. - Explain various industrial applications of heat exchangers. - Describe practical design steps of heat exchangers. - Identify key design variables such as flow rate and temperature difference. - Design a shell-and-tube heat exchanger mechanically. - Analyze forces and stresses affecting the shell and tubes.	Introduction to heat exchangers and their applications, practical design of heat exchangers, exchanger characteristics, furnaces, convection and radiation zones, mechanical design of shell-and-tube exchangers.	Direct	Quiz
(6–9)	2	- Identify key variables to determine tray number and column height. - Explain the concept of degrees of freedom in industrial systems. - Compare different methods used for distillation column design. - Explain design considerations for multi-component systems. - Apply approximate methods to calculate required tray numbers.	Distillation column design, degrees of freedom analysis, various design methods of distillation columns, general considerations for multi-component distillation design.	Direct	Practical Assignment
(10–11)	2	- Explain differences between vessels and industrial tanks in terms of function and design. - Explain general design principles for pressure vessels.	Vessels and tanks, principles of vessel design.	Direct	Homework

		- Differentiate between internal and external pressure vessels.			
(12–15)	2	- Identify types of stresses (hoop, longitudinal, thermal). - Calculate wall thickness to withstand stresses. - Design pressure vessels using basic design equations. - Select materials appropriate to operating conditions. - Compare the design between cylindrical and spherical vessels.	Stress considerations, pressure vessel design, codes and standards for pressure vessel design.	Direct	Midterm Exam
(16–20)	2	- Explain the operating principle of separators. - Differentiate between vertical and horizontal separators. - Design vertical and horizontal separators according to operating conditions. - Determine their dimensions and main components.	Separators – principles of separation and types of separators, vertical and horizontal separators.	Direct	Quiz
(21–23)	2	- Classify types of industrial pumps. - Design a piping system according to operating data. - Differentiate between pipe fittings and their functions. - Explain types of industrial valves and their applications. - Explain the working principle of steam traps and their role in thermal systems.	Pumps, piping systems, fittings, valves, steam traps.	Direct	Practical Assignment
(24–27)	2	- Design an integrated industrial piping network according to operating, pressure, and temperature requirements. - Differentiate between valve types (control valves – safety valves – shut-off valves) in terms of construction and use.	Piping system design, valve types, control valves, safety valves, structural features, selection criteria.	Direct	Homework

		- Explain structural features of valves and related pipes. - Apply selection criteria for valves and fittings based on industrial application and operating conditions.			
(28–30)	2	- Explain the concept of cost diagrams and their role in project design. - Use cost diagrams to evaluate design alternatives in terms of efficiency and cost. - Determine the economically optimal choice using comparison methods. - Identify direct and indirect cost elements in the project.	Introduction to cost diagrams, alternative analysis using cost diagrams, project cost estimation.	Direct	Midterm Exam

11. Course Evaluation

- First midterm exam: 10 marks
- Midyear exam: 15 marks
- Second midterm exam: 10 marks
- Class activities and assignments: 5 marks
- Design exercises or projects: 10 marks
- Final exam (end of year): 50 marks

12. Learning and Teaching Resources

Required textbooks	• Seider, Warren D., Seader, J. D., and Lewin, Daniel R., Product and Process Design Principles: Synthesis, Analysis, and Evaluation, 2nd Edition, New York, Wiley, 2004. • Coulson, J. M., Richardson, and Sinnott, R. K., Chemical Engineering Design, Vol. 6, 4th Edition, Butterworth-Heinemann, 2006.
Main references (sources)	• Coulson, J. M., Richardson, and Sinnott, R. K., Chemical Engineering Design, Vol. 6, 4th Edition, Butterworth-Heinemann, 2006.
Recommended books	• Peters, M. S., and Timmerhaus, K. D., Plant Design and Economics for Chemical Engineers, 5th Edition, New York, McGraw-Hill, 2003.
Websites	• None.

