Ministry of Higher Education and Scientific Research

Academic Supervision and Evaluation Authority Quality Assurance and Academic

Accreditation Department Accreditation Department

Academic program description

(Bologna Process)

2025-2026

Introduction:

The educational program is a coordinated and organized package of courses that include procedures and experiences organized into curricular modules. The primary purpose is to build and refine graduates' skills, making them qualified to meet the demands of the labor market. The program is reviewed and evaluated annually through internal or external audit procedures and programs, such as the External Examiner Program. The academic program description provides a concise overview of the program's key features and courses, outlining the skills students are expected to develop in alignment with the program's objectives. The program description is crucial because it serves as the cornerstone of program accreditation. It is co-written by faculty members under the supervision of academic committees in the academic departments.

This second edition of the guide includes a description of the academic program after updating the vocabulary and paragraphs of the previous guide in light of the latest developments in the Iraqi educational system. This includes a description of the academic program in its traditional form (annual, semester), as well as adopting the academic program description circulated pursuant to the Department of Studies Circular No. 3/2906 dated May 3, 2023, regarding programs that adopt the **Bologna Process** as the basis for their work. In this regard, we cannot but emphasize the importance of writing descriptions of academic programs and courses to ensure the smooth running of the educational process.

Concepts and terms:

Academic Program Description:
The academic program description provides a concise summary of the program's vision, mission, and objectives, including a detailed description of the targeted learning outcomes based on specific learning strategies.

Course Description: Provides a concise summary of the course's key features and the learning outcomes expected of the student, demonstrating whether the student has made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious vision for the future of the academic program to be an advanced, inspiring, motivating, realistic, and applicable program.

Program mission: It briefly explains the objectives and activities required to achieve them, and also identifies the program's development paths and directions.

Program objectives: These are statements that describe what the academic program intends to achieve within a specific time and are measurable and observable.

Curriculum structure: All courses/subjects included in the academic program according to the approved learning system (semester, annual, Bologna track), whether required by (ministry, university, college, or scientific department), along with the number of academic units.

Learning outcomes: A consistent set of knowledge, skills, and values acquired by a student after successfully completing the academic program. Learning outcomes for each course must be defined in a manner that achieves the program's objectives.

Teaching and learning strategies: These are the strategies used by faculty members to develop student teaching and learning. They are plans followed to achieve learning objectives, describing all classroom and extracurricular activities to achieve the program's learning outcomes.

Academic Program Description Form

University Name: Al-Turath University

College/Institute: College of Engineering

Department: Department of Oil and Gas Refining Engineering

Academic or Professional Program Title: Bachelor's Final Degree

Title: Bachelor's in Oil and Gas Refining Engineering

Academic System: Semester Description

Preparation Date: October 2025

File Completion Date: October 2025

Signature:

Name of Academic Assistant: Prof. Dr. Jamal Mani Ali

Date: October 2025

Signature:

Name of Department Head: Prof. Dr. M.F. Abid

Date: October 2025

Name of the Director of the Quality Assurance and College Performance Division:
Assist. Lecturer Farah Ghazi Fahad

Date: 10/4/2026

Signature

Dean's approval

Prof. Dr. Mohammad Fadhil Abid

1. Program Vision:

The department strives to achieve academic excellence by enriching its students with scientific and applied capabilities and expertise, drawing on the unique nature of Al-Turath University. The department's vision is evident through its scientific specialization, which aims to adopt the principles of high performance and quality in this field to achieve innovation and development in oil and gas refining engineering sciences.

2. Program mission

Preparing engineering cadres in the field of oil and gas refining engineering to serve the country's oil industry, conducting applied research and studies in the fields of oil and gas refining engineering, and solving industrial problems that arise in oil refineries and gas processing plants.

3. Program objectives:

1- Preparing engineers with the basic scientific and engineering expertise and knowledge in the field of oil and gas refining engineering and its technological developments.

2- Preparing graduates capable of operating and managing laboratories and factories related to oil and gas refining engineering by focusing on the practical and applied aspects of their studies.

3- Providing graduates with the ability to design laboratories and factories related to the petroleum and petrochemical industries.

4- Enriching the educational process with sound applied scientific research, emphasizing its role in serving society and solving operational problems in the field.

4. Program accreditation

Is the program accredited? By which authority? We do not currently have an accredited accreditation program.

5. Other external influences

Is there a sponsor for the program? Yes. The University of Technology/Chemical Engineering College

Curriculum structure .6				
*Notes	Percentage(%)	Credit hours (ECTS)	Number of courses	Curriculum structure
	5	**6**	**3**	Institutional requirements
	50	**60**	**21**	College requirements
	45	**54**	**10**	Department requirements
	N.A.	**N.A.**	**2 months**	**Summer training**
				Others

. Notes may include whether the course is core or optional. *

7. Academic Program Description .4			.3		.2	.1
Credit hours			Course name	Course code		Year\ Level
(ECTS) Credits	**Lab**	**Course lecture**				First / 2025 Year
2		3	English Language	ENLA107		First Course
7		2	Mathematics I	MATH111		
7		2	Analytical Chemistry	ANCH112		
7		2	Physics and Strength of Materials	PHSM113		
3		2	Computer Science	COSC108		
4		2	Workshops	WSHE106		
6		2	Mathematics II	MATH121		Second Course
6		2	Chemical Engineering Principles I	CHEP122		
6		2	Organic Chemistry	ORCH123		
6	1	2	Engineering Drawing and AutoCAD	EDAU124		
2		1	Human Rights and Democracy	HURD125		
4		1	Workshops	WOSH116		

Academic Program Description			.7	.6	.5	
Credit hours			Course name	Course code		Year\ Level
(ECTS) Credits	Lab	Course lecture				/ 2025 Second Year
5		3	Mathematics III	MATH211		First course
5		3	Chemical Eng. Principles II	CHEP212		
5	1	3	Fluid Flow I	FLFL213		
6	1	3	Physical Chemistry	PHCH214		
4	1	3	Fuel Technology	FUTE215		
5	1	3	Materials Engineering	MAEN216		
5		3	Mathematics IV	MATH221		Second course
6		3	Chemical Eng. Principles III	CHEP222		
6	1	3	Fluid Flow II	FLFL223		
5	1	3	Computer Programming	COPR224		
3		3	Corrosion In Petroleum Refinery	COPR225		
3		3	Combustion	COMB226		
2		3	Al-Baath Part Crimes			

Academic Program Description .4			.3		.2	.1
Credit hours			Course name	Course code		Year\ Level
Credits ECTS)	**Lab**	**Course lecture**				**3rd / 2026 Year**
5	0	3	Thermodynamics I	**THER311**		**First course**
5	2	3	Statistics and Numerical Analysis	**STNA312**		
5	0	3	Mass Transfer	**MATR313**		
4	0	3	Chemical Reaction Kinetics	**CHRK314**		
6	2	4	Heat Transfer	**HETR315**		
3	0	3	Petroleum and Gas Field Processing	**CES.R.339**		
2	0	2	Arabic Language	**ARLA3041**		
5	2	3	Thermodynamics II	**THER321**		**Second course**
5	0	3	Applied Mathematics	**APMA322**		
5	2	4	Unit Operation I	**UNOP323**		
5	0	3	Reactor Design	**REDE324**		
5	2	3	Equipment Design	**EQDE325**		
3	0	2	Chemicals from Petroleum	**CHPE326**		
3	0	2	English Language	**ENLA307**		

8. Expected learning outcomes of the program	
knowledge	
1. Preparing academically qualified graduates in oil and **2**. Preparing academically gas refining engineering. qualified personnel for admission to postgraduate studies. **3**. Keeping pace with scientific developments in the **4**. Scientific cooperation with educational process. **5**. government ministries and the private sector. Contributing to scientific research, organizing seminars **6**. and conferences, and participating in conferences. Contributing to solving institutional problems using scientific methods.	Cognitive objectives
Skills	
	Skill objectives
1- Professional skills in aspects of oil and gas refining **2-** Data analysis skills in oil and gas engineering. **3-** Acquire the necessary skills in refining engineering**.** the field of specialization.	
Evaluation	
1. Using smart tools such as smart boards and display screens. 2- Student participation in the lecture. 3- Preparing the material in advance and using exercises as homework. 4- Expanding students' knowledge by asking questions about their previous studies. 5- Researching solutions to the problem using academic sources and the internet.	Evaluation methods
1- The student understands the teaching methods. 2-Direct observation	Emotional and value goals

9- Teaching and learning strategies
Teaching and learning strategies and methods adopted in implementing the program **1**. Delivering lectures that promote moral values**. 2**. Holding seminars and workshops for students throughout the academic year. **3**. Field visits to relevant ministries and health institutions.

Professional development **.10**
Guidance of new faculty members
1- Commitment to the educational institution's regulations. 2- Respect for the teaching staff at the deanship level (deanship, assistants, and teachers). 3. For new faculty members, prepare and support them in participating in intensive experiential programs (workshops and courses), given their impact on developing the academic capabilities of instructors.
Professional development for faculty members
1- Building and strengthening the capacity of academic circles to utilize digital platforms and emphasizing the use of diverse teaching methods that enhance training to meet the challenges of the knowledge quest. **2**- Working to provide high-quality work in the field of the humanities.

11. Acceptance Criteria
Central admission and interview

12. Program Development Plan
Teamwork: Working effectively and energetically within a group. - Time Management: Managing time effectively and setting priorities, with the ability to work in an organized and timely manner. - Leadership: The ability to direct and motivate others. - Work independently. - Preparing research and reports.

1. Expected learning outcomes of the program	
Knowledge	
A1	Mathematics, science and engineering underlying the practice of chemical engineering.
A2	The interactions involved in chemical engineering systems and analytical and computational tools to deal with these.
A3	The scope of chemical engineering from the molecular to the large scale.
A4	The economic, management and statutory requirements involved in the practice of chemical engineering.
Skills	
B1	Communicate clearly the findings of experiments, projects and other assignments using written reports, oral and visual presentations as well work effectively in a team, recognizing the roles played by different team members.
B2	Creatively employ applied science and engineering concepts in the design of industrial processes and equipment. Which in turn will demonstrate awareness of the importance of scaling techniques in design work.
B3	Perform complete mass and energy balances for chemical engineering plants. apply the principles of chemical equilibrium process thermodynamics to systems with chemical reactions.
B4	Chemical engineering graduates will be able to write coherent, concise, accurate technical reports ,use computers effectively for solving chemical engineering problems.
Ethics	
C1.	An ability to perceive ethical and professional responsibilities in engineering cases and make brilliant judgments taking into account the consequences in worldwide financial, ecological and societal considerations
C2	Apply the principles of the law as well as understanding of responsible research and innovation, data protection, ethics and bias relevant to AI research and innovation
C3	know how to support the development of 'sustainability thinking
C4	have developed an awareness of a chemical engineer's issues, obligations, and responsibilities with regard to ethics

13. Program Skills Map															
مخرجات التعلم المطلوبة من البرنامج															
ethics				skills				knowledge				Essential or elective?	Course name	Course code	Year/Level
4C	3C	2C	1C	4B	3B	2B	1B	4A	3A	2A	1A				
											✓	Essential	English Language	ENLA107	First / 2025 Year
						✓				✓	✓	Essential	Mathematics I	MATH111	
										✓	✓	Essential	Analytical Chemistry	ANCH112	
										✓	✓	Essential	Physics and Strength of Materials	PHSM113	
						✓	✓				✓	Essential	Computer Science	COSC108	
✓	✓	✓	✓	✓	✓	✓				✓	✓	Essential	Workshops	WSHE106	
						✓				✓	✓	Essential	Mathematics II	MATH121	
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Chemical Engineering	CHEP122	

													Principles I		
										✓	✓	Essential	Organic Chemistry	ORCH123	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Essential	Engineering Drawing and AutoCAD	EDAU124	
											✓	Essential	Human Rights and Democracy	HURD125	
✓		✓	✓	✓	✓	✓				✓	✓	Essential	Workshops	WOSH116	
✓	✓	✓	✓			✓				✓		Essential	Mathematics III	MATH211	**/ 2025**
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Chemical Eng. Principles II	CHEP212	Second Year
✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	Essential	Fluid Flow I	FLFL213	
✓	✓	✓	✓			✓			✓		✓	Essential	Physical Chemistry	PHCH214	
✓	✓	✓	✓			✓						Essential	Fuel Technology	FUTE215	

✓	✓	✓	✓			✓			✓		✓	Essential	Materials Engineering	MAEN216	
✓	✓	✓	✓	✓	✓	✓				✓		Essential	Mathematics IV	MATH221	
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Chemical Eng. Principles III	CHEP222	
✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	Essential	Fluid Flow II	FLFL223	
✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	Essential	Computer Programming	COPR224	
✓	✓	✓	✓	✓		✓	✓		✓		✓	Essential	Corrosion In Petroleum Refinery	COPR225	
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Combustion	COMB226	
											✓	Essential	Al-Baath Part Crimes		

Please mark () in the boxes corresponding to the individual learning outcomes of the program being assessed. ✓

														Third Year 2026
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	Essential	Thermodynamics I	**THER311**
			✓	✓	✓	✓	✓			✓		Essential	Statistics and Numerical Analysis	**STNA312**
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Mass Transfer	**MATR313**
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Chemical Reaction Kinetics	**CHRK314**
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Heat Transfer	**HETR315**
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Petroleum and Gas Field Processing	**CES.R.339**

											✓	Essential	Arabic Language	**ARLA3041**
✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	Essential	Thermodynamics II	**THER321**
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Applied Mathematics	**APMA322**
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Unit Operation I	**UNOP323**
✓	✓	✓	✓	✓	✓	✓	✓			✓		Essential	Reactor Design	**REDE324**
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	Essential	Equipment Design	**EQDE325**
✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	Essential	Chemicals from Petroleum	**CHPE326**
											✓	Essential	English Language	**ENLA307**

Please mark () in the boxes corresponding to the individual learning outcomes of the program being assessed. ✓

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTION FORM **(Bologna)**

Module Information

Module Title	English Language		**Module Delivery**
Module Type	Support or related learning activity		☒ **Theory** ☒ **Lecture**
Module Code	ENLA107		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	U	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Dr.Samaria Mohsin Radhwan	**e-mail**	samira.mohsin@uoturath.edu.iq
Module Leader's Acad. Title		**Module Leader's Qualification**	PhD
Module Tutor		**e-mail**	
Peer Reviewer Name	Prof.Dr Jamal.M.Ali	**e-mail**	Jamal.manaa@uoturath.edu.iq
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 أهداف المادة الدراسية	This module aims to enhance the communication skills of students whose English language level is equivalent to the first-year undergraduate students in the Chemical Engineering Department. There will be a particular focus on developing the four language skills (speaking,

	listening, reading and writing) and on broadening students' vocabulary and grammatical range so that they can communicate easily on a wide range of topics. In addition, to teaching the technical English vocabulary that the student needs in his/her academic engineering studies and in his/her professional life as a chemical engineer in factories.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The course covers the core language and skills students need to communicate successfully in engineering specializations. 2. Express their opinions and participate in discussions on a wide range of topical issues. 3. Communicate effectively in written format on a range of contemporary topics, especially the technical ones. 4. Understand the key points of a range of moderately complex oral and written texts with relative ease. 5. Communicate effectively as part of a multicultural group. 6. Manage, interpret and create meaning using a variety of digital devices and tools. 7. An accurate description of the nature of the vocabulary and expressions used by chemical engineers in dealing with their fields of specialization, and then trying to simulate that in writing reports, expression, and formulating simple and complex sentences.
Indicative Contents المحتويات الإرشادية	**A- Communicative competences** **Listening** - Understand and identify the main points of dialogues of 230-250 words on familiar topics that are regularly encountered in life, work, university, etc., within the scope of the syllabus. - Listen and guess the meanings of speakers' expressions and feelings in monologues and familiar conversations in everyday life. - Understand the main points of news programs, broadcasts, interviews, etc., on familiar topics given clearly, in simple language, or with illustrative images (pictograms). **Speaking** – Pronunciation of short dialogues clearly and accurately. - Speak and interact with fellow speakers about familiar topics, express personal points of view and share information on topics covered in the curriculum. - Describe in simple discourse familiar topics while telling a short story related to the topics covered. – Presenting projects related to curriculum topics in an accurately prepared manner. **Reading** - Read and comprehend the main points and specific contents of a 200-word text on current and familiar topics. - Read and understand the flow of argument for texts, identify key conclusions in texts using plain language. - Reading to find and summarize short texts for daily use, including those related to the work of the chemical engineer, such as excerpts from scientific books, and the use of words and structures from the original texts. **Writing** – write paragraphs (i.e., block and indented styles), Write simple connected and coherent texts of 180-200 words; write short reports based on suggestions, providing factual information and reasons for recommendations in the reports; collect short information from several sources and summarize it. - Complete (write/fill) administrative forms such as CVs and resumes, employment application letter, emails, etc. - Write descriptive texts for simple charts and tables. **B- Linguistic knowledge** - **Pronunciation**: Vowel and consonant syllable, words with different syllables, Words with stress (specials cases) – Words without stress, Sentence stress, comprehension (assimilation), linking vowels with question vowels, intonation, homophones, practice words and terms, phrases, and sentences related to the students' specialization. - **Vocabulary**: Words related to themes and topics of the course, collocations, words with different meanings and pronunciations. - **Grammar**: parts of speech, past, present, and future tenses, word structure (i.e., compound nouns), countable and uncountable nouns. Types on sentences: simple, compound, complex sentences, articles, linguistic function: commands, requests, offers, advice and instructions. Modal verbs, relative pronouns and relative clauses with which-that-who-whom-whose-where-when. Prepositions, Phrasal verbs including verbs, adverbs and prepositions, comparison showing changing things, sentences of reason and results and conjunctions: although, however etc, active and passive, adverbial clauses of condition, comparatives and superlatives of adjectives.

Learning and Teaching Strategies

Strategies	**Students are taught through Communicative language teaching (CLT)** in which students are encouraged to communicate with each other in the target language. Students need to be as familiar with the target language as possible in order to understand and use it in real-life situations. A variety of ways are also utilized to teach students technical English language in the field of chemical engineering. For example, work in group, practicing various activities, discussion, and presentation to make students communicate with each other in the target language and practice using the target language to communicate. Students need to be confident in their ability to use the target language and to develop better interpersonal skills.