Course Description Form

1. Course Name:
Control and Measuring Engineering
2. Course Code:
FS404
3. Semester / Year:
Year / Fourth Class
4. Description Preparation Date:
24/7/2025
5. Available Attendance Forms:
In person
6. Number of Credit Hours (Total) / Number of Units (Total)
150/7
7. Course administrator's name (mention all, if more than one name)
Name: Email:

8. Course Objectives

Course Objectives	• Analyze responses of systems with different orders. • Design controllers for closed loop systems. • Tune controllers that has been designed using various methods.

9. Teaching and Learning Strategies

Strategy	Assessment is based on submitted assignments, written tests, quizzes, reports, and seminars.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1-2	2	Introduction to proc control	Why Process Control, Control Systems, Process dynamics	Direct	Review
3-7	2	Linear Open-Loop Systems: Response First-Order Systems	Transfer Function (Mercury Thermometer), Transient Response , Forcing Functions, Step Response , Impulse Response , Ramp Response , Sinusoidal Response	Direct	Quiz
8-10	2	Linear Open-Loop Systems	Examples of First-Order Systems , Liquid Level, Mixing Process, Heating Process , Linearization	Direct	Homework
11-13	2	Response of First-Order Systems in Series	Non-interacting System , Interacting System	Direct	Experimental test
14-18	2	Higher-Order Syste Second-Order and Transportation Lag	Second-Order System , Transportation Lag Linear closed-loop systems: the control system Components of a control system , Block diagram , Development of block diagram	Direct	First Exam
19-20	2	Block Diagram of a Reactor Control System	Description of System, Reactor Transfer Functions, Control Valve, Measuring Element,	Direct	Mid-year Exam

			Controller, Controller Transducer, Transportation Lag.		
21-22	2	Stability	Concept of Stability , Definition of Stability (Linear Systems), Stability Criterion , Routh Test for Stability	Direct	Homework
23-24	2	Root Locus	concept of root locus	Direct	Experimental test
25-26	2	Frequency Respons	Substitution Rule , Bode Diagrams	Direct	Homework
27-28	2	Control System Des by Frequency Response	Tank Temperature Control System, The Bode Stability Criterion , Gain and Phase Margins , Ziegler-Nichols Controller Settings	Direct	Quiz
29-30	2	Control valves	Control valve construction , Valve sizing , Valve characteristics , Valve positioner	Direct	Second Exam

11.Course Evaluation

First Exam (10 Marks).

Mid-year Exam (15 Marks).

Second Exam (10 Marks).

HomeWorks (5 Marks).

Experimental part (10 Marks).

Final Exam (50 Marks)

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	• Coughanowr and LeBlanc, Process Systems Analysis and Control, McGraw-Hill, 3rd edition, 2009. • G.Stephanopoulos, “Chemica

	Process Control-An Introduction to Theory ar Practice”, • Prentice -Hall, New Jersey, 1984. • W. L. Luyben, “Process Modeling, Simulation and Control for Chemical Engineers,” McGraw- • Hill, New York, 2nd edition, 1990 .
Main references (sources)	• W. Bequette "Process Dynamics: Modeling, Analysis and Simulation".
Recommended books and references (scientific journals, reports...)	• Stephnopolous, Chemical Process Control • W.L.Luyben, Process Modeling, Simulation and Control for Chemical Engineers, McGrawHill .
Electronic References, Websites	-----

Course Description Form

1. Course Name:
Combustion and Explosion Technology
2. Course Code:
FS406
3. Semester / Year:
Annual / Fourth Stage
4. Description Preparation Date:
23/7/2025
5. Available Attendance Forms:
Direct
6. Number of Credit Hours (Total) / Number of Units (Total)
175/7
7. Course administrator's name (mention all, if more than one name)
Name: Noor Shafeeq Obeid

8. Course Objectives

Course Objectives	**Main Learning Objectives:** 1. Analyze the ignition mechanism and flame propagation. 2. Evaluate combustion technology in industrial applications. 3. Apply explosion prevention methods in industrial facilities (e.g., safety valves, extinguishing systems, early detection devices).