Student Workload (SWL)/ 15 weeks

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10 % (5)	5, 10	LO #1, 2,
	Assignments	2	10 % (5)	All weeks	LO # 3, 4, 6 and 7
	Oral evaluation	1	10% (10)	7	All
	Written& spoken evaluation	continuous	10% (10)	All	All
Summative assessment	**Midterm Exam**	1.5 hr	10% (10)	14	LO # 1-5
	Final Exam	3hr	50 % (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	**Parts of Speech** (nouns – verbs – adjectives – adverbs – prepositions – articles - pronouns- conjunctions - interjections)

Week 2	The components, structure and kinds of the sentences 1- Simple - compound - complex 2- Declarative - interrogative - exclamatory - imperative
Week 3	Tenses - present tenses, definite and indefinite articles, ways of joining sentences
Week 4	Tenses – past tenses, reading comprehension
Week 5	Tenses- future tenses, writing basics and strategies.
Week 6	Passive and active sentence in scientific writing.
Week 7	Listening skills - how to participate in different topics - how to avoid silence, how to answer the questions of the passage in exam (i.e., WH Questions)
Week 8	Writing skills (punctuation - ways to join sentences - principles of paragraph structure - practice writing)
Week 9	Listening and speaking skills (multiple native conversations, especially in the technical language of chemical engineering).
Week 10	Idioms and idiomatic expression
Week 11	Reading skills (skimming, scanning, and intensive reading)
Week 12	Phrasal verbs, speaking skills (participating in a dialogue and turn taking)
Week 13	Translation (from English to Arabic and vice versa)
Week 14	Comparison and modals, participating in group discussion and be active listener/speaker
Week 15	Writing skills (CV, cover letter, and email writing and related technical language used by chemical engineer)

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	1- New Headway, English Course, (beginner, pre-intermediate level), John and Liz Soars and Mike Sayer, Oxford University Press. 2- Selected ESP materials. 3- The language of chemical engineering in English, Roy V. Hughson, Regents publishing company, Inc.- New headway plus (English Course), Liz & John Soars (2014), Oxford University press.	Yes
Recommended Texts	Grammar in Use and Rapid Review of Grammar.	No
Websites	Randall's ESL Cyber Listening Lab - English Listening	

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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	General Mathematics		**Module Delivery**
Module Type	Basic		**Theory** **Lecture** **Tutorial**
Module Code	GEMA111		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	UC	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Asst.Lec Zainab Ala'a Hassan	**e-mail**	zainab.alaa@uoturath.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	M.sc
Module Tutor	None	**e-mail**	
Peer Reviewer Name	Prof. Dr. Adnan AbdulJabbar AbdulRazzaq	**e-mail**	adnan.a.alsalim@uoturath.edu.iq
Review Committee Approval	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 Aims	1. To develop an understanding with the concepts of calculus and analytic geometry and the applications of these concepts to the solution of engineering problems. 2. Introduction to functions, limits, derivatives and their applications. 3. Provide practice at developing critical thinking skills, solving open ended problems and to work in teams.
Module Learning Outcomes	1. Develop a deep understanding of issues related to the basic principles of calculus, and how to solve problems in chemical engineering. 2. The ability to understand and analysis problems related to specific field. 3. Understanding the necessary of all subject of mathematics in other sciences. 4. Understanding the necessary of derivatives and its application in other sciences. 5. An ability to apply effective, creative and innovative solutions, both independently and cooperatively, to current and future problems. 6. Characterization and analyses the performance of any problems in any object of chemical engineering.
Indicative Contents	Indicative content includes the following. Preliminaries Real numbers, Interval, Absolute value, Cartesian coordinates in the plane, Domain and range, Even & odd functions, Sum, differences, products & quotients, Composite functions, shifting a graph of a function, Scaling & reflecting a graph of a function. [6 hrs] Limits and Continuity Limits, Finite limits, Horizontal asymptotes, Vertical asymptotes, Continuity. [6 hrs] Transcendental functions Natural logarithms functions, Exponential functions, Logarithms functions, a^x functions, Trigonometric functions, Inverse trigonometric functions, Hyperbolic functions, Inverse hyperbolic functions. [9 hrs] Tangents & Derivatives Finding a tangent to the graph of a function, Differentiation, Differentiation rules, Second & higher-order derivatives , The derivative as a rate of change , Derivatives of trigonometric functions , The chain rule & parametric equations , The chain rule with powers of a function , Slopes of parameterized curves , Implicit differentiation , Related rates , L' Hopital's rule. [15 hrs] Determinates Properties of determinates, Cramer 's rule [3 hrs] Vector analysis

	Component form, Vector algebra operations, Unit vectors, Midpoint of a line segment , Vector tangent & normal to the curve , The dot product , Angle between vectors , Perpendicular (orthogonal) vectors , Dot product properties & vector projections , The cross product [6 hrs]

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 and tutorials.

Student Workload (SWL)

Structured SWL (h/Sem.) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/Sem.) الحمل الدراسي غير المنتظم للطالب خلال الفصل	112	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/Sem.) الحمل الدراسي الكلي للطالب خلال الفصل			175

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (5)	4,8,12	LO #2, 3, 4 and 5
	Assignments	6	20%	Continuous	
	Report	1	5% (5)	14	LO # 1 and 6
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO # 2, 3, 4 and 5
	Final Exam	2hr	50% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Real numbers, Interval, Absolute value, Cartesian coordinates in the plane, Domain and range
Week 2	Even & odd functions, Sum, differences, products & quotients, Composite functions , Shifting a graph of a function , Scaling & reflecting a graph of a function
Week 3	Limits, Finite limits
Week 4	Horizontal asymptotes, Vertical asymptotes , Continuity
Week 5	Natural logarithms functions, Exponential functions, Logarithms functions , a^x functions
Week 6	Trigonometric functions, Inverse trigonometric functions
Week 7	Hyperbolic functions, Inverse hyperbolic functions
Week 8	Finding a tangent to the graph of a function

Week 9	Differentiation , Differentiation rules , Second & higher-order derivatives
Week 10	The derivative as a rate of change , Derivatives of trigonometric functions
Week 11	The chain rule & parametric equations , The chain rule with powers of a function , Slopes of parameterized curves
Week 12	Implicit differentiation , Related rates , L'Hopital's rule
Week 13	Properties of determinates , Cramer 's rule
Week 14	Component form , Vector algebra operations , Unit vectors , Midpoint of a line segment , Vector tangent & normal to the curve
Week 15	The dot product , Angle between vectors , Perpendicular (orthogonal) vectors , Dot product properties & vector projections , The cross product
Week 16	Final Exam

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	"Thomas' Calculus Early Transcendentals", George B.Thomas, Jr. , Twelfth Edition, Addison-Wesley, 2010	Yes
Recommended Texts	"Mathematical Methods in Chemical Engineering", Jenson. V.J. and Jeffereys, G.V, 2nd Edition, Academic Press New York, 1977	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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Technology
Chemical Engineering Department

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Analytical Chemistry	**Module Delivery**	
Module Type	Basic	**Theory** **Lecture** **Tutorial** **Lab**	
Module Code	ANCH112		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	UG	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Dr. Ahmed adnan Haider	**e-mail**	ahmed.adnan@coeng.uobaghdad.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph. D
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. Shakir Mahmood	**e-mail**	Shakir.mahmood.a @uoturath.edu.iq
Review Committee Approval	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 Aims	1-Preparing applied engineers in the field of sciences who are distinguished by a high level of knowledge and technological creativity, and develop problem solving skills by knowing important Laws of Chemistry. 2. Enable the student to know and understand calculation and methods of preparing solutions needed in many field.3. Enable the student to understand theoretical principles in handicrafts and measurements.
Module Learning	1- To recognize how to calculate molecular weight by different methods.

Outcomes	2- The principle of preparing standard solutions which is very important every time and place to chemical engineering student in every stage. 3- Studying instrumental analysis method to know how devices works (mechanism and calculation. 4- The student acquires basic engineering skills such as Electrical and spectral in addition to traditional methods of analytical chemistry installations that serve him in the professional field. 5- Enabling the student to use labs tools and devices in chemistry laboratory.
Indicative Contents	1. Introducing the student to the basics of calculation of Analytical Laws, and methods of measurement and standardization 2. Introducing the student to use different types of laboratory tools 3. Introducing students to deal with Chemicals 4. Introducing the student to the basics of keeping safe in the lab 5. Introducing the student to the basics of the art of solving exercises 6. Introducing the student to accept the experience in theoretical and practical subject through Four years of study.
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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	112	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15	,7,11,133	,2,3,41
	Assignment	5	10		
	Report	1	5	4.9,15	,2,3,41
	Lab	15	10	12	4
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO ALL
	Final Exam	2hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction of Atom -theories of discovering atom. Experiments of Scientist. -Defects of some theories and solutions.
Week 2	Introduction of Analytical Chemistry - Branches of analytical chemistry (Definition and classification) -methods of calculation for every branch of analytical chemistry.
Week 3	Molecular weight calculation for atom and molecules. -oxidation states for ions and valence numbers for acids and bases. -Mole fraction, weight fraction. Volume fraction. -solving examples and giving homework.
Week 4	Molarity, Normality, Law and Calculation, Examples and Home Works
Week 5	Strong and weak acid and base (scientist definitions). -PH for strong acid and base. -PH for weak acid and base. -Written exam in practical exercises. (quiz)
Week 6	Blacksmith Workshop -An exercise forming the number five in English. - Exercise forming the number nine in English. - An exercise in forming an iron model in the form of a circle.
Week 7	Blacksmith Workshop S-shape exercise. Air hammer hot barbell exercise. Exercise to form a circle on an electric bending machine. Exercising cold and hot ornament formation. A written exam in practical exercises
Week 8	-PH for weak acid and its salt. PH for weak base and its salt. -solving exercise. Calculation of PH for common ion. -Solving exercise and homework.
Week 9	Chemical Equilibrium - Calculation the rate of chemical equilibrium reaction -factors affecting on Chemical Equilibrium. -solving examples and homework
Week 10	Spectroscopic Analysis. -Introduction about Spectroscopy. -Methods of spectroscopic Analysis: -Ultra Violet (UV), Infra-Red (IR) Spectroscopy. -Wave length, preparing the sample
Week 11	Atomic Absorption Spectroscopy (AAS) -PH Meter. -Chromatography -Wave length, preparing the sample .
Week 12	Environmental Chemistry ----- Water Chemistry -Fresh water. Hydrological cycle. Waste water. -Water pollutant: chemical water pollutant. -Characterization of waste water
Week 13	Air Pollution - Air pollutant: primary pollutant, secondary pollutant Photo chemical smog. -Formation and Depletion of Ozone in the Stratosphere.
Week 14	Soil Pollution -Domestic and Municipal wastes. -Industrial and Mining wastes. -Agricultural wastes. -Radioactive Materials. -Biological Agents.
Week 15	Third Exam.
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: Tools and safety instruction in laboratory
Week 2	Lab 2: preparation of standard solutions
Week 3	Lab 3: Direct titration
Week 4	Lab 4: Oxidation -Reduction Titration
Week 5	Lab 5: Calculation of chloride ion in tap water
Week 6	Lab 6: Acidity of Vinegar
Week 7	Lab 7: Hardness of Water

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	الكيمياء التحليلية د.نجاة جمعة	Yes
Recommended Texts	Analytical Chemistry....Skoog and West Holler	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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq Al-Turath University Petroleum and Gas Refining Engineering	

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	PHYSIS & STRENGTH OF Materials		**Module Delivery**
Module Type	Basic		**Theory** **Lecture** **Tutorial** **Seminar**
Module Code	PHST113		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	UC	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Asst. Lect. Marwa Mohsin	**e-mail**	
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	M.sc
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Prof.Dr Mohammed.F.Abid	**e-mail**	Mohammed.abid@uoturath.edu.iq
Review Committee Approval	08/ 06/2023	**Version Number**	1.0

Relation With Other Modules

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

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. Determine the components of linear motion (displacement, velocity, and acceleration). 2. Solve problems involving forces and work. 3. Apply Newton's laws to physical problems. 4. Identify the different types of energy.

	5. Solve problems using principles of conservation of energy. 6. Define the principles of momentum and collisions. 7. This class is designed to study the effects of external forces on a group of solid objects. 8. This class is designed to study the resistance of materials and their applications in chemical engineering
Module Learning Outcomes	1. Students will demonstrate basic understanding of basics and definitions of physics. 2. The student should be able to describe the motions of objects using generalized coordinates, power, forces and energy. 3. To familiarize the students with basic concepts of the thermodynamics and their applications in engineering problems 4. The student should be able to apply the Newtonian laws using various mathematical formulations 5. The student should be able to identify the mathematical quantities which effect the momentum and be able to calculate momentum from mass and velocity. 6. A student should be able to appreciate that physics is relevant to the real world and is a useful tool for solving problems 7. The student should be able to identify the resistance of materials and their applications in chemical engineering
Indicative Contents	Indicative content includes the following. Motion in one Dimension: • Position• Displacement• Velocity• Acceleration• Derivation: creating new equations• Motion equations for constant acceleration• Free-fall acceleration **(3hr)** Work, Energy, and Power: • Energy• Kinetic energy• Work-kinetic energy theorem• Power• potential energy• Work and gravitational potential energy• Conservation of energy **(3hr)** Thermodynamics and Thermal Stress: • Temperature and Heat• Temperature and thermometers• Temperature scales• Temperature scale conversions• Heat• Zeroth law of thermodynamics• Internal energy • Thermal expansion and its types• Specific capacity• Phase changes• Latent heat• Modes of heat transfer• Global warming and the greenhouse effect (5hr) **Force and Newton's Laws:** **Surface Tension, Viscosity. Newton's first law• Gravitational force: weight• Newton's second law• Newton's third law• Normal force• Tension• Newton's second and third laws (5hr)** Momentum: • Linear momentum• Conservation of momentum• Collisions Force Vectors and Force System Resultants **(4hr)** **Properties of matter** Equilibrium of Rigid Bodies :Moment of a Force: **Introduction Force in Rigid Bodies: Poisson Ratio, Composite Stresses:** (30hr) **Modern Physics (5hr)** **Chemical Effect of Electricity: (4hr)**

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 type of simple problems and design involving activities that are interesting to the students.

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	97	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (5)	3,8	1, 3,6
	Assignments	6	20% (20)	5	1,3,
	Seminar	1	5% (10)	13	1-7
Summative assessment	**Midterm Exam**	1 hr/2	10% (10)	4,10	1-5
	Final Exam	3hr/1	50% (50)	16	1-7
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Motion in one Dimension: • Position• Displacement• Velocity• Acceleration• Derivation: creating new equations• Motion equations for constant acceleration• Free-fall acceleration
Week 2	Work, Energy, and Power: • Energy• Kinetic energy• Work-kinetic energy theorem• Power• potential energy• Work and gravitational potential energy• Conservation of energy
Week 3	Thermodynamics and Thermal Stress: • Temperature and Heat• Temperature and thermometers• Temperature scales• Temperature scale conversions• Heat• Zeroth law of thermodynamics• Internal energy • Thermal expansion and its types• Specific capacity• Phase changes• Latent heat• Modes of heat transfer• Global warming and the greenhouse effect
Week 4	**Force and Newton's Laws:** **Surface Tension, Viscosity. Newton's first law• Gravitational force: weight• Newton's**

	second law• Newton's third law• Normal force• Tension• Newton's second and third laws
Week 5	Momentum: • Linear momentum• Conservation of momentum• Collisions Force Vectors and Force System Resultants
Week 6	Equilibrium of Rigid Bodies
Week 7	Moment of a Force: **Moment about a point, Resultant moment of multiple forces, Moment of Couple**
Week 8	Friction and Friction on an Inclined Plane
Week 9	Internal Forces and Centroid & Center of Gravity
Week 10	**Introduction Force in Rigid Bodies:** **Definitions of Stress and Strain, Stress-Strain Diagrams** **Elastic limit, Stiffness elasticity, Plasticity, Hardness and working stress.**
Week 11	Hooke's law and spring force• Air resistance • **Free body diagram• Static and kinetic friction**
Week 12	**Poisson Ratio, Composite Stresses:** **Volumetric Stress, Bulk Modulus, Thin-Walled Cylinders** **Shear and Bending Moments in Beam**
Week 13	**Modern Physics**: Electron, thermionic, emission, photoelectric emission,• X-ray• The nucleus• Structure of nucleus and atom• Radioactivity• Nuclear energy• Ionizing radiation• Health hazards
Week 14	**Introduction to IS units and DC circuit:** Materialuseinelectriccomponent,ohmslaw,temperatureCoefficient,Review of Kirchhoff's Laws, Series and Parallel circuit, Resistance and resistivity **Electrolysis, Electroplating, Electrical Cells**
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	1 Shipman, James, Jerry D. Wilson, Charles A. Higgins, and Bo Lou. An introduction to physical science. Cengage Learning, 2013. **2.** Principle of Physics, Kinetic Books Company, 2007	yes
Recommended Texts	Principles of physics Kinetic book (1-877-4kbooks) Engineering Physics I&II Engineering mechanics by Ferdinand Engineering mechanics by R.C. Hibbeler	no

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Computer Science	**Module Delivery**	
Module Type	Basic	**Theory** **Lecture** **Lab**	
Module Code	COSC108		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	U	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Asst. Lect. Marwa Hamza	**e-mail**	ams.marwamaram@yahoo.com

Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	
Peer Reviewer Name	Prof. Dr Jamal.M.Ali	**e-mail**	Jamal.manaa@uoturath.edu.iq
Review Committee Approval	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 Aims أهداف المادة الدراسية	1- Learn the basics of computer and operation system Windows 7 and application program Office 2010 and programming language (Visual Basic) and used to solve the problems of chemical engineering. 2- emphasizes the general principles and techniques of computer programming, which can be applied to almost any programming language. Although the emphasis is on programming in any language, this course focuses on one language, in particular, called Visual Basic. It provides the students with a basic understanding and appreciation of the various essential programming-languages constructs, programming paradigms, evaluation criteria and language implementation issues. 3- develop the mathematical skills necessary to solve practical problems 4- Equip you with the knowledge and skills for a range of careers in technology and computer-based industry 5 developing critical thinking skills, solving open-ended problems and working in teams.-
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Be able to operate computer hardware and peripherals, Overview of computer systems-hardware and operating systems. Be familiar with software applications, understand file management and have skills in developing simple scientific and educational programs 2- skills in using Microsoft software; and accomplishing creating essential documents, worksheets and databases. 3- Demonstrate knowledge and understanding of the core ideas of programming languages. 4- Analyze a problem, and identify and define the computing requirements appropriate to its solution. 5- Apply algorithmic principles and computer science to design problem solutions.

	6- Understand and apply various programming principles to solve problems in different areas. 7- Demonstrate knowledge and understanding of the core ideas of programming languages. 7- Analyze a problem, and identify and define the computing requirements appropriate to its solution. 8- Apply algorithmic principles, and computer science to design problem solutions. 9- Understand and apply various programming principles to solve problems in different areas.
Indicative Contents المحتويات الإرشادية	❖ Microsoft Windows 7(1 hr.) ❖ Microsoft Word (1 hr.) ❖ Microsoft Excel(1 hr.) ❖ Introduction To Visual Basic Programming • Menu bar • Tools bar • Project explorer • Tool box • Properties windows • Form • Code• Controls: Command Buttons, Labels, Textbox, Pointers, Picture box, frame. • Naming Controls. • Properties for controls: Height, Width, Left, Top, Font, Forecolor, Backcolor, Name, Caption, Text, and Visible.(1 hr.) ❖ Events. • Saving Visual Basic Project. • Examples: Chemical Engineering Applications.(1 hr.) ❖ Built-In Functions Built-in math functions: • Abs(x), Int(x), Rnd(x), sgn(x), sqr(x), str(x), val(x), round(x, n), CInt(x), Fix(x). • String Functions .(1 hr.) ❖ Selection Structure:Single Selection: If/Then structure.• Double Selection: If/Then/Else structure.• Nested If/Then/Else structure.• Select Case Multiple Selection Structure. • Examples: Chemical Engineering Applications. .(2 hr.) ❖ • InputBox.• MsgBox. • Examples: Chemical Engineering Applications**.** .(2 hr.) ❖ Repetition Structure:• For ... Next Loop.• While ... Wend • Do .... While ... Loop • Do ... Loop Until • Exit Do, Exit For, Examples: Chemical Engineering Applications. (2hr.) ❖ Variable • Data Types: Boolean, Integer, Long, Single, Double, String. • Valid Naming of Variables, • Initial Value for each Type of the Variables (Initial Value for each Data Type). • Size of each Variable Type in Bytes. • How to Declare Variables. (Dim statement). • Using: Dim variable-name As Data type. • Using Suffix: Integer, Long, Single, Double, String• Constant Variable. • Examples: Chemical Engineering Applications. .(1 hr.) ❖ ARRAYS:• Introduction: Defining Arrays • Array Declaration Statement • Assigning Values for Arrays (i.e. filling array's element value either by the loop or by direct assignment statement). • ReDim Statement. • Using Loops with Arrays. (i.e. writing an application on an array using loops) • Two Dimensional Arrays. • Operations on Arrays: • Fill Array Elements with Random Numbers using Rnd Function.• Sorting.• Searching. (i.e. Linear search).• Swapping Two Elements. .(1 hr.) ❖ Graphics In Visual Basic• Graphics control• Picture box• Image box • Coordinate system• Pixel• Graphics methods (Line, Circle, pset) • Examples: Chemical Engineering Applications.(1 hr.)