9. Teaching and Learning Strategies

Strategy	Key strategies suitable for achieving the intended learning outcomes include: 1. Interactive lectures 2. Case studies 3. Problem-based learning 4. Collaborative learning 5. Discussion of environmental values 6. Field or virtual visits

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week (1-3)	2	- Classify fuels by physic state. - Identify heat changes in chemical reactions. - Analyze the effect of environmental conditions (temperature and pressure on thermal reactions.	1. Types of fuels 2. Thermochemical properties	direct	Feedback
Week (4-6)	2	- Differentiate between combustion types (complete, incomplete, _Analyze combustion products. - Understand and differentiate between Hig Heating Value (HHV) and Lower Heatin Value (LHV).	1. Combustion modes and flame types 2. Analysis of combustion products 3. Heating values	direct	Classroom activity
Week (7-9)	2	- Perform heat calculations. - Explain the equilibrium constant (K) in chemical reactions at a specific temperature. - Calculate adiabatic flame temperature using energy	1. Heat calculations 2. Adiabatic flame temperature 3. Equilibrium	direct	Short test

		conservation.	constant		
Week (10-14)	2	_Explain thermal decomposition of compounds at high temperatures. - Describe ignition mechanisms in gases, liqu and solid fuels. - Analyze premixed flame structure: combustion zor blue flame, inner and oute flame. - Explain the importance flame speed and stability and its effect on burner design.	1. Water-to-gas transformation 2. High-temperature decomposition 3. Ignition reactions and limits 4. Premixed flame analysis (conservation equations)	direct	Home work
Week (15)	2	- Describe ignition mechanisms. _Analyze premixed flame structure. _- Perform heat calculations	Review of topics: 1.Heatcalculations 2. Adiabatic flame temperature 3. Equilibrium constant 4. Water-to-gas transformation 5. Thermal decomposition 6.Ignitionreactions 7. Flame analysis	direct	midterm exam
Week (16-20)	2	- Understand flame thickness as the distance between the start and end thermal or chemical react zone. - Explain the G-function (Flame Surface Function) for mathematically representing the flame surface. - Differentiate between premixed and diffusion flames regarding mixing and ignition.	1. Flame thickness 2. Flame interface structure (G-function) 3. Diffusion flames: definition, assumptions, types 4. Negative scale and mixture fraction 5. Jet flame Calculations.	direc	Short test

Week (21-23)	2 2	Understand air pollution from combustion process - Identify major nitrogen oxides (NO, NO_2, N_2O). - Analyze thermal format of nitrogen oxides at high temperatures> _- Explain the role of therm conduction and molecular diffusion in flame front broadening.	1. Air pollution and emission index 2. Nitrogen oxides and their thermal formation 3. Combustion wave propagation (governing equations).	direc	Work assignment
Week (24-27)	2	_Understand the concept chemical energy in propellants and explosive - Calculate explosion ene using heat of formation a reaction equations. - Analyze the effect of chemical composition on burn rate and thermal stability.	1. Energy of propellants and explosives 2. Explosion technology (heat of formation, oxygen balance, classification) 3. Propellant composition (nitropolymers, single, double, triple-base fuels) 4.Explosive combustion phenomena.	direc	Home work
Week (28-30)	2	- Understand the relationship between detonation velocity and pressure in explosive materials. - Understand combustion stages in rocket engines, including ignition. _Analyze influencing factor such as temperature, fuel ty and ambient pressure.	1. Detonation velocity and pressure, density 2. Combustion phenomena in rocket engines 3.Transient, convective, and radiative ignition	direct	midterm exam

11.Course Evaluation

First semester exam: 10 points

Midterm exam: 15 points

Second semester exam: 10 points

Classroom activities and assignments: 5 points Practical activities and projects: 10 points Final exam (end of year): 50 points Total: 100 points	
12.Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1. Victor N. Kondratiev ، "Chemical Reacti Moscow 117334, Russia, July 17, 2025.
Main references (sources)	Introduction to Combustion: Concepts Applications – Stephen R. Turns.
Recommended books and references (scientific journals, reports...)	1. Explosives – Rudolf Meyer, Josef Köhler, A Homburg
Electronic References, Websites	nothing

Course Description Form

1. Course Name:	
Modeling and Simulation	
2. Course Code:	
FS407	
3. Semester / Year:	
Year/ Fourth Stage	
4. Description Preparation Date:	
23/7/2025	
5. Available Attendance Forms:	
In Attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
100/ 4	
7. Course administrator's name (mention all, if more than one name)	
Name: MS.c Aseel Satar Abdullah	
8. Course Objectives	
	Understand the basic concepts of modeling and simulation and their importance in systems analysis.