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

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (5)	13-1	LO #3, 4, 5,6,7 and 8
	Assignments	2	10% (5)	32-1	9LO # 1-
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	5% (5)	13	9LO # 1-
Summative assessment	**Midterm Exam**	2 hr	10% (10)	45-1	9LO # 1-
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Windows7
Week 2	Micro soft word
Week 3	Micro soft excel
Week 4	Introduction To Visual Basic Programming
Week 5	Other toolbox items
Week 6	Mathematic functions
Week 7	Conditional sentence
Week 8	InputBox function and message box function
Week 9	Iteration loops
Week 10	Data and variable
Week 11	Array
Week 12	Menu bar
Week 13	graphics

Week 14	Review
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1:windows7,Microsoft Word, Microsoft Excel
Week 2	Lab 2: Introduction To Visual Basic Programming,writing code
Week 3	Lab 3: Mathematic functions
Week 4	Lab 4: Conditional sentence
Week 5	Lab 5: InputBox function and message box function
Week 6	Lab 6: Iteration loops
Week 7	Lab 7: Data and variable,array, the menu bar
Week 8	Lab 8:graphics

Learning and Teaching Resources

	Text	**Available in the Library?**

Required Texts	1- Microsoft® Making the Transition to Microsoft Windows 7 – Just the Basics! © 2009 CustomGuide, Inc. / Bates College (October 2011) 2- Windows® 7 Step by Step by Joan Preppernau and Joyce Cox ©2009 Joan Preppernau and Joyce Cox, Early Content—Subject to Change, Microsoft Press. 3- Step by Step, Microsoft Office Word 2007, Published by Microsoft Press A Division of Microsoft Corporation, One Microsoft Way Redmond, Washington 98052-6399, Copyright © 2007 by Joyce Cox, Joan Preppernau, and Online Training Solutions, Inc. 4- Microsoft Office Word 2007 By: Torben Lage Frandsen & Ventus Publishing Aps, The eBookboon, The eBook company,2010 5- BEGINNING EXCEL, Barbara Lave, Diane Shingledecker, Julie Romey, Noreen Brown, & Mary Schatz, Portland Community College, 2021,Libretext: https://workforce.libretexts.org/@go/page/14525 6- Introduction: Visual Basic Basic 6.0, By: Gary Haggard, Wade Hutchison, Christy Shibata,1st edition, 2013, bookboon.com 7- Programming Microsoft Visual Basic 6.0, PUBLISHED BY:Microsoft Press, A Division of Microsoft Corporation,One Microsoft Way Redmond, Washington 98052-6399, 1999 by Francesco Balena	no
Recommended Texts		No
Websites		

APPENDIX:

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

NB 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.

	Ministry of Higher Education and Scientific Research - Iraq Al-Turath University Petroleum and Gas Refining Engineering	

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Human Rights and democracy		**Module Delivery**
Module Type	Suplement		**Theory** **Lecture** **Seminar**
Module Code	HURD125		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	U	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Ala'a Fahem	**e-mail**	alaa.fahem@uoturath.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	None
Peer Reviewer Name	Prof. Dr. Adnan AbdulJabbar AbdulRazzaq	**e-mail**	adnan.a.alsalim@uoturath.edu.iq
Review Committee Approval	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 أهداف المادة الدراسية	1-Define the concept of human rights democracy and their characteristics 2-To promote the culture of human rights and democracy in society

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1.تزويد الطلبة بالمعرفه العامه عن حقوق الانسان والانضمه السياسية 2.تطوير قدرات الطالب المعرفية وتنمية اهتمامه في مجالات حقوق الامسان. 3.تسليح الطلبه بالمعلومات العامه عن الانضمة السياسيه ووسائل استقرارها ونجاحها 4.تسليح الطلبة بالافكار السوية التي تحميهم من الافكار المتطرفه وابعادهم غن الترويج لفكر معين. 5.خلق جيل ذات سلوك سوي يتوافق مع السلوك الجامعي . 6-نقل المسؤولية للطالب في قيادة المحاظرة مع التصحيح وتشخيص المعوقات .
Indicative Contents المحتويات الإرشادية	1.معرفه مفهوم حقوق الانسان واهم خصائصه 2.معرفه فئات حقوق الانسان والاعلان العالمي لحقوق الانسان 3-.معرفه حقوق الانسان في الاسلام ثم العلاقة بين حقوق الانسان والعولمه من خلال درا سة الاصالة والمعاصرة 4.ارهاصات حقوق الانسان والفرق بين الثقافه السياسيه والايدلوجيه 5 .معرفه ماهو النظام الديمقراطية وماهي اهم سماته والتطور التاريخي للنظام الديمقراطي 6.الديمقراطيه المباشره وشبه المباشره والتمثيليه 7.العالمية والخصوصيه للنضام الديمقراطي 8.مساوء ومحاسن الديمقراطيه 9.ادلجه الديمقراطية 10.العلاقه بين الديمقراطية والتنمية 11 معرفة النظام البرلماني والنظام الرئاسي

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1.محاضرات نضريه مباشره 2. استخدام طريقه العصف الذهني 3 .تقارير علميه لكل طالب وباختيارهم 4.سيمنر لمناقشه البحوث التي تقدم من قبل الطلبه 5سؤال فكري ك.واجب بيتي 6 - في النية استخدام الداته شو لعرض فلم عن حقوق الانسان من اجل استخلاص العبر والمضامين الانسانية.

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	and 5 1,4LO #
	Assignments	2	)55% (	2, 12	LO # 3, 4, 5 -and-6
	Report	1	)55% (	13	LO # 5
Summative assessment	**Midterm Exam**	1	)510% (	7	LO # 1-4
	Final Exam	1	0)770% (	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Human Rights and Human Rights and Secularism
Week 2	The concept of human rightsand Characteristics of human rights
Week 3	Human Rights Classification
Week 4	Human Rights in Ancient Civilizations and Human Rights and Islam
Week 5	Human rights sources
Week 6	Universal Declaration of Human Rights Human Rights and the Constitution of the Republic of Iraq 2005
Week 7	Human rights and political partiesHuman Rights and Globalization
Week 8	Positions of the Arab intellectual currents of human rights and Human rights between universality and privacy
Week 9	The historical development of democracy and Forms of democracy
Week 10	Types of democratic systems
Week 11	Concept of Election
Week 12	Challenges to democratization
Week 13	Democracy between universality and privacy
Week 14	Democracy and development
Week 15	The pros and cons of democracy
Week 16	**Final Exam**

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	1. عبد الكريم خليفة، القانون الدولي لحقوق الإنسان، بدون طبعة)الإسكند رية: دار الجامعة الجديدة، 2013 2. د. صلاح حسن مطرود, مبادئ و قواعد عامة في حقوق الأنسان	Yes
Recommended Texts	1. محمد علي الشجيري , حقوق الأنسان بين الأسلامي و العالمي 2. زكريا أبراهيم , مشكلة الحرية .	No
Websites	1. ماهر صلاح الجبوري , حقوق الأنسان و الديمقراطية 2. مجموعة باحثين، مشاكل تطبيق الديمقراطية في العالم العربي 3. رياض هاشم، اسس الديمقراطية وقواعدها 4. محمد عابد، الديمقراطية وحقوق الانسان	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Differentiation and Integration		**Module Delivery**
Module Type	Basic		**Theory** **Lecture** **Tutorial**
Module Code	DIIN121		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	UC	**Semester of Delivery**	2
Administering Department	CES.PR	**College**	CES
Module Leader	Asst.Lec Zainab alaa Hassan	**e-mail**	zainab.alaa@uoturath.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	M.sc
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. Shakir Mahmood	**e-mail**	Shakir.mahmood.a @uoturath.edu.iq

Review Committee Approval	01/06/2023	Version Number	1.0

Relation With Other Modules

Prerequisite module	GEMA112	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims

1. To develop an understanding with the concepts of calculus and analytic geometry and the applications of these concepts to the solution of engineering problems.
2. Introduction to functions, limits, derivatives and their applications.
3. Provide practice at developing critical thinking skills, solving open ended problems and to work in teams.

Module Learning Outcomes

1. Develop a deep understanding of issues related to the basic principles of calculus, and how to solve problems in chemical engineering.
2. The ability to understand and analysis problems related to specific field.
3. Understanding the necessary of all subject of mathematics in other sciences .
4. Understanding the necessary of integration and its application in other sciences .
5. An ability to apply effective, creative and innovative solutions, both independently and cooperatively, to current and future problems.
6. Characterization and analyses the performance of any problems in any object of chemical engineering.

Indicative Contents

Indicative content includes the following.

Integration

Indefinite integrals , Rules for indefinite integrals , Integration by substitution , Definite integrals , Rules for definite integrals , Mean (average) value , One-to-one functions , Inverse functions , Derivatives of inverse of differentiable functions ,The derivative & integral of natural logarithms functions, Exponential functions, Logarithms functions, a^x functions, Trigonometric functions, Inverse trigonometric functions, Hyperbolic functions, & Inverse hyperbolic functions. [12 hrs]

Techniques of integration

Integration by parts , Integration of rational functions by partial fractions , Trigonometric integrals , Trigonometric substitutions , Integration of rational functions of sine & cosine. [9 hrs]

Applications of definite integrals

Area between the graph & the x-axis , Area between curves , Volume by slicing & rotation about an axis , The disk method , The washer method , The shell method , Length of plane curves , Length of a parametric curves , Length of curve y=f(x) , Length of curve x=g(y) , Area of surfaces of revolution , Surface area for revolution about the x-axis , Surface area for revolution about the y-axis , Surface area of revolution for parameterized curves. [12 hrs]

	Partial derivatives Partial derivatives with respect to x , Partial derivatives with respect to y , Functions of more than two variables , Second order partial derivatives , The mixed derivative theorem , partial derivatives of still higher order , The chain rule , Implicit differentiation. [6 hrs] Polar coordinates Definition , Polar equation & graphs , Relating polar & Cartesian coordinates , Polar equation , Graphing in polar coordinates. [6 hrs]

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 and tutorials.

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	4,8,12	LO #2, 3, 4 and 5
	Discussion	1	5% (5)	Continuous	
	Report	1	5% (5)	14	LO # 1 and 6
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO # 2, 3, 4 and 5
	Final Exam	2hr	70% (70)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Indefinite integrals , Rules for indefinite integrals , Integration by substitution
Week 2	Definite integrals , Rules for definite integrals , Mean (average) value , One-to-one functions , Inverse functions , Derivatives of inverse of differentiable functions
Week 3	The derivative & integral of natural logarithms functions, exponential functions, logarithms

	functions, & a^x functions
Week 4	The derivative & integral of trigonometric functions, inverse trigonometric functions , hyperbolic functions, & inverse hyperbolic functions
Week 5	Integration by parts
Week 6	Integration of rational functions by partial fractions
Week 7	Trigonometric integrals , trigonometric substitutions , integration of rational functions of sine & cosine
Week 8	Area between the graph & the x-axis , area between curves
Week 9	Volume by slicing & rotation about an axis , the disk method , the washer method , the shell method
Week 10	Length of plane curves , length of a parametric curves , length of curve y=f(x) , length of curve x=g(y)
Week 11	Area of surfaces of revolution , surface area for revolution about the x-axis , surface area for revolution about the y-axis , surface area of revolution for parameterized curves
Week 12	Partial derivatives with respect to x , partial derivatives with respect to y , functions of more than two variables , second order partial derivatives
Week 13	The mixed derivative theorem , partial derivatives of still higher order , the chain rule , implicit differentiation
Week 14	Definition , polar equation & graphs , relating polar & cartesian coordinates , polar equation
Week 15	Graphing in polar coordinates
Week 16	Final Exam

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	"Thomas' Calculus Early Transcendentals", George B.Thomas, Jr. , Twelfth Edition, Addison-Wesley, 2010	Yes
Recommended Texts	“Mathematical Methods in Chemical Engineering”, Jenson. V.J. and Jeffereys, G.V, 2nd Edition, Academic Press New York, 1977	Yes
Websites		

APPENDIX:

GRADING SCHEME

Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Chemical Engineering Principles I		**Module Delivery**
Module Type	Core		**Theory** **Lecture** **Tutorial** **Seminar**
Module Code	CHES.P.131		
ECTS Credits	6		
SWL (hr/sem)	36		

Module Level	U	**Semester of Delivery**	2
Administering Department	CES.PR	**College**	CES
Module Leader	Dr. Eman Noori Ali	**e-mail**	iman129@uoturath.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Prof.Dr Mohammed.F.Abid	**e-mail**	Mohammed.abid@uoturath.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules

Prerequisite module	ANCH113	**Semester**	1
Co-requisites module	DIIN121	**Semester**	2

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. To understand how Dimensions, Units, Their Conversion and Dimensional Consistency (Homogeneity) 2. To understand how dealing with of Multicomponent Solutions and Mixtures 3. This course deals with the basic concept of material balance. 4. To understand how to solve material balance problems
Module Learning Outcomes	1. Have a deep knowledge, wide scope and improved understanding of the mechanisms in mass balance as well as a better insight into analytical and empirical methods applied in analysis of material balance related problems. 2. Gain knowledge for applying the material balance in chemical engineering problems. 3. To provide experience for students to solve material balance for different process 4. To enhanced the student's ability to develop a strategy for the analyzing and resolving material balance problems 5. To be able to understand the principles and essentials of energy balancing and the relationship between the energy consumed and the generated energy
Indicative Contents	Indicative content includes the following. Dimensions Are Our Basic Concepts Of Part A -Dimensions, Units, And Their Conversion Measurement Such As Length, Time, Mass, Temperature, And So On; Units Are The Means Of Expressing The Dimensions, Such As Feet Or Centimeters For Length, And Hours Or Seconds Or Time., Operations With Units, Conversion Of Units And Conversion Factors **[10 hrs]** **Introduction to Moles, Density and Concentration, Mole Fraction and Mass (Weight) fraction:** **Theprocedureforconvertingonesetofunitstoanotherissimplytomultiplyanynumberand its associated units by ratios termed conversion factors to arrive at the desired Analyses of Multicomponent Solutions and units. its associated answer and Mixtures: The composition of gases will always be assumed to be given in mole percent or fraction unless specifically stated otherwise.** **The composition of liquids and solids will be given by mass (weight) percent or fraction unless otherwise specifically stated.[8 hrs]** Choosing a Basis: A basis is a reference chosen by you for the calculations you plan to make in any particular problem, and a proper choice of basis frequently makes the problem much easier to solve. The basis may be a period of time such as hours, or a given mass of material, such as 5 kg of CO2, or some other convenient quantity. [8 hrs] Temperature: Temperature is a measure of the energy (mostly kinetic) of the molecules in a system. This definition tells us about the amount of energy. Other scientists prefer to say that Temperature is a property of the state of thermal equilibrium of the system with respect to other systems because temperature tells us about the capability of a system to transfer energy (as heat). [8 hrs] Revision problem classes [4 hrs] Part B - Introduction to Material Balances Fundamentals: The Concept of a Material Balance: A material balance is nothing more than the application of the law of the conservation of mass. [8 hrs] A General Strategy for Solving Material Balance Problems: Problem Solving: An orderly method of analyzing problems and presenting their solutions represents training in logical

	thinking that is of considerably greater value than mere knowledge of how to solve a particular type of problem. [4 hrs] Solving Material Balance Problems for Single Units without Reaction The use of material balances in a process allows you (a) to calculate the values of the total flows and flows of species in the streams that enter and leave the plant equipment, and (b) to calculate the change of conditions inside the equipment. [10 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 type of simple problems and design involving activities that are interesting to the students.

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

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

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction - Dimensions, Units, and Their Conversion
Week 2	Dimensional Consistency (Homogeneity)
Week 3	Operations with Units
Week 4	Introduction to Moles, Density and Concentration
Week 5	Mole Fraction and Mass (Weight) Fraction
Week 6	Analyses of Multicomponent Solutions and Mixtures
Week 7	Choosing a Basis: A basis is a reference chosen by you for the calculations you plan to make in any particular
Week 8	An introduction to temperatures and temperature concepts and their effect on other thermal properties

Week 9	Mid-term Exam
Week 10	Introduction to Material Balances, the Concept of a Material Balance
Week 11	Steady-State and Unsteady-State Systems
Week 12	General Strategy for Solving Material Balance Problems
Week 13	Degree of Freedom Analysis
Week 14	Solving Material Balance Problems for Single Units without Reaction
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	D.M.Himmelblau and J.B.Riggs ,Basic Principles and Calculations in Chemical Engineering ,8th Edition , 2012 .	Yes
Recommended Texts	R.M.Felder and R.W.Rousseau ,Elementary Principles of Chemical Processes ,3rd Edition ,2005 .	Yes
Websites	https://www.icheme.org/education/whynotchemeng/	

APPENDIX:

GRADING SCHEME

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

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

Module Information

Module Title	Chemistry of Petroleum	**Module Delivery**	
Module Type	Basic	**Theory** **Lecture** **Tutorial** **Lab**	
Module Code	CHPE123		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	UGx11 1	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Dr. Ahmed adnan haider	**e-mail**	ahmed.adnan@coeng.uobaghdad.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. Shakir Mahmood	**e-mail**	Shakir.mahmood.a @uoturath.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules

Prerequisite module	ANCH112	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims أهداف المادة الدراسية	1-Preparing applied engineers in the field of sciences who are distinguished by a high level of knowledge and technological creativity, and develop problem solving skills by knowing important organ compound. 2. Enable the student to learn the basic concept of organic chemistry.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- To recognize the most important organic compound that found in petrochemical products. 2- The principle of preparing important organocompound that chemical engineering student needs to know. 3- Knowing the most important method to identify and distinguish between organic compounds. 4- Students will learn the chemistry of petroleum and refinery.
Indicative Contents المحتويات الإرشادية	1. Introducing the student to the basics of naming organic compounds. 2. Introducing the student to use different types of laboratory tools 3. Introducing students to deal with Chemicals

	4. Introducing the student to the basics of keeping safe in the lab 5. Introducing the student to the basics of the art of preparing some of organic materials 6. Introducing the student to accept the experience in theoretical and practical subject through Four years of study.

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

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10	,7,11,133	,2,3,41
	Report	3	10	4.9,15	,2,3,41
	Lab	15	10	12	4
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO ALL
	Final Exam	2hr	60% (70)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction of organic compound -Naming and physical properties of Alkanes. Representation of structure. -Cycloalkanes.
Week 2	-Preparing of Alkanes -Substitution Reactions -Reactions of Alkanes.
Week 3	-Alkenes: -Naming, physical properties. -Representation of alkenes structure.
Week 4	-Preparing of Alkenes. -Elimination Reactions. -Reactions of Alkenes.

	Alkynes, Naming and physical properties
Week 5	-Preparation of Alkynes. - Elimination Reaction of Alkynes,
Week 6	--Alkyl Halide: -Naming and physical properties. -Primary, Secondary, tertiary Alkyl Halide. - Preparation of Alkyl Halides
Week 7	Blacksmith Workshop -An exercise forming the number five in English. - Exercise forming the number nine in English. -An exercise in forming an iron model in the form of a circle .
Week 8	Blacksmith Workshop - S-shape exercise. - Air hammer hot barbell exercise. - Exercise to form a circle on an electric bending machine. - Exercising cold and hot ornament formation. A written exam in practical exercises.
Week 9	-Reaction of Alkyl Halide -Examples. -Homework
Week 10	Alcohols. -Naming and physical properties. -Primary, secondary and tertiary Alcohols. -Preparation of Alcohols.
Week 11	-Reactions of Alcohols. -Example -Homework
Week 12	-Aldehyde and Ketones: -Naming and physical properties. -Preparing of Aldehyde. -Preparing of Ketones. -Distinguish between Aldehyde and Ketones
Week 13	Mechanism of Organic Reactions: - Elimination Reactions. Substitution Reactions.
Week 14	Heterocyclic Compounds -Preparing and reaction of: -Furan. -Pyrrole. -Pyridine.
Week 15	Third Exam.
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: Melting Point
Week 2	Lab 2: preparation of Aspirin
Week 3	Lab 3: Simple Distillation
Week 4	Lab 4: Esterification
Week 5	Lab 5: Saponification Reaction
Week 6	Lab 6: Identification of functional group I

Week 7	Lab 7: Identification of functional group II

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Ghatak, k (textbook of organic chemistry PHL learning 2014	متوفر
Recommended Texts	Morrison; Boyd (Organic chemistry) 6thed	
Websites	Bruice,p,yj,m(Organic chemistry) 7th ed. 2014	

GRADING SCHEME
مخطط الدرجات

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

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Engineering Drawing and AutoCAD	Module Delivery

Module Type	Basic	**Theory** **Lecture** **Lab**	
Module Code	EDAU124		
ECTS Credits	6		
SWL (hr/sem)	150		

Module Level	U	**Semester of Delivery**	2
Administering Department	CES.PR	**College**	CES
Module Leader	Asst.Lec Zainab Ryadh Hashim	**e-mail**	Zainab.ryadh@uoturath.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	Master.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Prof.Dr Jamal.M.Ali	**e-mail**	Jamal.manaa@uoturath.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation with Other Modules
العلاقة مع المواد الدراسية الأخرى

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

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

Module Aims أهداف المادة الدراسية	Engineering Drawing 4. The aims of the course provide a deep knowledge, wide scope and improved understanding of the engineering drawing. 5. The students should gain knowledge to apply the engineering drawing in engineering applied. Auto CAD 6. Understand the fundamental concepts and features of Auto CAD. 7. Learn sketching and taking field dimensions. 8. Take Data and transform it into graphic drawings. 9. Learn basic engineering drawing formats. 10. Learn basic Auto CAD skills. 11. Learn how draw 2D and 3D drawings in Auto CAD.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Engineering Drawing 1. The students can be use Tools Drawing in draw and analyze geometric shapes. 2. Enable students to draw devices, equipment & PFD in chemical engineering Auto CAD 3. Utilize the power and precision of Auto CAD as a drafting and design tool used in chemical engineering design. 4. Apply basic CAD concepts to develop and construct accurate 2D geometry. 5. Create, manipulate and edit 2D drawings and figure. 6. Apply elements of mechanical drafting such as layers,. dimensions, drawing format 7. Create, manipulate 3D drawings and figure.
Indicative Contents	Engineering Drawing

المحتويات الإرشادية	❖ 1 Introduction 3 hr. ❖ 2 Planning of Drawing paper 3hr. ❖ 3 Types of line 3hr. ❖ 4 Engineering operation 3hr. ❖ 5 Projections Drawing 3hr. ❖ 6 First angle projection 3hr. ❖ 7 Third angle projection 3hr. ❖ 8 Full section 3hr. ❖ 9 Half section 3hr. ❖ 10 The finding of third view 3hr. ❖ 11 Application Example 3hr. ❖ 12 Pictorial Drawing (Isometric and Oblique) 3hr. ❖ 13 Dimensions 3hr. ❖ 14 Examples of Chemical Engineering drawing and exercises. Auto CAD ❖ Introduction, drawing program screen components, Setting drawing limits, Units, Grid and snap, Zoom, Orthogonal, Osnap. 2D drafting: Cartesian system coordinate, AutoCAD drawing command (6hrs). ❖ Point, Line: line, multi-line, construction line, drawing line by using: absolute coordinate, polar coordinate, relative coordinate, Examples. ❖ Continuous line drawing: Rectangle, Polygon, Poly line with their options, Examples (6 hrs). ❖ Curves drawing: Arc, Circle, point –SP line, Ellipse with their options, Example (6 hrs). Modify command: ❖ 1-copy tool: copy, mirror, offset, array. 2- Erase tool: erase, trim, break .3-move tool: move, rotate Examples (6 hrs).4- Change tool: stretch, Lengthen, Extend, Scale, Chamfer, and Fillet .5-Explode, Examples (6 hrs). ❖ Layers: Create a new layer, rename layer, active layer, run and extinguishing layers, Freezing layers, Lock and open layers, the color, Font type, Line width, Example (6 hrs). ❖ 3D drawing methods: Surfaces drawing: box, Wedge, Pyramid, Dome, Sphere, Cone, Torus, Dish, Example (6 hrs). ❖ 3D drawing methods: Solids: box, Cylinder, Sphere, Cone, Wedge, Torus, Examples (6 hrs).

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in the delivery of this module is to encourage students to participate in the exercises, while improving and expanding their critical thinking skills at the same time. This will be achieved through classes, giving engineering designs, participating in solving them, and competing in giving ideas and skills for the solution.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL(h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL(h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10% (10)	3-10	LO #1, 2, 4,5,and 7
	Assignments	5	)5% (5	2-13	LO # 1-7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	)5% (5	13	LO # 1-7
Summative assessment	Midterm Exam	2 hr	0)20% (2	6,14	LO # 1-7
	Final Exam	hr3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction and Planning of Drawing paper.
Week 2	Types of line and Engineering operation.
Week 3	Projection Drawing, first angle projection and third angle projection.
Week 4	Full section, half section, the finding of third view and application Example.
Week 5	Pictorial Drawing (Isometric and Oblique) and Application Example.
Week 6	Dimensions, examples of chemical engineering drawing and exercises.
Week 7	Final Exam.
Week 8	Introducing the AutoCAD program and interfaces and Drawing settings, preparing the drawing screen and worksheet.
Week 9	Create two-dimensional graphics (line drawing methods)(rectangle, circle).
Week 10	Create two-dimensional graphics (polygon, Arc, polyline, Ellipse).
Week 11	Modification Operations (Erase, Copy, Mirror, Offset, Move, Explode,Fillet,chamfer, Trim,).
Week 12	Modification Operations (Rotate, Scale,Extend , Array, Break, Stretch)
Week 13	Drawing with layers
Week 14	3D drawing methods: Surfaces drawing
Week 15	3D drawing methods: Solids
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Drawing rectangular using lines in absolute coordinate, polar coordinate, relative coordinate
Week 2	Lab 2: Drawing line,rectangular,circle

Week 3	Lab 3: Drawing Arc, polygon, point –SP line, Ellipse
Week 4	Lab 4: Drawing simple 2D shape and applying Modify commands such as copy, mirror, offset, array , trim, move, rotate , stretch, Lengthen, Extend, Scale, Chamfer, and Fillet
Week 5	Lab 5: Drawing a simple 2D chemical engineering drawing and applied layers.
Week 6	Lab 6:3D drawing methods: Surfaces drawing
Week 7	Lab 7: 3D drawing methods: Solids

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available
Required Texts	Engineering Drawing 1.الرسم الهندسي،تاليف (عبد الرسول الخفاف) الطبعة الثانية١٩٩٣ 2. R.P Hoelscher and C.H Springer "Engineering Drawing and Geometry AutoCAD 1-Terry T. Wohler, applying AutoCAD 2002 fundamentals, Glencoe /McGraw-Hill. 2-James A. Leach, AutoCAD 2002 Companion Essentials of AutoCAD plus Solid modeling ,2003, McGraw-Hill, Boston. 3- Terry T. Wohler, applying AutoCAD a step by step approach for AutoCAD release 13, 1996, Glencoe McGraw-Hill. 4- James A. Leach, AutoCAD 14 Companion Essentials of AutoCAD plus Solid modeling ,1999, WCB / McGraw-Hill, Boston.	no
Recommended Texts	David Byrnes and Mark Middlebrook, AutoCAD® 2007 For Dummies , Wiley Publishing, Inc.	No

GRADING SCHEME
مخطط الدرجات

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

Note:

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Workshops	**Module Delivery**	
Module Type	Suplement	**Practical**	
Module Code	WSHE106		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	UC	**Semester of Delivery**	1
Administering Department	Training and Workshops Center	**College**	
Module Leader	Hatif Salim	**e-mail**	Hatif@uoturath.edu.iq
Module Leader's Acad. Title		**Module Leader's Qualification**	B.sc
Module Tutor	None	**e-mail**	None
Peer Reviewer Name		**e-mail**	
Review Committee Approval	08/ 06/2023	**Version Number**	1.0

Relation With Other Modules

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

Module Aims, Learning Outcomes and Indicative Contents

Module Aims أهداف المادة الدراسية	1-Preparing applied engineers in the field of engineering sciences who are distinguished by a high level of knowledge and technological creativity, in line with the strict standards adopted globally in quality

	assurance and academic accreditation of the corresponding engineering programs, while adhering to the ethics of the engineering profession. 2. Enable the student to know and understand work systems, risks, and the factors surrounding them. 3. Enable the student to know and understand theoretical principles in handicrafts and measurements.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- To familiarize the student with the vocabulary of occupational safety and its importance in the field of work. 2- Acquisition of the student's manual operation skills, for example (Filings and Tinsmith workshops), and mechanical operation skills, for example (Turning). 3- Acquisition of the student's mechanical forming skills, for example (Casting and Blacksmithing). 4- The student acquires basic engineering skills such as Welding, Carpentry, and Electrical installations that serve him in the professional field. 5- Enabling the student to operate the various machines and devices in mechanical operations and formation. - Cooperative learning by working collectively.6
Indicative Contents المحتويات الإرشادية	1. Introducing the student to the basics of the art of turning and milling, types of cold working machines, the skill of dealing with them, choosing metals, operational tools, and methods of measurement and standardization 2. Introducing the student to the basics of the art of casting, hot forming, metal selection, method of working on casting furnaces and tools, and manufacturing casting molds 3. Familiarize students with the basics of cars and the systems they use, as well as maintenance, disassembly, and assembly processes. 4. Introducing students to the basics of household and industrial electrical appliances, the skill of using tools, and designing electrical circuits and control panels 5. Introducing the student to the basics of the art of plumbing, leveling surfaces, the skill of using tools, manufacturing and installing geometric shapes, and methods of measurement and standardization 6. Introducing the student to the basics of the art of blacksmithing, cold and hot forming of metals, the method of hardening them, and the skills of dealing with hand tools, forming machines, and heating furnaces 7. Introducing the student to the basics of the art of filing and manual operation of metals with the help of manual, electrical, and mechanical tools, the skills of dealing with them, and the methods of measurement and standardization 8. Introducing the student to the basics of the art of welding, the installation and assembly of metals, the types of welding machines, the skills of dealing with them, the types of welding, and the methods of measurement and standardization 9. Introducing the student to the basics of the art of carpentry and woodworking with the help of manual, electrical, and mechanical tools, the skills of dealing

	with them, and methods of measurement and standardization

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	7	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		
Structured SWL (h/year) الحمل الدراسي المنتظم للطالب خلال الفصل	186	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/year) الحمل الدراسي غير المنتظم للطالب خلال الفصل	14	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.46
Total SWL (h/year) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**				
	Assignments				All
	Projects / Practice	Every 3 weeks	60%	Continuous	
Summative assessment	**Midterm Exam**				
	Final Exam	Every 3 weeks	40%	Continuous	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Welcoming workshop. -Occupational safety and its importance in welding workshops. -Introduction to the basics of welding. -Electric arc exercise. -An exercise for welding straight lines in a circular motion (helical).
Week 2	Welding workshop - An exercise for welding straight lines with a crescent movement and other welding methods -Construction welding exercise.

Week 3	Welding workshop. -Welding two pieces together. -Written exam in practical exercises.
Week 4	Casting workshop -Occupational safety and its importance in plumbing workshops. -Introduction to the basics of metal casting. -Simple wooden disc exercise. Half workout.
Week 5	Casting workshop Wheel exercise. Pushing arm exercise.
Week 6	Casting workshop. -Complete pulley exercise. -Circular pole exercise. -Written exam in practical exercises.
Week 7	Blacksmith Workshop -Occupational safety and its importance in blacksmithing workshops. -Introduction to the Basics of Blacksmithing. - Barbell adjustment exercise. -Eight-star exercise. - Exercise forming the number eight in English. -Six formation exercises in English.
Week 8	Blacksmith Workshop -An exercise forming the number five in English. - Exercise forming the number nine in English. -An exercise in forming an iron model in the form of a circle .
Week 9	Blacksmith Workshop - S-shape exercise. - Air hammer hot barbell exercise. - Exercise to form a circle on an electric bending machine. - Exercising cold and hot ornament formation. - A written exam in practical exercises .
Week 10	Automotive Workshop -Occupational safety and its importance in car maintenance workshops. -An introduction to cars and their basic parts. -Parts of the engine, how it works, types of engines, and methods of classification.
Week 11	Automotive Workshop - Open the engine and identify the parts -Lubrication system -Cooling system.
Week 12	Automotive Workshop -The fuel system. -The old and new ignition circuits. -Written exam in practical exercises.
Week 13	Turning Workshop -Introduction to lathe machines and identifying their parts -Measuring tools and the use of an oven measuring instrument -Circular column lathing exercise on different diameters.

Week 14	Turning Workshop -Exercise using the pen (semicircular R) brackets. An exercise in making different angles using a pen (square + angle pen 55).
Week 15	Turning Workshop - Making shaft with different diameter exercises using (left and right pen) - Workout (Tube Connection). -Written exam in practical exercises.
Week 16	Fitting workshop Occupational safety and its importance in filing workshops -An introduction to the basics of filing -Pen holder exercise “preparation and preparation”
Week 17	Fitting workshop Pencil holder exercises finishing and assembling.
Week 18	Fitting workshop -The catcher exercise. - Clamping exercise. Written exam in practical exercises.
Week 19	Carpentry workshop -Occupational safety and its importance in carpentry workshops. - An introduction to carpentry, its types, types of wood, tools used, and preparation Preparing the tools used Face modification exercise using the reindeer
Week 20	Carpentry workshop Garden fence work and how to connect its parts, the eight-star exercise
Week 21	Carpentry workshop - Wood smoothing exercise using smoothing paper - Wood dyeing exercise in three stages Final smoothing and varnishing exercise Written exam in practical exercises
Week 22	The tinsmith workshop Occupational safety and its importance in plumbing workshops An introduction to plumbing, its tools, and plumbing stages Planning and marking exercise on metal plates
Week 23	The tinsmith workshop Geometric shapes Types of individuals and methods of individuals Geometric shape individuals exercise on a metal board
Week 24	The tinsmith workshop Cone members exercise - Exercise of cylinders with an oblique cut Roll forming operations Connection without the use of an intermediary Written exam in practical exercises
Week 25	Electric Workshop Occupational Safety and its importance in electrical workshops An introduction to the basics of electrical installations - Linking a simple circuit consisting of a lamp to the control of a single-way switch.

	Connect two lamps in series with one-way switch control. Connecting two lamps in parallel with the control of a single road switch. Connect two lights with one-way dual switch control.
Week 26	electric Workshop Connect a fluorescent lamp circuit to a one-way switch control Connecting an electric supply socket circuit to the control of a separate or combined one-way switch Written exam in practical exercises
Week 27	electric Workshop Occupational Safety and its importance in blacksmithing workshops Introduction to the basics of Blacksmithing - Barbell adjustment exercise Eight-star exercise - Exercise forming the number eight in English Exercise forming the number six in English
Week 28	supplementary training curriculum Welding workshop Plumbing workshop Blacksmith's workshop
Week 29	supplementary training curriculum - Automotive workshop - Turning workshop Fitting workshop
Week 30	supplementary training curriculum Carpentry workshop The plumbing workshop electric Workshop

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Workshop technology and measurements, Ahmed Salem Al-Sabbagh,	yes

GRADING SCHEME
مخطط الدرجات

Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
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Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:				

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Mathematics I	**Module Delivery**	
Module Type	Basic	**Theory** **Lecture** **Tutorial**	
Module Code	MATH211		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Asst.Lec Zainab Ala'a Hassan	**e-mail**	zainab.alaa@uoturath.edu.iq
Module Leader's Acad. Title	Assistant lecturar	**Module Leader's Qualification**	M.sc
Module Tutor		**e-mail**	
Peer Reviewer Name	Prof. Dr. Adnan AbdulJabbar AbdulRazzaq	**e-mail**	adnan.a.alsalim@uoturath.edu.iq
Review Committee Approval	26/05/2024	**Version Number**	1.0

Relation With Other Modules

Prerequisite module	MATH121	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims أهداف المادة الدراسية	To develop an understanding with the concepts of calculus and analytic geometry and the applications of these concepts to the solution of engineerin problems .12 Introduction to functions, limits, derivatives and their applications .13 Provide practice at developing critical thinking skills, solving open ended problems and to work in teams .14 **. Able to evaluate double, triple integrals and the area, volume by double & 4 Triple Integrals,** **respective** **5. Understand the concept of Fourier-series representation of periodic functio and their applications..** **6.** Develop the technical knowledge and understanding of mathematical techniqu and the ability to apply them appropriately in conte
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Develop a deep understanding of issues related to the basic principles of calculus, and how to solve problems in chemical engineering .7 The ability to understand and analysis problems related to specific field .8 Understanding the necessary of all subject of mathematics in other sciences .9 Understanding the necessary of derivatives and its application in other sciences .10 An ability to apply effective, creative and innovative solutions, both independently and cooperatively, to current and future problems .11 Characterization and analyses the performance of any problems in any object of chemical engineering .12
Indicative Contents المحتويات الإرشادية	Double Integral (15 Area and volume by using double integral, Double Integral in polar coordinates, Tri Integral in rectangular coordinates, physical application of double and tri integration **Function and definite Integrals: (10** The error function, the gamma function, The beta function, factorial function **Infi (10** Sequences, Convergence, Geometric series, nth partial sum, Tests of convergen alternating series, power and Taylors serie **Fourier series: (10** Periodic functions, Fourier series, Even and odd functions, Half range expansio

Learning and Teaching Strategies

Strategies	The main strategy that will be adopted is to encourage students' participation in t exercises forms, while at the same time refining and expanding their critical thinki skills. This will be achieved through a homework, classes, interactive tutorials and considering type of simple problems and design involving activities that are interesti to the students. The lectures are given in terms of questionable manner and answers a shared among the student

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (5)	4,8,12	LO #2, 3, 4 and 5
	Online Assignments	3	12% (4)	Continuous	All
	Onset Assignments	4	6% (2)	Continuous	All
	Report	1	5% (5)	14	LO # 1 and 6
Summative assessment	**Midterm Exam**	3hr	10% (10)	10	LO # 2, 3, 4 and 5
	Final Exam	3hr	50% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	**Double Integral**
Week 2	**Area and volume by using double integral**
Week 3	**Double Integral in polar coordinates**
Week 4	**Triple Integral in rectangular coordinates, physical application of double and triple integration.**
Week 5	**The error function, the gamma function**
Week 6	**The beta function, factorial function.**
Week 7	**The beta function, factorial function.**
Week 8	**Sequences, Convergence, Geometric series, nth partial sum,**
Week 9	**Sequences, Convergence, Geometric series, nth partial sum,**
Week 10	**Tests of convergence, alternating series, power and Taylor's series**
Week 11	**Tests of convergence, alternating series, power and Taylor's series**
Week 12	**Periodic functions, Fourier series**
Week 13	**Periodic functions, Fourier series**

Week 14	**Even and odd functions, Half range expansion.**
Week 15	**Even and odd functions, Half range expansion**
Week 16	**Final Exam**

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	"Thomas' Calculus Early Transcendentals", George B.Thomas, Jr. , Twelfth Edition, Addison-Wesley, 2010	Yes
Recommended Texts	"Mathematical Methods in Chemical Engineering", Jenson. V.J. and Jeffereys, G.V, 2nd Edition, Academic Press New York, 1977 Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition, 2007.	Yes

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information					
Module Title	Chemical Eng. Principles II			**Module Delivery**	
Module Type	Core			**Theory** **Lecture** **Tutorial**	
Module Code	CHEP212				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	U		**Semester of Delivery**	1	
Administering Department	CES.PR	**College**	CES		
Module Leader	Prof. Dr. Amer Aziz	**e-mail**	Amer.a.Abdulrahman@uotechnology.edu.iq		
Module Leader's Acad. Title	Assist.Prof	**Module Leader's Qualification**	Ph.D		
Module Tutor		**e-mail**			
Peer Reviewer Name	Prof. Dr. Adnan AbdulJabbar AbdulRazzaq	**e-mail**	adnan.a.alsalim@uoturath.edu.iq		
Review Committee Approval		**Version Number**	1		

Relation With Other Modules			
Prerequisite module	CHEP122	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	1. Have a deep knowledge, wide scope and improved understanding of the mechanisms in mass balance as well as a better insight into analytical and empirical methods applied in analysis of material balance related problems. 2. Gain knowledge for applying the material (equation) balance in chemical engineering problems. 3. To provide experience for students to solve material balance for different process.
Module Learning Outcomes	1. Gain a general concept of materials balance. 2. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics. 3. An ability to apply the engineering design and material balance for different

	process to produce solutions that meet specified needs with consideration for public health and safety, and global, cultural, social, environmental, economic, and other factors as appropriate to the discipline. 4. An ability to function effectively as a member or leader of a team that establishes goals, plans tasks, meets deadlines, and creates a collaborative teams and inclusive environment.
Indicative Contents المحتويات الإرشادية	Systematic steps of solving material balance problems 1 [9 hrs] Systematic steps of solving material balance problems 2 [6 hrs] Systematic steps of solving material balance problems 3 [9 hrs] Toxicology Hazards identification-toxicity, fire, static electricity, noise and dust concentration; Material safety data sheet, hazards indices- Dow and Mond indices, hazard operability (HAZOP) and hazard analysis (HAZAN). [6 hrs] Material Balances for Processes Involving Chemical Reaction Material Balances for Processes Involving Chemical Reaction [9 hrs] [6 hrs] Gases and Vapors

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 type of simple problems and design involving activities that are interesting to the students.