Course Objectives	Build mathematical or computer models to represent realistic systems. Use simulation tools to analyze performance and make effective decisions.

9. Teaching and Learning Strategies

Strategy	Theoretical lectures and exercises in the computer lab

10. Course Structure

Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
Week (1-2)	**3**	Modeling	Introduction to process modeling. Type of modeling.	Direct	Feedback
Week (3-4)	**3**	arameter Estimation	Parameter estimation techniques in theoretical as well as numerical models	Direct	Feedback
Week (5-8)	**3**	Models	Models, need of models and their classification, models based on transport phenomena principles, alternate classification of models, population balance, stochastic, and empirical models, unit models.	Direct	Short exam
Week (9-12)	**3**	Models of Heat Transfer Equipment	Development of detailed mathematical models of evaporators, use of Newton . Raphson method for solving evaporator problems	Direct	Mid Exam

Week (13-15)	**3**	Models of Separation Processes	Separation of multicomponer mixtures by use of a single equilibrium stage, flash calculation under isothermal and adiabatic conditions. Tridigonal formulation of component-material balances and equilibrium relationships for distillation, absorption and extraction of multicomponen Thiele and Geddes method p θ - method and Kb method, models of absorbers, stripper and extractors	Direct	Practical exam
Week (16-17)	**3**	Models of Reactors .	Classification of fixed bed reactor models, one-dimensional and two dimensional fixed bed reactor models, fluidized bed reactor models, bioreactor models	Direct	Practical
Week (18-20)	**3**	Numerical Methods	Classification of partial differential equations (PDE's), solution of PDEs by Finite difference techniques, method of weighted residuals. Orthogonal collocation to solve PDEs with their application to chemical engineering systems models. Nonlinearity and Linearization of Models	Direct	Practical
Week (20-21)	**3**	Simulation	Introduction to process simulation, tools of simulation, approaches of simulation, planning of calculation in a plant simulation	Direct	Practical Exam

Week (22-24)	**3**		Simulation of holding tank using Euler method or 4th order Rung-kutta method with initial condition and final time	Direct	Feedback
Week (25-27)	**3**	Reactor Simulation	simulation of isothermal and non-isothermal operation of batch reactor, isothermal and non-isothermal CSTR	Direct	Short exam
Week (28-30)	**3**		Simulation of Petroleum Fractionation: Atmospheric and Vacuum towers	Direct	Practical
Week (31-32)	3		Analysis and design specification Sweetening of Gaseous fuel Plant	Direct	Short exam
Week (33-37)	3		Simulation of Liquefied Petroleum Gas plant (LPG) Simulation of gaseous fuel Drying by adsorption and absorption.	Direct	Final / practical Exam

11.Course Evaluation

First semester exam: 10 points

Midterm exam: 15 points

Second semester exam: 10 points

Classroom activities, assignments, and reports: 5 points

Practical: 10 points

Final exam (end of year): 50 points

Total: 100 points	
12.Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Luyben, William L. “Process modeling, simulation and control for chemical engineers”. McGraw Hill Higher Education. • Jana, Amiya K. “Chemical process modelling and computer simulation”. PHI Learning Pvt. • Denn M. M., "Process Modeling", Longman, 1986.
Main references (sources)	• Aris R., "Mathematical Modeling, Vol. 1: A Chemical Engineerin Perspective (Process System Engineering)", Academic Press, 1999. • Najim K., "Process Modeling and Control in Chemical Engineering", CRC, 1990.
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	Nothing

Course description form

1. Course name	
Sustainable Energy	
2. Course code	
EFS408	
3. Semester/Year/	
Annual/Fourth Stage	
4. Date of preparation of this description	
2025/7/22	
5. In presence /online	
In presence	
6. Number of study hours (total) / Number of units / (total(	
100 /4	
7. Name of course administrator (if there is more than one name, also mention it)	
Dr. Adil Hatem Nawar	
8. Course Goals	
Goals of the basic subject	-Educational aspects aimed at training and teaching students on the ideas and methods of transitioning to sustainability and its sources. -Practical aspects aimed at training in the uses of sustainable energy.
9. Teaching and learning strategies	
Strategies	Assessment is based on theoretical lectures, submitted assignments, written tests, quizzes, reports, and seminars.