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (5)	4,8,12	LO #2, 3, 4 and 5
	Online Assignment	2	10% (5)	Continuous	LO#1-6
	Onset Assignments	2	10% (5)	Continuous	LO#1-6
	Report	1	5% (5)	14	LO # 1 and 6

Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO # 2, 3, 4 and 5
	Final Exam	3hr	50% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Material balances without chemical reactions.
Week 2	Material balances with chemical reactions.
Week 3	Species Material Balances.
Week 4	Processes Involving a Single Reaction.
Week 5	Element Material Balances.
Week 6	Material balances on combustion processes.
Week 7	Species Material Balances.
Week 8	Processes Involving a Single Reaction.
Week 9	Processes Involving Multiple Reactions.
Week 10	Element Material Balances, Process flow sheet.
Week 11	Bypass and Purge.
Week 12	Recycle without Chemical Reaction.
Week 13	Ideal gas law.
Week 14	Ideal gas mixtures.
Week 15	Material Balance Problems Involving Multiple Units.
Week 16	Final Exam.

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	David M. Himmelblau and James B. Riggs, "Basic Principles and Calculations in Chemical Engineering", Seventh Edition, (2004). David M. Himmelblau, "Basic Principles and Calculations in Chemical Engineering", Sixth Edition, (1996).	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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Fluid Flow I	**Module Delivery**	
Module Type	Core		Theory Lecture Tutorial LAB
Module Code	FLFL213		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UG	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Dr. Haidar Alaa	**e-mail**	hayder.alhameedi@qu.edu.iq

Module Leader's Acad. Title	Asst. Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name	Dr. Shakir Mahmood	**e-mail**	Shakir.mahmood.a @uoturath.edu.iq
Review Committee Approval	01/06/2024	**Version Number**	1.0

Relation With Other Modules

Prerequisite module	PHSM113	**Semester**	1
Co-requisites module	CHEP212	**Semester**	2

Module Aims, Learning Outcomes and Indicative Contents

Module Aims أهداف المادة الدراسية	1. Provide students with a lasting and solid understanding of fluid flow. 2. Effectively teach fundamental concepts in fluid flow, including mass, energy, and momentum balances. 3. Teach students how to properly set up and solve fluid flow problems either analytically and numerically. And define the problems in fluid dynamics in various engineering applications. 4. Introduce students to chemical engineering processes and equipment where fluid flow is involved. And make them distinguish the energy variation and its applications spatially the frictional energy losses calculations and the required energy for fluid pumping. 5. Teach students how to apply fundamental concepts to advance topics in fluid flow. 6. Define to students the necessary fluid parameters of full scale projects by performing simple model experiments and share ideas and work in a team in an efficient and effective manner under controlled supervision or independently.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowledge of fundamental concepts in fluid statics including density, viscosity, pressure as a function of depth, acceleration variation, and surface tension. 2. Ability to derive the relationships between multivariable in fluid flow by dimensional analysis methods. 3. Ability to apply mass, energy, and momentum balances to fluid flow problems including Bernoulli's equation, power pump calculations, pipe flow, and linear/angular momentum. 4. Ability to analyze fluid flow in chemical engineering equipment. 5. Ability to solve fluid flow problems both analytically and numerically. 6. Understand applications of fundamental fluid flow in piping system for Newtonian and non-Newtonian fluid flow.
Indicative Contents المحتويات الإرشادية	INTRODUCTION [5 hr] Types of fluids, Physical properties, mass and energy conservation laws, Newton's laws of motion. Newton law of viscosity with applications. DIMENSIONAL ANALYSIS [7 hr] Dimensional analysis, definition, dimensional homogeneity, dimensional analysis methods. FLUID STATICS [5 hr]

	Fluid statics, definition, pressure measurement devices with applications FLUID DYNAMICS [16 hr] Fluid kinematics, Reynolds experiment and flow patterns, Mass conversation, continuity equation, Energy conversation, Euler equation of motion and Bernoulli's equation with modification and applications steady and unsteady state. PUMPING OF LIQUIDS [7 hr] Total heads, Pump characteristics curves. Types of the pumps, Centrifugal pump relations and homologous, centrifugal pumps in series and in parallel NON-NEWTONIAN FLUIDS [5 hr] Definition, types of fluid depended on time, calculation of friction and pressure drop for general time independent in laminar and turbulent flow

Learning and Teaching Strategies

Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises electronic (weekly) and paper (monthly) forms, while at the same time refining and expanding their critical thinking skills. This will be achieved through a homework, classes, interactive tutorials and by considering type of simple problems and design involving activities that are interesting to the students. The lectures are given in terms of questionable manner and answers are shared among the students.

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20%(10)	4, 11	and 61LO #
	Online HW.	5	5%	Continuous	and 61LO #
	Onsite HW.	5	5%	Continuous	and 61LO #
	LAB	1	10%	Continuous	LO # 1, 3
Summative assessment	**Midterm Exam**	2 hr	10%	8	and 61LO #
	Final Exam	3 hr	50%	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Definition of a fluid, and fluid mechanics. Physical properties of fluids: Density, specific gravity, viscosity, Kinematic viscosity, surface tension and capillarity, Pressure and shear stress, Newton's laws of motion. Types of Fluids, Newtonian, non-Newtonian fluids ideal and real fluids
Week 2	Newton's law of viscosity with applications
Week 3	Fundamental dimensions, dimensions. Dimensional homogeneity. methods of dimensional analysis: 1- Rayleigh's method (power series).
Week 4	2- Buckingham's method / Π-Theorem, and Dimensionless numbers
Week 5	Basic equation of fluid statics, pressure head of liquid. Pressure force on surfaces, and Buoyancy. Pressure Measurement devices: (Piezometer, Manometers, types of Manometers, Mechanical Gauges).
Week 6	Pressure Measurement devices: (Piezometer, Manometers, types of Manometers, Mechanical Gauges). With applications
Week 7	Fluid Dynamics, Newtonian's Incompressible Fluid: Kinematics: Types of fluid flow (steady & unsteady flows, uniform and non-uniform flows, one two and three dimensional flows, Rotational and Irrotational flows. Laminar & turbulent, compressible & incompressible fluid flow), Fluid dynamics, Reynolds experiment and flow patterns, Define momentum boundary layer B-L.
Week 8	Euler equation of motion and Bernoulli's equation and modified Bernoulli's equation. Velocity distribution for laminar and turbulent flow, derive the average velocity in laminar and turbulent flow, Hagen-Poiseuille's equation.
Week 9	Darcy equation and, types of frictions, or head losses (skin friction) in circular pipes for laminar & turbulent flow, use empirical correlations and Moody chart.
Week 10	Head losses in fittings (form friction), Application of modified Bernoulli's equation for a piping system consist (skin & form friction).
Week 11	Estimation of total pumping power required. Equivalent diameter for flow in non-circular pipes, and flow in open channels. Pipe size selection.
Week 12	Pumping of liquids, types of pumps, heads types, NPSH, Cavitation, Horse Power, Pumping Efficiencies, pump characterization curves with applications, pump specific speed.
Week 13	Types of the pumps, centrifugal pump relations, homologous centrifugal pumps, centrifugal pumps in series and in parallel with applications.
Week 14	Definition, types of fluid depended on time, calculation of friction and pressure drop for general time independent in laminar and turbulent flow
Week 15	Drive the velocity distribution of power law fluid, pressure drop calculations, with applications.
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab. 1: Description of Basic Principles of Hydraulic Bench system
Week 2	Lab. 2: Calibration of Bourdon Tube Pressure Gauge
Week 3	Report discussion and assessment
Week 4	Lab. 3: Impact of Jet
Week 5	Report discussion and assessment
Week 6	Lab. 4: Reynolds Experiment
Week 7	Report discussion and assessment

Week 8	Lab. 5: Frictional Energy Loss Along Pipe
Week 9	Report discussion and assessment
Week 10	Lab. 6: Frictional Energy Losses in Piping System
Week 11	Report discussion and assessment
Week 12	Lab. 7: Gear Pump
Week 13	Report discussion and assessment
Week 14	Compensation for just one experience
Week 15	Final Lab Exam

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Coulson, J.M and Richardson J.F. "Chemical Engineering, volume 1 and volume 2", Fifth edition 2002, Elsevier Science, Linacre House, Jordan Hill, Oxford.	Yes
Recommended Texts	F.A. Holland and R. Bragg "Fluid Flow for Chemical Engineers", 2nd Ed. (1995) Elisevier Ltd.	Yes
Websites		

GRADING SCHEME
مخطط الدرجات

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

Note:

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Physical Chemistry	**Module Delivery**	
Module Type	Basic	**Theory** **Lecture** **Tutorial** **Lab.**	
Module Code	PHCH214		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	UC	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Asst.lec Dhargham Abdullah	**M**	dargham.abdulaziz.abdullah@uoturath.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	M.sc
Module Tutor		**e-mail**	
Peer Reviewer Name	Prof.Dr Mohammed.F.Abid	**e-mail**	Mohammed.abid@uoturath.edu.iq
Review Committee Approval		**Version Number**	1

Relation With Other Modules

Prerequisite module	ANCH112	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims أهداف المادة الدراسية	1. able to apply experimental techniques to the determination of rates law and rate constant, enzyme reactions kinetics. 2. deal with Surface chemistry: adsorption isotherms, surface tension, colloidal systems, and its properties 3. learns how to deal with applications of the equations of ideal gases for the close system with its four types of process 4. Be able to understand the relationship between electrical energy and chemical energy and their inter-conversion of one form to another and their calculation. 5. Understand the principles governing phase diagrams and be able to interpret phase diagrams for various kinds of systems
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics. Developed a solid foundation of fundamental concepts spanning physical chemistry. Developed skills draw and uses graphs/tables/etc. (oral and written) 2. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. Gained experience of good laboratory practices, essential practical techniques, and in the preparation of written reports. students get the knowledge of functioning of various instruments, electrochemical techniques. 3. An ability to communicate effectively with a range of audiences. It enhances the student's ability to solve exercises and explain some points to others
Indicative Contents المحتويات الإرشادية	**Chemical Kinetics:** Rate of consumption and formation, rate of reaction, empirical rate equation, order of reaction (zero, 1st, 2nd, 3ed) rate constants and rate coefficients, enzyme reactions (9 h) kinetics, analysis of kinetic results. **Surface chemistry:** Adsorption, adsorption isotherms, surface tension and capillary rise, colloidal systems, electrical properties of colloidal systems, gels, emulsions. (9 h) **Phase Equilibria:** Equilibrium between phases, one component systems, binary systems, temperature composition diagram (boiling point curves), liquid vapor equilibria of two component system, liquid vapor equilibrium in system not obeying Raoults law, distillation, azeotropes, component systems. (9 h) **Applications of the equations of ideal gases:** The PVT behavior of pure substances, close system, isotherm process, isochoric process, isobaric process, the adiabatic process and the polytropic process. (9 h) **Electrochemistry:** Electrolyte, units, type, conductivity, activity and ionic strength, determination of activity coefficient from solubility, the Debye-Hackle theory, Faradays laws of electrolysis, Electromotive force (EMF) of a cell, standard free energy and energy of aqueous ions, standard electrode and its potentials, oxidation- reduction reactions balance, concentrations cells, electrolysis and batteries. (9 h)
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 Lectures /

	Tutorial / Pictures / video clips and Laboratories' Experimenter.

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	15% (3)	2, 4,6,9,12	LO #1, 2
	Online Assignments	5	10% (2)	Continuous	LO #1, 2
	Onsite Assignments	5	5% (1)	Continuous	LO # 1 ,2, 3
	Lab	1	10% (10)	Continuous	LO # 1, 2
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO #1, 2
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
V	Rate of consumption and formation, rate of reaction
V	empirical rate equation, order of reaction, First order reaction, second order
V	Factors affecting reaction kinetics, activation energy.
Week 4	Adsorption, type, adsorption isotherms,
Week 5	adsorption isotherms, Surface tension and capillary rise, pressure difference across curved surface tension,
Week 6	colloidal systems, electrical properties of colloidal systems, gels, emulsions.
Week 7	The PVT behavior of pure substances, the ideal gas, close system
Week 8	the constant volume process, the constant pressure process
Week 9	the adiabatic process, the polytropic process
Week 10	Definitions, Gibbs Phase rule, One component system, Two-component systems, Constant pressure equilibria, Vapour pressure diagrams, composition of the vapour,
Week 11	Temperature composition diagrams, distillation, Azeotropes

Week 12	Immiscible liquids, Heat of transformation, Three-component phase Diagram
Week 13	Electrolytes, type, units, molar conductivity, ionic strength, determination of activity coefficient from solubility,
Week 14	the Debye-Hackle theory, Electromotive force (EMF) of a cell, measurements of EMF- the potentiometer, the polarity of electrodes, the cell reactions and reversible cells
Week 15	free energy and reversible cells, typical of half-cells classification EMF, standard electrode potentials, standard free energy and energy of aqueous ions, calculation of EMF
Week 16	Final Exam

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	"Physical Chemistry"8ed edition, W. H. Atkins, P., de Paula, J. Freeman and Company. 2006	Yes
Recommended Texts	1. J. Laidler, physical chemistry, Bosten; Houghton M, ffl.n company, 1999. 2. G. Mortimer, physical chemistry, San Francisco; Altarcourt science and technology company, 2000.	Yes
Websites		

GRADING SCHEME
مخطط الدرجات

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

Lab. Experiments

Exp. No.	**Exp. Name.**
Exp. No. 1	Hydrolysis of H_2O_2 (kinetic)
Exp. No. 2	Saponification of acetate ethyl. (kinetic)

Exp. No. 3	Surface chemistry: Adsorption by solid from solution
Exp. No. 4	Viscosity.&Surface chemistry: Surface tension
Exp. No. 5	Three component system (water, ethanol and ethyl acetate)
Exp. No. 6	Measurement of conductivity and acidity of different electrolytes using electrodes

	Ministry of Higher Education and Scientific Research - Iraq Al-Turath University Petroleum and Gas Refining Engineering	

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information			
Module Title	Materials Engineering	**Module Delivery**	
Module Type	Core	**Theory** **Lecture** **Tutorial** **Lab.**	
Module Code	MAEN216		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UG	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Asst.Lec Marwa Hamza	**M**	ams.marwamaram@yahoo.com
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	M.sc
Module Tutor		**e-mail**	

Peer Reviewer Name	Dr. Shakir Mahmood	**e-mail**	Shakir.mahmood.a @uoturath.edu.iq
Review Committee Approval		**Version Number**	

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	PYST113	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims أهداف المادة الدراسية	1. To have an understanding of interatomic bonding in solids. 2. To study the properties of some materials related to their crystal structures. 3. To study the phenomena that occur during a heat treatment involving atomic diffusion. 4. To understand how the various mechanical properties are measured and what these properties represent. 5. To knowledge and understanding of phase diagrams related to the design and control of heat-treating procedures. 6. To knowledge of the various types of composites, as well as an understanding of the dependence of their behaviors on the characteristics, relative amounts, geometry/distribution, and properties of the constituent phases. 7. To study some of the properties of ceramics. .
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1**-An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics. 2- Developing a solid foundation of fundamental concepts spanning material science and engineering 3- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
Indicative Contents المحتويات الإرشادية	***Classification of Materials*** (3 h) Historical Perspective, Materials Science and Engineering and Classification of Materials. ***Atomic Structure and Interatomic Bonding*** (3 h) Atomic Structure and Atomic bonding in Solids.

	The Structure of Crystalline Solids (9 h) Crystal Structures Crystallographic Points, Directions, and Planes Crystalline and Nanocrystalline Materials ***Imperfections in Solids.*** (3 h) Types of defects Microscopic Examination ***Diffusion*** (6 h) Introduction Diffusion Mechanisms Fick's First Law Fick's Second Law—Nonsteady -State Diffusion Factors That Influence Diffusion ***Mechanical Properties of Metals*** (6 h) Elastic Deformation Plastic Deformation Fracture Fatigue Creep ***Phase Diagrams*** (6 h) Definitions and Basic Concepts Binary Phase Diagrams ***Composites*** (3 h) *Particle-Reinforced Composites* Fiber-Reinforced Composites Structural Composites ***Structures, Properties and Applications of Ceramics*** (6 h) Ceramic Structures Mechanical Properties Types and Applications of Ceramics
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding

	their critical thinking skills. This will be achieved through classes interactive Lectures / Tutorial / Inspiring teamwork and develop collaboration skills among students through group solving tasks / video clips and Laboratories' Experimenter. Using assessment techniques such as quizzes and tests, and classroom polls to measure student's understanding and evolution throughout the course. Providing recurrent feedback to report misunderstanding and improve learning.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (10)	2, 5, 9	LO #1, 2
	Online Assignments	1	2% (2)	Continuous	LO #1, 2
	Onsite Assignments	2	8 % (4)	Continuous	LO # 1,2
	lab	1	10% (10)		LO # 3
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO #1, 2
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week	Introduction to material science and engineering, classification of materials.
Week	***Structure and Interatomic Bonding:*** Atomic Structure and Atomic bonding in Solids.
Week	Crystallographic and Crystal Structures
Week 4	Crystallographic Points, Directions, and Planes
Week 5	Crystalline and Nanocrystalline Materials
Week 6	***Imperfection in Solids:*** Types of defects and Microscopic Examination
Week 7	Introduction to Diffusion, Diffusion Mechanisms, and Fick's First Law
Week 8	Fick's Second Law—Nonsteady -State Diffusion, and Factors That Influence Diffusion
Week 9	***Mechanical Properties of Metals,*** Elastic Deformation

Week 10	Plastic Deformation, Fatigue, Creep, and Fracture
Week 11	***Phase Diagrams:*** Definitions and Basic Concepts
Week 12	Binary Phase Diagrams

Exp. No.	Exp. Name.

Week 13	***Composites:*** *Particle-Reinforced Composites*, Fiber-Reinforced Composites , and Structural Composites
Week 14	**Structures of Ceramics**
Week 15	Properties and Applications of Ceramics
Week 16	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	William D. Callister, Jr., Materials science, and engineering, Tenth edition, 2018.	Yes
Recommended Texts	.3 Donaled R. Askeland, The science and engineering of materials, international student edition, 2006. .4 Smith W.F. and Hashemi J. "Foundations of Materials Science and Engineering" McGraw- Hill 4th Edition (2002) .5 Shackelford James " Materials Science for Engineers" Pearson 6th Ed	Yes
Websites		

Lab. Experiments

Exp. No. 1	Tension test
Exp. No. 2	Hardness Testing
Exp. No. 3	Bending Test
Exp. No. 4	Creep Test
Exp. No. 5	Abrasion Test
Exp. No. 6	Impact Test
Exp. No. 7	Moisture Measurement in Engineering Materials
Exp. No. 8	Determination of Linear Thermal Expansion for a Solid
Exp. No. 9	Microstructure Examination of Pb-Sn alloys using the metallurgical microscope

GRADING SCHEME
مخطط الدرجات

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

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Fuel Technology	**Module Delivery**	
Module Type	Core	**Theory** **Lecture** **Lab**	
Module Code	FUTE215		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	UG	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Asst.Lec Dhargham abdulaziz	**e-mail**	dargham.abdulaziz.abdullah@uoturath.edu.iq
Module Leader's Acad. Title	Asst.Lecturer	**Module Leader's Qualification**	Msc.
Module Tutor		**e-mail**	
Peer Reviewer Name	Prof.DrMohamm.F. Abid	**e-mail**	Mohammed.abid@uoturath.edu.iq
Review Committee Approval	01/06/2024	**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 أهداف المادة الدراسية	1. Undestanding the types and properties of fuel (solid, liquid and gas). 2. Study the properties of crude oil, the physical and chemical properties of fuel and the five or six basic products of crude oil, the purification and the distillation of crude oil to obtain different products. 3. Explain in details all the properties of the products.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To provide an understanding of the fuel technology and the important of fuel fractions and the classification of fuel. 2. A comprehensive understanding of the petroleum product which they appear in visible form ,such as gasoline ,diesel , kerosene , and in less visible form over the entire spectrum of industry such as automobile lubricants , greases, carbon black for truck tires. 3. Ability to think that a refinery may produce five or six basic products such as LPG, naphtha, kerosene, diesel, and fuel oils, but specialty manufactures may produce a large number of their products from these basic refinery products.

Indicative Contents المحتويات الإرشادية	1. Introduction to Fuel Technology: Types of fuel and its importance (2hr). 2. Solid Fuel: Coal classification, composition and basis Coal preparation and washing (2hr) 3. Different types of coal combustion techniques Combustion of coal and coke making Coal liquefaction (4hr) 4. Liquid Fuel: Theories of petroleum formation, Classification as a Hydrocarbon Resource, Production of Petroleum, Composition of Crude Oils (2hr) 5. Evaluation of crude (12hr) - Crude oil assays - Properties of crude oil and petroleum products: - Types of Gasoline & it's Important Properties and tests such as ASTM Distillation, RVP, Octane Number, Oxidation Stability, Sulphur Content etc, - Various Types of Naphtha and their Important Properties & Applications. Important Tests & Properties of Kerosene such as Flash& Fire Point, Smoke Point , Aniline Point etc., - Types of Diesel & it's Important Properties & Tests such as Pour Point, Diesel Index, Cetane Number etc. - Lubricating oil, Production and properties, test methods Heavy Fractions like Lube Oil, Bitumen, Asphalt etc. & their Important. 6. Gas Fuel: History of Gaseous Fuel Producing of Gas Natural Gas, composition, classification, sweeting. (4hr) 7. LPG: Properties of LPG, composition, production, Test methods. (4hr)

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 and tutorials.

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (5)	1,2,3,4	LO #1,2,3
	Online Assignments	5	10%(2)	Continuous	LO #1,2,3
	Onset Assignment	1	5%(5)	Continuous	LO #1,2,3
	Lab	1	10% (10)	Continuous	LO #1,2,3
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO # 1,2,3
	Final Exam	3hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Fuel Technology: Types of fuel and its importance
Week 2	Solid Fuel: Coal classification, composition and basis Coal preparation and washing
Week 3	Different types of coal combustion techniques
Week 4	Combustion of coal and coke making Coal liquefaction
Week 5	Production of Petroleum, Composition of Crude Oils
Week 6	- Liquid Fuel: Theories of petroleum formation, Classification as a Hydrocarbon Resource, Production of Petroleum.
Week 7	Composition of Crude Oils
Week 8	Evaluation of crude - Crude oil assays - Properties of crude oil and petroleum products:
Week 9	Types of Gasoline & it's Important Properties and tests such as ASTM Distillation, RVP, Octane Number, Oxidation Stability, Sulphur Content etc,
Week 10	Various Types of Naphtha and their Important Properties & Applications
Week 11	. Important Tests & Properties of Kerosene such as Flash& Fire Point, Smoke Point , Aniline Point etc.
Week 12	Types of Diesel & its Important Properties & Tests such as Pour Point, Diesel Index, Cetane Number etc.
Week 13	Lubricating oil, Production and properties, test methods ,Heavy Fractions like Lube Oil, Bitumen, Asphalt etc. & their Important.
Week 14	Gas Fuel: History of Gaseous Fuel Producing of Gas Natural Gas, composition, classification, sweeting:.
Week 15	LPG: Properties of LPG, composition, production, Test methods,
Week 16	Final Exam

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	Speight, J.G, Handbook of petroleum product analysis, John Willey & Sons,2002.	Yes
Recommended Texts	Speight J.G., The chemistery and Technology of petroleum, 3rd Edition. Marcel Dekker, New York 1999	Yes
Websites		

GRADING SCHEME
مخطط الدرجات

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

	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

Laboratory experiments

Exp. No.	Exp. Name.
Exp. No. 1	ASTM distillation exp.
Exp. No. 2	Density and specific gravity exp.
Exp. No. 3	Viscosity& viscosity index exp.
Exp. No. 4	Salt content in crude oil exp.
Exp. No. 5	Gum and gum stability exp.
Exp. No. 6	Flash & fire point exp.
Exp. No. 7	Ash content for petroleum products exp.
Exp. No. 8	Conrad Son Carbon residue of petroleum exp.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Mathematics II	**Module Delivery**	
Module Type	Basic	**Theory** **Lecture** **Tutorial**	
Module Code	MATH221		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UC	**Semester of Delivery**	2
Administering Department	CES.PR	**College**	CES
Module Leader	Asst.Lec Zainab Ala'a Hassan	**e-mail**	zainab.alaa@uoturath.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	M.sc
Module Tutor		**e-mail**	
Peer Reviewer Name	Prof.Dr Jamal.M .Ali	**e-mail**	Jamal.manaa@uoturath.edu.iq
Review Committee Approval	26/05/2024	**Version Number**	1.0

Relation With Other Modules

Prerequisite module	MATH211	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims أهداف المادة الدراسية	1. Develop the technical knowledge and understanding of mathematical techniques and the ability to apply them appropriately in context

	2.Giving student the skills to use the method to solve problems. 3.Enable students to demonstrate appropriate transferable skills and the ability to work with relatively little guidance and support. 4.Give the learner the skills necessary to accommodate considered and disclosure of new relationships 5. Equip students with the confidence and study skills to enable them to progress both in the workplace and in post-graduate study
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The importance of using a structured analytical approach to problem solving. 2. Understand the concept of stochastic process and how can be apply to solve real problems in chemical engineering. 3. Understand discrete dynamical systems and their application in modeling problems in Chemical engineering process. 4. Applying the mathematics principles in chemical engineering. 5. Help the learner to rely on himself in the collection and development of himself in mathematics. 6. Compare and contrast various method so as to get the best solutions .
Indicative Contents المحتويات الإرشادية	• **Introduction to Ordinary Differential Equations: (9 hr)** Representation problems of 1st and 2nd ordinary differential equations **First Order Ordinary Differential Equations:** (Variable Separable Equation, Homogenous Equation **Exact, reducible to exact and Bernoulli's differential equations..Orthogonal trajectories in Cartesian and polar form. Simple problems on Newton's law of cooling)** • Second Order Ordinary Differential Equations: (9hr) **(** Non-Linear Differential Equations ,Equations with Dependent Variable Missing , Equations with Independent Variable, Homogenous Equation , • Linear Differential Equations Missing , Equations with Constant Coefficient, • Equations with Coefficients as a Function of the Independent Variable • Order Ordinary Differential Equations. (9hr) Simultaneous Differential Equations. Series Solution of Differential Equations. • **Solution by Series: (6hr)** • Infinite series by Taylor theorem,. • Method of Frobenius (Case I, II) , Method of Frobenius (Case IIIa, and IIIb), (6hr) • Bessels's and Modified Bessel's Equation, • Properties of Bessel Functions, • Applications in chemical engineering, (6hr) • Tubular Gas Preheater, Reaction in ax symmetric Spherical and Cylindrical pellets

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (5)	4,8,12	LO #2, 3, 4 and 5
	Online Assignments	3	12% (4)	Continuous	All
	Onset Assignments	4	6% (2)	Continuous	All
	Report	1	5% (5)	14	LO # 1 and 6
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO # 2, 3, 4 and 5
	Final Exam	3hr	50% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to Ordinary Differential Equations:** Representation problems of 1st and 2nd ordinary differential equations (linear and nonlinear, homogeneous …etc.).
Week 2	• **First Order Ordinary Differential Equations:** • Variable Separable Equation
Week 3	• Homogenous Equation
Week 4	• Exact Equation
Week 5	• Linear Equation • Bernoulli, s Equation.
Week 6	• Second Order Ordinary Differential Equations: • Non-Linear Differential Equations
Week 7	• Equations with Dependent Variable Missing • Equations with Independent Variable Missing

Week 8	• Homogenous Equation • Linear Differential Equations.
Week 9	• Equations with Constant Coefficient • Equations with Coefficients as a Function of the Independent Variable
Week 10	• Higher Order Ordinary Differential Equations. • Simultaneous Differential Equations. • Series Solution of Differential Equations.
Week 11	**Solution by Series:** • Infinite series by Taylor theorem,.
Week 12	Method of Frobenius (Case I, II)
Week 13	• Method of Frobenius (Case IIIa, and IIIb), • Bessels's and Modified Bessel's Equation, • Properties of Bessel Functions,
Week 14	• Applications in chemical engineering, • Tubular Gas Preheater,
Week 15	• Reaction in axisymmetric Spherical and Cylindrical pellets
Week 16	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Thomas' Calculus Early Transcendentals", George B.Thomas, Jr. , Twelfth Edition, Addison-Wesley, 2010	Yes
Recommended Texts	"Mathematical Methods in Chemical Engineering", Jenson. V.J. and Jeffereys, G.V, 2nd Edition, Academic Press New York, 1977 Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition, 2007.	Yes

GRADING SCHEME
مخطط الدرجات

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

(0 – 49)	**F** – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	**Chemical Eng. Principles III**		**Module Delivery**
Module Type	**Core**		**Theory** **Lecture** **Tutorial**
Module Code	**CHEP222**		
ECTS Credits	**6**		
SWL (hr/sem)	**150**		
Module Level	UGx1	**Semester of Delivery**	2
Administering Department	CES.PE	**College**	CES
Module Leader	Prof.Dr Amer Aziz	**e-mail**	Amer.a.Abdulrahman@uotechnology.edu.iq
Module Leader's Acad. Title	Asst. Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name	Prof.Dr	**e-mail**	Jamal.manaa@uoturath.edu.iq

	Jamal.M.Ali		
Review Committee Approval		**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CHEP212	**Semester**	1
Co-requisites module	**NONE**	**Semester**	
Module Aims, Learning Outcomes and Indicative Contents			
Module Aims أهداف المادة الدراسية	1.Acquire skills in quantitative problem solving, specifically the ability to think quantitatively (including numbers and units), the ability to translate words into diagrams and mathematical expressions, the ability to use common sense to interpret vague and ambiguous language in problem statements, the ability to make judicious use of approximations and reasonable assumptions to simplify problems 2. Understand processes typical of those found in the chemical and bio process industries 3. Know general principles used in process engineering, particularly stoichiometry, material and energy balances, gas laws, and phase equilibria		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the concepts of dimensions, units, psychrometry, steam properties, and conservation of mass and energy 2. Solve steady-state and transient mass and energy balance problems involving multiple-unit processes and recycle, bypass, and purge streams **3.** Solve and understand simple unsteady-state mass and energy balances 4. Present the solutions to engineering problems in both oral and written form in a clear and concise manner		
Indicative Contents المحتويات الإرشادية	Define or explain energy, system, closed system, non-flow system, open system, flow system, surroundings, property, extensive property, intensive property, initial state, final state, state variable, cyclical process, and path function. a graph of a function. [2 hrs.] Heat, work, kinetic energy, potential energy, internal energy, flow energy, enthalpy, [4 hrs.] Steam Turbine, Compressors, Heaters and Coolers. [2hrs] Mechanical Energy Balance. [2hrs] [2hrs.] Bernoulli's Equation. Enthalpy Calculations Enthalpy Change as a Result of Temperature [2hrs.] Constant Heat Capacity [2hrs.] Enthalpy Calculations with Phase Changes Energy Balance for Open Systems with Multiple [4hrs.] Inputs and Multiple Outputs Material Balances and Energy Balances for chemical reaction including		

	[25hrs.] Conversion, Yield, Extent of Reaction (ξ),

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 type of simple problems and design involving activities that are interesting to the students.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	102	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Energy Balance for a Closed System Kinetic Energy Potential Energy
Week 2	Energy Balance for an Open System Steam Turbine Heaters and Coolers
Week 3	Compressors Mechanical Energy Balance Bernoulli's Equation

Week 4,5	Enthalpy Calculations Enthalpy Change as a Result of Temperature Constant Heat Capacity
Week 6	Enthalpy Calculations with Phase Changes Energy Balance for Open Systems with Multiple Inputs and Multiple Outputs
Week 7	Heat of Reaction Heats of Formation and Heat of Combustion Extent of Reaction
Week 8-9	Reactions in Closed Processes Energy Balance for Reactive Processes Heat of Reaction Method
Week 10	Element Balance Method
Week 11	Simultaneous Material and Energy Balances
Week 12	Heat Capacity, Sensible & latent heat principles
Week 13	Heat effects of industrial reactions
Week 15	Enthalpy Change because of Mixing
Week 15	Implementing Recycle on the Separation Process
Week 16	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	D.M.Himmelblau and J.B. Riggs, Basic Principles and Calculations in Chemical Engineering, 7th Edition, 2004.	Yes
Recommended Texts	Nayef Ghasem and Redhouane Henda, Principles of Chemical Engineering Processes, Material And Energy Balances, Second Edition, 2015.	Yes
Websites		

GRADING SCHEME
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition

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

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Fluid Flow II	**Module Delivery**
Module Type	Core	Theory Lecture Tutorial LAB
Module Code	FLFL223	
ECTS Credits	6	

SWL (hr/sem)	150				
Module Level	UG		**Semester of Delivery**	2	
Administering Department	CES.PR	**College**	CES		
Module Leader	Dr. Haider Ala'a	**e-mail**	hayder.alhameedi@qu.edu.iq		
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.		
Module Tutor		**e-mail**			
Peer Reviewer Name	Dr.Shakir mahmood	**e-mail**	Shakir.mahmood.a @uoturath.edu.iq		
Review Committee Approval	01/06/2024	**Version Number**	1.0		

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	FLFL213	**Semester**	1
Co-requisites module	None	**Semester**	

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

Module Aims أهداف المادة الدراسية	1. Define the operation principles of the different types flow measurement, solve problems in fluid flow through flow measurement devices with applications for steady and unsteady flow. 2. Demonstrate knowledge of compressible fluid flows, with differences of equations using depending on compressible flow conditions, sonic, sub, super, sonic flow, conversion-diversion nozzle, types of gas pumping devices. 3. Provide the ability to estimate the energy (power) consumption for liquid mixing equipment and to design it by predict necessary fluid parameters of full scale projects by performing simple model experiments. 4. Provide the ability to estimate the terminal falling velocity and description drag coefficient for flow through packed columns and pressure drop calculation for fixed and fluidized beds and transport of particles... 5. Predict necessary fluid parameters of full scale projects by performing simple model experiments 6. Share ideas and work in a team in an efficient and effective manner under controlled supervision or independently.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowledge of fundamental concepts in fluid flow measurements, types of fluid flow measurements for closed and open channel. 2. Ability to apply mass, energy, and momentum balances to compressible fluid flow problems, power pumping calculations, fluid flow in pipes at Isothermal, adiabatic conditions, and flow through conversion diversion nozzle. 3. Understand applications of fundamental fluid flow in rotational system with liquids mixing applications. 4. Ability to estimate particle settling velocity in all Reynolds number ranges both analytically and numerically. 5. Ability to analyze fluid flow packed and fluidized beds.
Indicative Contents المحتويات الإرشادية	FLUID FLOW MEASUREMENT [13 hr] Define the fluid flow measurements methods and devices and their principles.

	Apply the fundamental aspects of flow measurement in closed and open channels. Special flow meters. COMPRESSIBLE FLUID FLOW [10 hr] Define the compressible fluid flow, Mach Number and general equation of energy for compressible fluid flow. Conversion-diversion nozzle, Compressors. MIXING OF LIQUIDS [10 hr] Define the mixing of liquids and types of mixing systems, design of mixing system with applications. Fundamental concepts to advance topics in rotational fluid. FLUID FLOW IN BACKED AND FLUIDIZED BEDS [12 hr] Define the fluid flow through packed bed and fluidization types, drive the minimum velocity and porosity for fluidization, pressure drop calculation for fluid flow through fixed and fluidized bed and transportation of particles with applications.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises electronic (weekly) and paper (monthly) forms, while at the same time refining and expanding their critical thinking skills. This will be achieved through a homework, classes, interactive tutorials and by considering type of simple problems and design involving activities that are interesting to the students. The lectures are given in terms of questionable manner and answers are shared among the students.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20%(10)	4, 11	and 61LO #
	Online HW.	5	5%	Continuous	and 61LO #
	Onsite HW.	5	5%	Continuous	and 61LO #
	LAB	1	10%	Continuous	LO # 1, 3
Summative assessment	**Midterm Exam**	2hr	10%	8	and 61LO #
	Final Exam	3 hr	50%	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Define the fluid flow measurements methods and devices and their principles and applications

Week 2	Derive of local velocity equation of Pitot tube and flow rate in Venturi meter with applications
Week 3	Derive of flow rate in orifice meter, nozzle, Rotameter with applications.
Week 4	Define weirs and weirs types, derive of flow rate in weirs with applications. Special flow meters.
Week 5	Define the compressible fluids, derive of velocity of propagation of pressure wave, Mach Number and general equation of energy for compressible fluid flow.
Week 6	Derive the energy equation for compressible fluid flow at isothermal conditions and equation of maximum flow and equation of critical pressure with applications.
Week 7	Derive the energy equation for compressible fluid flow at adiabatic conditions and equation of maximum flow and equation of critical pressure with applications.
Week 8	Derive the equation of velocity and flow and area of flow through conversion /diversion (Laval) nozzle with describe the flow at sonic and supersonic velocity through Laval nozzle with applications.
Week 9	Define the gas pumping devices (fans, blowers, compressors), ideal and real gas compression cycle, clearance and swept volume with applications.
Week 10	Drive the equation of work done for compression in single stage and multi-stages for ideal and real compression cycles with applications.
Week 11	Define the mixing of liquids and types of mixing equipment, design of standard mixing system with applications.
Week 12	Define the forces arise in mixing process and dimensionless numbers and power consumption calculation and power curves with application. Equation of motion for rotational flow. Scale-up
Week 13	Define the packing types and packed columns, derive the terminal falling velocity, drug coefficient with applications
Week 14	Darcy law and permeability, pressure drop equations and Ergun equation with applications
Week 15	Define fluidization, types, drive the minimum velocity and porosity for fluidization, pressure drop calculation and transportation of particles with applications.
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي العملي (المختبر)

	Material Covered
Week 1	Lab. 1: Flow through a Venturi Meter
Week 2	Report discussion and assessment
Week 3	Lab. 2: Discharge Through an Orifice
Week 4	Report discussion and assessment
Week 5	Lab. 3: Open Channel Flow Over Weir
Week 6	Report discussion and assessment
Week 7	Lab. 4: Open Channel Flow Over Weir
Week 8	Report discussion and assessment
Week 9	Lab. 5: Forced Vortex
Week 10	Report discussion and assessment
Week 11	Lab. 6: Fluidization
Week 12	Report discussion and assessment
Week 13	Report discussion and assessment
Week 14	Compensation for just one experience
Week 15	Final Lab Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Coulson, J.M and Richardson J.F. "Chemical Engineering, volume 1 and volume 2", Fifth edition 2002, Elsevier Science, Linacre House, Jordan Hill, Oxford.	Yes
Recommended Texts	F.A. Holland and R. Bragg "Fluid Flow for Chemical Engineers", 2nd Ed. (1995) Elisevier Ltd.	Yes
Websites		

GRADING SCHEME
مخطط الدرجات

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

Note:

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information

Module Title	Computer Programming	**Module Delivery**

Module Type	Core	**Theory** **Lecture** **Lab**	
Module Code	COPR224		
ECTS Credits	5		
SWL (hr/sem)	125		