10. Course structure

Week	Hours	Required Learner Outcomes	Unit or Topic Name	Learning Method	Evaluation Method
(1^{st}) week	2	Revision to Energy resources	Introduction	Direct	Feed back

(2-5) weeks		Solar Energy: Solar angle, time equations ,solar radiation in space, Ashri and Hotel Models, Fresnel law, transmittance of diffused radiation Solar Collectors: Flat solar collectors (Parabolic solar collector, irrigation tubing solar collector), Solar concentrating collectors(Fresnel collectors, Mirrors Farm collectors, Parabolic solar collector	Learn about solar energy, how it works, and design solar panels for training purposes	Direct	Short and monthly test
(8-6)weeks	2	Wind Energy: Wind turbines, Calculations, Wind Farms, Applications	Learn about wind energy, how it works, and design turbine farms for training purposes	Direct	Short and monthly test
(9^{th}) week	2	Monthly exam to assess student levels	Within the contents of the selected article	Direct	Semester exam
(11-10) **weeks**	2	Hydraulic Energy: Kinetic energy, Kinds of Hydroelectricity power plant, water wheels، water turbines	Learn about hydropower, how it works, and design complexes that rely on water energy to convert it into multi-use energy	Direct	Short tests, monthly exams, and reports
(15-12) **weeks**	2	Geothermal Energy: Energy Geothermal system, The applications of Geothermal energy and	Understanding geothermal energy, how it works, and designing complexes that rely on the energy	Direct	Short tests, monthly exams, and reports

		its limitations .	found within the Earth's interior to convert it into multi-use energy		
(19-16) **weeks**	2	-Energy from Seas and Oceans: Oceans thermal energy conversion, Temperature differences utilization for energy generation, Tidal energy systems of utilization tidal energy، wave energy, systems of utilization wave energy	Learning about the energy of the seas and oceans by exploiting the energy of waves to convert it into electrical energy, how it works, and designing complexes that rely on the energy found within the Earth for the purpose of converting it into energy for multiple uses	Direct	Short tests, monthly exams, and reports
(24-20) **weeks**	2	-Energy economics and how to calculate it according to resource availability and capabilities	Training and practice on calculating the costs of energy types and procedures for comparing and evaluating these types	Direct	Short tests, monthly exams, and reports
(26-25) **weeks**		Energy storage	Learn about the method of storing energy obtained from its source and how to design energy storage tanks for the purpose of converting it into multi-use energy	Direct	Short tests, monthly exams, and reports
(28-27) **weeks**	2	Discussing and evaluating the practical reports assigned to students in the form of research, and indicating the	Test this material by conducting an assessment	Direct	Homeworks and reports

		students' levels of comprehension			
(30-29) weeks	2	Monthly exam to assess student levels	Within the contents of the selected article	Direct	Semester Exam.

11. Course evaluation

First semester exam: 10 points
Second semester exam: 10 points
Classroom activities and assignments: 5 points
Daily exams (no less than 5): 5 points
Design reports or projects: 10 points
Annual work: 40 points
Final exam (end of year): 50 points
Total: 100 points

12. Learning and teaching resources

Required books	-The Cambridge Handbook of Renewable Energ edited by David J. Hawkes and D. R. Smith. -Introduction to Renewable Energy: by Anthony Rosato and David A. Wittenberg. -Energy Systems and Sustainability: Power for a Sustainable Future: by Godfrey Boyle. -Fundamentals of Renewable Energy Processes: Aldo V. da Rosa -Others
Main book	--Energy Resources: Sustainability, the Environment and the Economy: by Peter G. List
Recommended Books	All books on sustainable energy
Educational websites	do not exist