Module Level	U	**Semester of Delivery**	2
Administering Department	CES.PR	**College**	CES
Module Leader	Asst.Lec Marwa Hamza	**e-mail**	ams.marwamaram@yahoo.com
Module Leader's Acad. Title	Asst .lec	**Module Leader's Qualification**	M.sc
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	None
Review Committee Approval	01/06/2024	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

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

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

Module Aims أهداف المادة الدراسية	To introduce chemical engineering students to modern calculating tools used in the practice of engineering to: 1. Develop problem-solving skills through algorithmic thinking and problem decomposition 2. Apply programming concepts to solve real-world problems and implement solutions efficiently.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module students should be able to: 1. Use Matlab to import data and create 2D and 3D plots. 2. Perform vector and matrix operations and use them to solve mathematical equations. 3. Solve engineering problems using for and while loops, if and if else statements. 4. Apply the most basic numerical methods to solve chemical engineering problems.
Indicative Contents المحتويات الإرشادية	**(2 h) Introduction to MATLAB** 1. **Starting MATLAB** o MATLAB windows o Menus and the toolbar o Working in the command window 2. **Basic Operations** o Arithmetic operations with scalars o Useful commands o Script files and the Editor Debugger **Symbolic Math (2h)** 1. **Symbolic Objects and Expressions**

- Creating symbolic objects

2. **Calculus**
   - Representing a function
   - Solving algebraic equations
   - Differentiation
   - Integration
   - Limits

One-dimensional Arrays (Vectors) (2h)

1. **Array Operations**
   - The transpose operator
   - Array addressing
   - Using a colon in addressing arrays
   - Adding and deleting elements
   - Built-in functions for handling arrays

Strings and String Variables
Two-dimensional Arrays (Matrices) (2h)

1. **Matrix Operations**
   - The transpose operator
   - Array addressing
   - Using a colon in addressing arrays
   - Adding and deleting elements
   - Built-in functions for handling arrays
   - Strings and strings as variables

Solving Simultaneous Algebraic Equations (2h)
Mathematics with Arrays

1. **Array Operations**
   - Addition and subtraction
   - Array multiplication and division
   - Element-by-element operations
   - Using arrays in MATLAB built-in math functions
   - Built-in functions for analyzing arrays
   - Generation of random numbers
   - Solving algebraic equations

2. Matrix Algebra (2h)

- Introduction
- Solving Linear Equations Using Matrix Algebra
- Exercises

Polynomials (2h)

1. **Curve Fitting and Interpolation**
   - Interpolation
   - Polynomials
   - Polynomial Interpolation

Condition and Loop Structures (2h)

1. **Relational and Logical Operators**
   - if-elseif-end
   - Relational operators (<, >, >=, <=, ==, ~=)
2. **Loops**

- For-end
- While-end
- Using loops for solving iterative equations

Two-dimensional Plots (2h)

1. **Basic Plotting**
   - The plot commands
   - Using the plot command
   - Line styles, markers, and colors
   - Adding grids, labels, text, or a legend
   - Customizing axes
   - The fplot command
   - Plotting multiple graphs in the same plot
   - Multiple figure windows
   - Formatting a plot
2. **Specialized 2-D Plotting Functions (2h)**
   - Plots with special graphics

Manipulating Plots and Sub-plotting
Three-dimensional Plots (2h)

1. **3-D Plot Commands**
   - plot3 command
   - mesh command
   - surf command
   - cylinder command
   - sphere command
2. **Engineering Examples**

Midterm Exam (2h)
Functions (2h)

1. **Creating and Using Functions**
   - Creating a local function file
   - Local and global variables
   - Saving a local function file
   - Examples of simple user-defined functions
   - Anonymous Functions
   - Function Handle

Numerical Analysis and Differential Equations(2h)

1. **Introduction and Initial Value Problems**
   - Numerical solution of differential equations
   - Euler's method
   - Error types
   - Exercises and examples

Solving Ordinary Differential Equations (ODEs)(2h)

2. **Higher Order ODEs**
   - Runge-Kutta method
   - Integration of two or more coupled first-order ODEs
   - MATLAB built-in routines for solving ODEs
   - ode45 using local function
   - ode45 using local function as Anonymous function after main program
   - ode45 using Anonymous function with ode45 in one main program

	○ Solving higher order ODEs using ODE45 ○ Solving non-linear equations using MATLAB's built-in function: (fsolve)

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Incorporate interactive lectures where students can engage with the material through discussions, demonstrations, and real-world examples. Use multimedia presentations to illustrate programming concepts and demonstrate their application in chemical engineering. Problem-Based Learning: Present students with real-world engineering problems that can be solved using programming. Encouraging students to work collaboratively in small groups to analyze the problem, develop algorithms, and implement solutions using computational tools. This approach helps students develop problem-solving skills and apply programming concepts in context.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	***Introduction to MATLAB*** • Starting MATLAB, MATLAB windows • Menus and the toolbar • Working in the command window • Arithmetic operations with scalars • Useful commands for managing variables • Script files and the Editor Debugger
Week 2	***Symbolic Math*** • Symbolic objects, and symbolic expressions • Calculus

	• Representing a function • Solving algebraic equations • Differentiation • Integration • Limits Solving an ordinary differential equation
Week 3	***One-dimensional array (vector)*** • The transpose operator • Array addressing • Using a colon: in addressing arrays • Adding elements to existing variables • Deleting elements • Built-in functions for handling arrays Strings and strings as variables
Week 4	***Two-dimensional array (matrix)*** • The transpose operator • Using a colon: in addressing arrays • Adding elements to existing variables • Deleting elements • Built-in functions for handling arrays • Strings and strings as variables • Solving simultaneous algebraic
Week 5	***Mathematics with arrays*** • Addition and subtraction • Array multiplication • Array division • Element-by-element operations • Using arrays in MATLAB built-in math functions • Built-in functions for analyzing arrays • Generation of random numbers • Solving Algebraic Equations • Matrix Algebra • Solving Linear Equations Using Matrix Algebra
Week 6	***Polynomials*** • Curve fitting • Interpolation • Polynomials • Polynomial Interpolation
Week 7	***Condition and Loop*** Relational and logical operators • if-elseif-end • < less than • > =greater than or equal • greater than • = = equal • < =less than or equal not equal =~ Loops • For-end • While-end Using Loops for solving iterative equations
Week 8	***Two-dimensional plot 1*** • The plot command • Using the plot Command • Line styles, Markers, and Colors • Adding Grids, Labels, Text, or a Legend • Customizing Axes • The fplot command

	• Plotting multiple graphs in the same plot • Multiple figure windows Formatting a plot
Week 9	***Two-dimensional plot 2*** Specialized 2-D plotting functions: • Plots with special graphics • Manipulating Plots and Sub-plotting
Week 10	***Three dimensional plot*** • plot3 command • mesh command • surf command • cylinder command • sphere command • Engineering examples on three dimensional plot
Week 11	**Midterm Exam**
Week 12	***Functions*** • Creating a function file • Local and global variables • Saving a function file • Examples of simple user-defined functions • Anonymous Functions • Function Handle
Week 13	***Introduction to Numerical analysis and Differential Equations of initial value problem 1*** • Numerical Solution of Differential Equations • Euler's Method • Error Types • Exercise and examples
Week 14	***differential equations of initial value problem & Higher order ode's*** • Runge-Kutta Method • Integration two or more coupled first-order ODE's • MATLAB Built-In Routines for solving ODES • ode45 using local function • ode45 using local function as Anonymous function after main program • ode45 using Anonymous function with ode45 in one main program • Solving higher order ODEs using ODE45 • Solve Non-Linear Equation using MATLABs built-in function: (fsolve) • Exercise and examples
Week 15	**Review Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Starting MATLAB, MATLAB windows, Menus and the toolbar, Working in the command window, Arithmetic operations with scalars, Useful commands for managing variables, Script files and the Editor Debugger.
Week 2	Lab 2: Symbolic objects, and symbolic expressions, Calculus, Representing a function, Solving algebraic equations, Differentiation, Integration, Limits, Solving an ordinary differential equation
Week 3	Lab 3: The transpose operator, Array Addressing, Using a colon: in addressing arrays, Adding elements to existing variables, Deleting elements, Built-in functions for handling arrays, Strings and strings as variables.
Week 4	Lab 4: The transpose operator , Array addressing ,Using a colon: in addressing arrays ,Adding elements to existing variables ,Deleting elements ,Built-in functions for handling arrays ,Strings and strings as variables, Solving simultaneous algebraic, Addition and subtraction, Array multiplication, Array division, Element-by-

	element operations, Using arrays in MATLAB built-in math functions.
Week 5	Lab 5: Matrix Algebra, Solving Linear Equations Using Matrix Algebra
Week 6	Lab 6: Curve fitting, Interpolation, Polynomials, Polynomial Interpolation.
Week 7	Lab 7: if-elseif-end, < less than, >= greater than or equal ,greater than , = = equal ,<= less than or equal, ~= not equal, For-end , Using Loops for solving iterative equations
Week 8	Lab 8: While-end, Using Loops for solving iterative equations.
Week 9	Lab 9: Creating a function file, Local and global variables, Saving a function file, Examples of simple user-defined functions, Anonymous function, handle function.
Week 10	Lab 10: The plot command ,Using the plot Command, Line styles, Markers, and Colors, Adding Grids, Labels, Text, or a Legend, Customizing Axes, the fplot command, Plotting multiple graphs in the same plot, Multiple figure windows ,Formatting a plot, Plots with special graphics ,Histograms Sub-plotting.
Week 11	Lab 11: Engineering examples on three dimensional plot.
Week 12	Lab 12: Numerical solution of algebraic equations, Numerical solution of multi simultaneous differential equations, Euler method Example, Runge-Kutta method Example.
Week 13	Lab 13: Numerical solution of higher order ordinary differential equation, use ODE45, Examples.
Week 14	Lab14: Nonlinear equation solve using fsolve command.
Week 15	Lab 15: final laboratory Exam.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. Chapra, Steven C. Applied numerical methods with MATLAB for engineers and scientists. Mcgraw-hill, 2018. 2. Yeo, Yeong Koo. Chemical engineering computation with MATLAB®. CRC (ebook)http://www.taylorandfrancis.comPress, 2020. 3. Schilling.Kattan, Peter. Matlab for beginners. Vol. 1. Petra books, 2022.	No Electronic file only
Recommended Texts	1. Otto, Stephen Robert, and James P. Denier. An introduction to programming and numerical methods in MATLAB. Springer Science & Business Media, 2005. 2. Yang, Won Y., et al. Applied numerical methods using MATLAB. John Wiley & Sons, 2020.	No
Websites	https://www.mathworks.com/	

APPENDIX:

GRADING SCHEME
مخطط الدرجات

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

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

Note:

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Turath University
Petroleum and Gas Refining Engineering

MODULE DESCRIPTOR FORM **(Bologna)**

Module Information
معلومات المادة الدراسية

Module Title	Corrosion Engineering in Petroleum Refinery	**Module Delivery**	
Module Type	Core	**Theory** **Lecture** **Tutorial** **Seminar**	
Module Code	CEPR225		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	UG	**Semester of Delivery**	2
Administering Department	CES.PR	**College**	CES
Module Leader	Asst.Lec Marwa Hamza	**e-mail**	ams.marwamaram@yahoo.com
Module Leader's Acad. Title	Asst. Lec	**Module Leader's Qualification**	M.Sc.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr .Shakir Mahmood	**e-mail**	Shakir.mahmood.a @uoturath.edu.iq
Review Committee Approval	26/05/2024	**Version**	1.0

		Number	

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	MAEN216	**Semester**	1
Co-requisites module	None	**Semester**	

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

Module Aims أهداف المادة الدراسية	1. Understanding the concept of corrosion. The form of corrosion, How the material destroyed by corrosion. 2. Determine the corrosion rates and electrochemical behavior of the metals and the thermodynamics of corrosion reactions. 3. Applying the corrosion prevention technology. 4. Selection of materials involved in applying the corrosion prevention technology.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	8. Develop a deep understanding of issues related to the corrosion science and electrochemistry. 9. Ability to predict the form of corrosion. 10. Ability to apply corrosion prevention. 11. Analyze and interpret the data from electrochemical behavior of the metal to determine the corrosion rate 12. Ability to relate the different methods of corrosion rate prediction to each other. 13. Apply the corrosion reaction to determine other topics relating to chemical engineering such as mass transfer coefficient, thickness of boundary layer …..etc..
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Introduction:** •Definitions• Why metals corrode• Basic concepts on corrosion• Corrosive environment• Consequences of corrosion• Anodic and Cathodic reactions• Types of cells• Cost of corrosion. **(3hr)** **Classification of corrosion:** • Wet corrosion • Dry corrosion • Forms of corrosion. **(3hr)** **Kinetics of aqueous corrosion:** •Faraday's laws of electrolysis and its application in determining the corrosion rate• reversibility and exchange current density. (3hr) **Kinetics of aqueous corrosion:** •Polarization• Activation polarization• Concentration polarization• Resistance Polarization• Combined polarization. (3hr) **Theoretical application of corrosion:** •Free energy• Cell potential• Reversible electrode potential• Nernst equation. **(3hr)** **Determining the corrosion rate:** • Corrosion rate measurement units • methods determining corrosion rate: 1. Immersion test 2. Electrochemical technique: a) Tafel extrapolation b) Linear polarization. **(3hr)** **Passivity:** • Active passive metal and conditions for passivity• Kinetics of passivity table passivity• Unstable Passivity **(3hr)** **Reference electrodes:** Hydrogen electrode •Ag/AgCl electrode• $Zn/ZnCl_2$ electrode• $Pb/PbCl_2$ electrode. (3hr) **Corrosion Prevention and Control:** Materials selection• Alteration of Environment• Design, Coatings. **(3hr)** **Corrosion Prevention and Control:**

	Chemical Protection Inhibitors• Types of Corrosion Inhibitors. **(3hr)** **Cathodic Protection:** Sacrificial anode corrosion protection• Galvanic systems anode• Design parameters in cathodic protection. (3hr) **Cathodic Protection:** Impressed current anode corrosion protection• Stray current corrosion• Major impressed current anodes. (3hr) **Effect of Environmental Parameters on Corrosion:** Effect of temperature• Effect of dissolved oxygen and oxidizers• Effect of velocity• Effect of acid concentration. (3hr) **Corrosion Petroleum Industries:** Sour Corrosion• Corrosion types due to acidic or sour gases• Corrosion by H_2S• Corrosion CO_2• Corrosion by combined effect of H_2S and CO_2. (3hr) **Preparatory Week:** (3hr) **Final Exam:** (3hr)

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (5)	3,8	1, 3,6
	Online Assignments	2	)48% (	Continues	1-6
	Onst Assignments	3	)412% (	Continues	1-6
	Seminar	1	5% (5)	13	1-6
Summative assessment	**Midterm Exam**	2hr	10% (10)	4,10	1-5
	Final Exam	3hr	50% (50)	16	1-6
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction** Definitions, Why metals corrode, Basic concepts on corrosion, Corrosive environment, Consequences of corrosion, Anodic and Cathodic reactions, Types of cells, Cost of corrosion.
Week 2	**Classification of corrosion** Wet corrosion, Dry corrosion, Forms of corrosion.
Week 3	**Kinetics of aqueous corrosion** Faraday's laws of electrolysis and its application in determining the corrosion rate, reversibility and exchange current density.
Week 4	**Kinetics of aqueous corrosion** Polarization, Activation polarization, Concentration polarization, Resistance Polarization, Combined polarization.
Week 5	**Theoretical application of corrosion** Free energy, Cell potential, Reversible electrode potential, Nernst equation.
Week 6	**Determining the corrosion rate** Corrosion rate measurement units, methods determining corrosion rate: 1- Immersion test 2- Electrochemical technique a) Tafel extrapolation b) Linear polarization
Week 7	**Passivity** Active passive metal and conditions for passivity, Kinetics of passivity stable passivity, Unstable Passivity.
Week 8	**Reference electrodes** Hydrogen electrode, Ag/AgCl electrode, $Zn/ZnCl_2$ electrode, $Pb/PbCl_2$ electrode.
Week 9	**Corrosion Prevention and Control** Materials selection, Alteration of Environment, Design, Coatings.
Week 10	**Corrosion Prevention and Control** Chemical Protection Inhibitors, Types of Corrosion Inhibitors.
Week 11	**Cathodic Protection** Sacrificial anode corrosion protection, Galvanic systems anode, Design parameters in cathodic protection.
Week 12	**Cathodic Protection** Impressed current anode corrosion protection, Stray current corrosion, Major impressed current anodes.
Week 13	**Effect of Environmental Parameters on Corrosion** Effect of temperature, Effect of dissolved oxygen and oxidizers, Effect of velocity, Effect of acid concentration.
Week 14	**Corrosion Petroleum Industries** Sour Corrosion, Corrosion types due to acidic or sour gases, Corrosion by H_2S, Corrosion CO_2, Corrosion by combined effect of H_2S and CO_2.
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1- Herbert H. Uhlig, "Corrosion and Corrosion Control" John WILEY, 2008. 2- Fontana, M.G and Greene, N.D, "Corrosion Engineering", 3rd Edition, McGraw-HILL, 1986.	yes

Recommended Texts	3- Zaki Ahmed, "Principle of Corrosion Engineering and Corrosion Control", 1st Edition, IChemE, ELSEVIER, 2006. 4- Nestor Perez," Electrochemistry and Corrosion Science", 1st Edition, KLUWER ACADEMIC PUBLISHERS, 2004	No

GRADING SCHEME
مخطط الدرجات

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

Note:

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Al-Turath
Petroleum Refining and Gas Engineering Department

MODULE DESCRIPTOR FORM

Module Information
معلومات المادة الدراسية

Module Title	Thermodynamics I	**Module Delivery**
Module Type	**Core**	**Theory**

Module Code	THER311	**Lecture** **Tutorial**	
ECTS Credits	**5**		
SWL (hr/sem)	125		

Module Level	U(	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Dr. AbdulMonem A. Karim	**e-mail**	Abdulmonem.a.karim@uotechnology.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Dr. AbdulMonem A. Karim	**e-mail**	Abdulmonem.a.karim@uotechnology.edu.iq
Peer Reviewer Name	Dr. AbdulMonem A. Karim	**e-mail**	Abdulmonem.a.karim@uotechnology.edu.iq
Review Committee Approval	01/06/2025	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Chemical Eng. Principles III	**Semester**	2
Co-requisites module	None	**Semester**	

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

Module Aims أهداف المادة الدراسية	15. To familiarize the students with basic concepts of the first and second laws of thermodynamics and their applications in engineering problems. 16. Develop a practical ability to solve Chemical Engineering Principle II problems, minimum work. 17. Students will demonstrate basic understanding of basics and definitions of thermodynamics and properties of pure substances. 18. Describe the reversible and irreversible processes (macroscopic description of ideal and real processes).
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	13. Students will be able to apply thermodynamic laws to variety of engineering problems. 14. By examining ideal gas and true gas behavior, students will be able to establish pressure, volume, and temperature relationships for pure substances and mixtures. 15. Students will be able to compute heat requirements for a process with specified chemical reactions and specified inlet and outlet temperatures. 16. Students will be able to comprehend the existence of entropy as a state function, related to observable properties of a system and compute ideal work, lost work, and thermodynamic efficiencies of processes. 17. Students will be able to calculate the heat and work requirements of chemical processes. 18. Students will be able to apply the second and third laws of thermodynamics to various engineering problems 19. Students will be able to conduct a thermodynamic analysis of heat-generating systems by examining the relationship between work and heat.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following: **1. Introduction**: Basic definitions, work, energy, heat, types of systems, extensive and intensive properties, thermodynamic processes, zero law of thermodynamics, 1st law of thermodynamic, energy balance for open and close system. (**3 hrs**) **2. Volumetric Properties of Pure Fluids**: Review on virile equation of state, cubic equation of state, generalized correlations for gases and for liquids. (**9 hrs**) **3. Heat Effects**: Heat capacity calculations, sensible heat, latent heat, standard heat of reaction, heat effect of industrial reactions. (**6 hrs**) **4. The 2nd Law of Thermodynamics:** Review on the 2nd law and Carnot heat engine, entropy balance for open system, calculation of ideal work, lost work. (**9 hrs**) **5. Thermodynamic Properties of Fluids**: Review on the property relations (ΔH, ΔS, ΔU and ΔG); residual properties, two phase systems, thermodynamic diagrams and tables, generalized property correlations for gases.(**9 hrs**) **20. Applications of Thermodynamics to Flow Processes**: Duct flow of compressible fluids, Pipe flow, Nozzles, Throttling process, Turbines, Compression processes compressors, Ejectors; The steam power plant, Carnot cycle, Rankin cycle, the regenerative cycle. (**9 hrs**)

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive and tutorials.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15 % (5)	4,8,12	LO #1,2, 3, 4 ,5 and 6
	Onset	3	12 % (4)	Continuous	

	Assignments				
	Online Assignments	2	8 % (4)		
	Report	1	5 % (5)	14	LO # 7
Summative assessment	**Midterm Exam**	2hr	10 % (10)	10	LO # 1,2, 3, and 4
	Final Exam	3hr	50 % (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction**: Basic definitions, work, energy, heat, types of systems, extensive and intensive properties, thermodynamic processes, zero law of thermodynamics, 1st law of thermodynamic, energy balance for open and close system.
Week 2	**Volumetric Properties of Pure Fluids**: Review on virile equation of state.
Week 3	Cubic Equations of State.
Week 4	Generalized Correlations for Gases and for Liquids.
Week 5	**Heat Effects**: heat capacity calculations, sensible heat, latent heat.
Week 6	Standard Heat of Reaction, Heat Effects of Industrial Reactions.
Week 7	**The 2nd Law of Thermodynamics:** Review on the 2nd law and Carnot heat engine.
Week 8	Entropy Balance for Open System.
Week 9	Calculation of Ideal work, Lost work.
Week 10	**Thermodynamic Properties of Fluids**: Review on the property relations (ΔH, ΔS, ΔU and ΔG).
Week 11	Residual Properties, two phase systems, thermodynamic diagrams and tables.
Week 12	Generalized Property Correlations for Gases.
Week 13	**Applications of Thermodynamics to Flow Processes**: Duct flow of compressible fluids, pipe flow.
Week 14	Nozzles, Throttling process, Turbines, Compression processes, Compressors, Ejectors.
Week 15	The steam power plant, Carnot cycle, Rankin cycle, the regenerative cycle.
Week 16	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	J. M. Smith, H. C. Van Ness, Introduction to chemical engineering thermodynamics, 8th edition (International Edition), McGraw Hall, 2018.	Yes
Recommended Texts	1. K. V. Narayanan, A textbook of chemical engineering thermodynamics, prentice Hall of India, New Delhi, 2011. 2. B. G. Kyle, Chemical and process thermodynamics, (3rd Edition), prentice Hall Inc. New Jersey, 1984. 3. J. Rayner, Basic engineering thermodynamics in SI units, printed in great Britain,1971.	Yes
Websites		

GRADING SCHEME
مخطط الدرجات

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

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Al-Turath
Petroleum Refining and Gas Engineering Department

MODULE DESCRIPTOR FORM

Module Information

معلومات المادة الدراسية

Module Title	Statistics & Numerical Analysis	**Module Delivery**	
Module Type	Core	**Theory**	
Module Code	STNA312	**Lecture**	
ECTS Credits	5	**Tutorial**	
SWL (hr/sem)	125	**Lab.**	

Module Level	U	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Dr. Salman Hussein Abbas	**e-mail**	Salman.h.ali@uotechnology.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	

Review Committee Approval	1/05/2025	Version Number	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Computer COMP208	**Semester**	4
Co-requisites module		**Semester**	2

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. At the end of the semester the student should be able to:- 2. To apply numerical methods including linear systems analysis , regression, curve fitting, root finding ,optimization, numerical integration, and solution of differential equations. 3. To study numerical analysis methods and their applications in solving chemical engineering problems 4. To solve chemical engineering problems with numerical analysis techniques 5. To learn the basics of MATLAB programing and write simple MATLAB codes 6. To apply the concepts from probability and statics including error propagation, hypothesis testing, and parameter estimation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Students will be informed which problems are used to assess each outcome: 1. An ability to knowledge of mathematics, science , and engineering 2. An ability to identify, formulates, and solves engineering problems. 3. An ability to use techniques, skills, and modern engineering tools necessary for engineering practice.
Indicative Contents المحتويات الإرشادية	**Part One : Numerical Analysis in Chemical Engineering** **1. Introduction to Numerical Analysis:** Numerical Solution, type of errors; relative error, absolute error, percentage error, truncation error, round off error, Floating point.[2 hr] **2. Interpolation and Polynomials Approximation:** • Lagrangian Polynomials (Linear, Quadratic, and General Form). • Newton's Divided differences (Linear, Quadratic, and General Form). • Cubic spline interpolating polynomials.[3hr] **3. Curve Fitting** • Linear regression, Polynomial Models, Nonlinear Data.[2hr] **4. Root Finding:** Roots of polynomials, Bisection method, Secant method, Newton-Raphson method.[3hr] **5. Numerical Differentiation and 6. Numerical Integration**: Forward, backward and central difference approximation. Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules. Double integrals using trapezoidal and Simpson's rules.[6hr] **7. Solving System of Equations**: Solution of linear system of equations by direct methods (Gaussian elimination and Gauss-Jordon). Solution of linear system of equations by Iterative methods (Jacobi and Gauss-Seidel). Solution of non-linear system of equations by Newton-Raphson.[4hr] **8. Solution of Ordinary Differential Equations**: Initial value problems. Solution of first-order ordinary differential equations using Taylor', Eular, Runge-Kutta and Predict or corrector methods. Solution of simultaneous ordinary differential equations.[10 hr] **Part Two : Basic Statistics in Chemical Engineering** **1: The Role of Statistics in Engineering** Sample statistics, mean median, variance, standard deviation, etc.[2 hr] **2: Data Summary and Presentation**

	Histograms, Box plots[2 hr] **3: Probability** Sample spaces, Probability rules, Combinatorial analysis, Conditional probability & independence [4 hr] **4: Discrete Random Variables and Probability Distributions** Discrete random variables, Probability mass functions, Cumulative distribution functions, Mean and variance of a discrete random variable, Uniform, binominal, and Poisson distributions [3 hr] **5: Continuous Random Variables and Probability Distributions** Probability density functions, Mean and variance of a continuous random variable, Uniform and normal distributions, Central Limit Theorem[2 hr] **6: Joint Probability Distributions** Joint and marginal distribution functions, Bivariate normal distribution, Linear combinations of random variables, Error analysis for nonlinear equations[2 hr]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive and tutorials.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (5)	3,5,8,10,13	LO #2, 3, 4 and 5
	Online Assignments	2	10% (5)	Continuous	
	Lab.	1	10%(10)	continuous	LO # 1 and 6
	Onset Assignment	2	10% (5)		
Summative assessment	**Midterm Exam**	2hr	15% (10)		LO # 2, 3, 4 and 5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week	Material Covered	Duration
	Part One : Numerical Analysis in Chemical Engineering	
Week 1	**1. Introduction to Numerical Analysis:**	

	• Numerical Solution, type of errors; relative error, absolute error, percentage error, truncation error, round off error. Floating point.	
Week 2	**2. Interpolation and Polynomials Approximation:** • Lagrangian Polynomials (Linear, Quadratic, and General Form). • Newton's Divided differences (Linear, Quadratic, and General Form). • Cubic spline interpolating polynomials.	
Week 3	**3. Curve Fitting** • Linear regression, Polynomial Models, Nonlinear Data.	
Week 4	**4. Root Finding:** Roots of polynomials, Bisection method, Secant method, Newton- Raphson method.	
Week 5	**5. Numerical Differentiation** Forward, backward and central difference approximation.	
Week 6	6. **Numerical Integration** Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules. Double integrals using trapezoidal and Simpson's rules.	
Week 7	**7. Solving System of Equations:** Solution of linear system of equations by direct methods (Gaussian elimination and Gauss-Jordon). Solution of linear system of equations by Iterative methods (Jacobi and Gauss-Seidel). Solution of non-linear system of equations by Newton-Raphson	
Week 8	**8. Solution of ordinary Differential Equations:** Initial value problems. Solution of first-order ordinary differential equations using Taylor', Eular, Runge-Kutta and Predict or corrector methods. Solution of simultaneous ordinary differential equations	
	Part Two : Basic Statistics in Chemical Engineering	
Week 9	**1: The Role of Statistics in Engineering** Sample statistics, mean median, variance, standard deviation, etc. **2: Data Summary and Presentation** Histograms, Box plots	
Week 10	**3: Probability** Sample spaces, Probability rules, Combinatorial analysis, Conditional probability & independence	
Week 11-12	**4: Discrete Random Variables and Probability Distributions** Discrete random variables, Probability mass functions, Cumulative distribution functions, Mean and variance of a discrete random variable, Uniform, binominal, and Poisson distributions	
Week 13	**5: Continuous Random Variables and Probability Distributions** Probability density functions, Mean and variance of a continuous random variable, Uniform and normal distributions, Central Limit Theorem	
Week 14-15	**6: Joint Probability Distributions** Joint and marginal distribution functions, Bivariate normal distribution, Linear combinations of random variables, Error analysis for nonlinear equations	
	Final Examination	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. "Numerical Methods for Engineers", Steven C. Chapra, Raymond P. Canale, McGraw Hill, 6th edition, 2010. 2. "Numerical Methods for Engineers and Scientists", Joe Hoffman, McGraw-Hill Book Company,1993. 3. "Applied Numerical Analysis", Gerald,C.F. and Wheatley, P.O., 6th Edition, Pearson Education, 2006. 4. Introduction to probability and statistics: Principles and applications for engineering and computing sciences, Milton and Arnold, 4th ed., McGraw – Hill (2002).	Yes

Recommended Texts	1. “Numerical Methods for Chemical Engineers with MATLAB Applications”, Alkis Constantinides, Navid Mostoufi, Prentice Hall, 1999.	Yes
Websites		

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

NB 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.

Topics Covered (Syllabus)/ Numerical Analysis Laboratory Guide

No.	Contents
1	Review of properties of Matlab programming language
2	Bisection method and Secant method.
3	Newton-Raphson method.
4	Lagrange interpolation.
5	Newton’s forward and backward difference formulas.
6	Trapezoidal rule.
7	Simpson’s 1/3 and 3/8 rules.
8	Solution of linear system of equations by direct methods (Gaussian elimination and Gauss-Jordon).
9	Solution of linear system of equations by Iterative methods (Gauss-Seidel and Jacobi).
10	Solution of differential equation using Euler’s method.
11	Solution of differential equation using Runge-Kutta method.
12	Solution of partial differential equations using explicit and implicit methods.
13	Solution of partial differential equations using Crank-Nicolson method.
14	Solution of steady state diffusion through catalyst
15	Solution of un-steady state diffusion through catalyst

	Ministry of Higher Education and Scientific Research - Iraq University of Al-Turath Petroleum Refining and Gas Engineering Department	

MODULE DESCRIPTOR FORM

Module Information

معلومات المادة الدراسية

Module Title	Mass Transfer		**Module Delivery**
Module Type	Core		**Theory** **Lecture** **Tutorial**
Module Code	MATR313		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	U	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Dr. Amer A. Abdulrahman	**e-mail**	amer.a.abdulrahman@uotechnology.edu.iq
Module Leader's Acad. Title	Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Dr. Amer A. Abdulrahman	**e-mail**	amer.a.abdulrahman@uotechnology.edu.iq
Peer Reviewer Name	Dr. Amer A. Abdulrahman	**e-mail**	amer.a.abdulrahman@uotechnology.edu.iq
Review Committee Approval	08/07/2024	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	FLFL223	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. Ability to Understand the steady state ordinary molecular diffusion and ability to derive the Fick,s law.

	2. Understand the Characterization of the process for Equimolar counter diffusion. 3. determine the time required to drop level in vessel. 4. Ability to estimate the diffusion coefficients. 5. Understand the basic principle for the Maxwell,s law of diffusion for binary and multi-component systems. 6. Understand the mass transfer models for fluid-fluid interface (phase boundary). 7. Ability to estimate the rate of diffusion and diffusivities in liquid and solid phase. 8. Ability to derive the rate of convection mass transfer for binary gas mixture. 9. Understand and analyze the empirical correlations to determine the mass transfer coefficient. 10. Understand the mass transfer models (Two film theory). 11. Pentration theory) (gas-liquid case).
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the basic information, concepts and terminology of the general principles of diffusion processes of gas-liquid-solid diffusion. 2. Gain and/or improve their ability to synthesize, integrate and utilize process information in solving separations and analogy problems. 3. An ability to apply effective solutions, both independently and Cooperatively for problems in separation processes 4. Demonstrating a broad and integrated knowledge and a deep 5. understanding of issues related to separation processes in a chemical process and important role it plays in the success of the process both economically and environmentally. 6. Use engineering and measuring equipment to provide data in support of theoretical understanding. 7. Ability to design separation system for the effective solution of intended problem.
Indicative Contents المحتويات الإرشادية	INTRODUCTION [6 hr] Fundamentals of mass transfer processes, concentrations, velocities, mass & molar fluxes. DIFFUSION IN BINARY GASEOUS [15 hr] Fick's first law of diffusion. Diffusion in gas mixtures, Equimolecular diffusion, diffusion in stationary layer. Correlations to calculate diffusivity, correcting diffusivity. DIFFUSION IN MULTI COMPONENT MIXTURES [6 hr] Multi-component gas phase systems, effective diffusivity. Maxwell's law of diffusion. DIFFUSION IN LIQUIDS, DIFFUSION IN SOLIDS [9 hr] Fick's first law of diffusion. Diffusion in liquid and solid, Equimolecular diffusion, diffusion in stationary layer. Correlations to calculate diffusivity, correcting diffusivity. DIFFUSION THEORIES [6 hr] Diffusion across phase boundary, Film theory, two film theory, Mass transfer coefficients (individual & overall) in laminar and turbulent flow. DIFFUSION RESISTANCES [3 hr] Calculating the resistance to mass transfer in both phases. Calculating intermediate concentrations.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises electronic (weekly) and paper (monthly) forms, while at the same time refining and expanding their critical thinking skills. This will be achieved through a homework, classes, interactive tutorials and by considering type of simple problems and design involving activities that are interesting to the students. The lectures are given in terms of questionable manner and answers are shared among the students.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Online Assignment	2	(5) 10%	Continuous	LO #1 and 2
	Onset Assignment	2	(5) 10%	Continuous	LO #3, 4 and 7
	Quiz	3	(5)15%	Continuous	LO # 6
	Seminar	1	5%	Continuous	LO # 6
Summative assessment	Midterm Exam	2	10%	4, 8, 11	LO #1 and 7
	Final Exam	3 hr	50%	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction, Definition of unit operation, Introduction to diffusion.
Week 2	Steady-state ordinary molecules diffusion.
Week 3	Fick's law of diffusion,
Week 4	Equimolar counter diffusion.
Week 5	Diffusion in conical vessel.
Week 6	Diffusivity in gases and vapours.
Week 7	Maxwell's law of diffusion for binary system.
Week 8	Maxwell,s law of diffusion for multi-component mass transfer.
Week 9	Methods for mass transfer at fluid-fluid interface (phase boundary).
Week 10	Molecular diffusion in liquid phase, Diffusivities in liquids.
Week 11	Diffusion of (A) through multi-component stagnant layer mixture.
Week 12	Molecular diffusion in solid phase.
Week 13	Convection mass transfer for binary gas mixture.
Week 14	Methods to determine the mass transfer coefficient.
Week 15	Film – Pentration theory, Two – film theory (gas-liquid case).
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي العملي (المختبر)

	Material Covered
Week 1	Guidance instructions for students to deal with laboratory and safety equipment.
Week 2	Liquid-Liquid diffusion
Week 3	Report discussion and assessment
Week 4	Absorption
Week 5	Report discussion and assessment

Week 6	Batch Distillation Column
Week 7	Report discussion and assessment
Week 8	Midterm exam
Week 9	Fluid Mechanics of Packed Bed
Week 10	Report discussion and assessment
Week 11	Sieve Analysis
Week 12	Report discussion and assessment
Week 13	Gas Solid Fluidization
Week 14	Report discussion and assessment
Week 15	Final term exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Colulsson ,J.M and Richardson J.F. "Chemical Engineering , volume 1", Fifth edition 2002, Elsevier Science, Linacre House, Jordan Hill, Oxford.	Yes
Recommended Texts	Colulsson ,J.M and Richardson J.F. "Chemical Engineering , volume 2", Fifth edition 2002, Elsevier Science, Linacre House, Jordan Hill, Oxford.	Yes
Websites		

GRADING SCHEME

مخطط الدرجات

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

Note:

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Al-Turath
Petroleum Refining and Gas Engineering Department

MODULE DESCRIPTOR FORM

Module Information
معلومات المادة الدراسية

Module Title	Chemical Reaction Kinetics	**Module Delivery**	
Module Type	**Core**	**Theory** **Lecture** **Tutorial**	
Module Code	CHRK314		
ECTS Credits	**4**		
SWL (hr/sem)	100		
Module Level	U(	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Dr. Farah Talib Al-Sudani	**e-mail**	Farah.t.jasim@uotechnology.edu.iq
Module Leader's Acad. Title	Assistant Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Dr. Farah Talib Al-Sudani	**e-mail**	Farah.t.jasim@uotechnology.edu.iq
Peer Reviewer Name	Dr. Farah Talib Al-Sudani	**e-mail**	Farah.t.jasim@uotechnology.edu.iq
Review Committee Approval	08/07/2024	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Physical Chemistry	**Semester**	1
Co-requisites module	None	**Semester**	

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

Module Aims أهداف المادة الدراسية	1. **Apply core principles of reaction kinetics** to interpret, analyse, and model kinetic data derived from laboratory and industrial-scale chemical processes. 2. **Identify, formulate, and solve engineering problems** related to reaction rate

	expressions, kinetic modelling, and reactor behaviour, particularly in systems governed by homogeneous reaction mechanisms. 3. **Specify, design, and size industrial chemical reactors** (e.g., batch, continuous-stirred tank reactor [CSTR], and plug flow reactor [PFR]) to meet desired production targets and conversion efficiencies, with an ensure efficient, safe, and scalable process operation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this module, students will be able to: 1. **Understand and apply the principles of chemical reaction kinetics**, including rate laws, reaction mechanisms, activation energy, and temperature dependence, to analyze and interpret experimental data for single and multiple reactions. 2. **Design and evaluate ideal isothermal reactors** (Batch, CSTR, and PFR), including configurations in series and parallel, to optimize conversion, yield, and selectivity under specified operating and kinetic constraints. 3. **Incorporate safety and environmental considerations into reactor design**, and effectively communicate technical findings in written and oral forms aligned with industry and academic standards.
Indicative Contents المحتويات الإرشادية	**Introduction to reactor design** [2 hr] - Interpretation of rate data, scale-up, and design - Classification of reactors. - Ensure safety and environmental considerations **Kinetic parameters and rate law** [6 hr] - Definition in terms of reacting compounds and reaction extent; irreversible and reversible reactions, homogeneous catalytic reactions - Symbols and relationships between concentration and conversion - Reaction order and elementary reactions. - Reaction rate constants, Arrhenius equation, Van't Hoff equation - Temperature and pressure effects on reaction rates. - Thermal effects due to heat of reaction **Reactors design and Stoichiometry** [9 hr] - Mole Balances. - Stoichiometry in batch systems - Batch Reactor Design Equations - Stoichiometry in flow systems. - Design of Continuous Stirred-Tank Reactor. - Design of Plug Flow Reactor. **Multiple reactions, yield and selectivity** [6 hr] - Types of multiple reactions. - Definitions of yield and selectivity. - Analysis of parallel, series, consecutive reactions. - Effect of pressure and temperature on multiple reactions **Group Project and Process Justification** [3 hr] - Small group presentations on selected reactor configurations - Justification of reactor choices based on process conditions - Environmental management **Collection and Analysis of rate data** [4 hr] - Differential and integral methods. - Initial rate and half-life methods.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	

Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises electronic (weekly) and paper (monthly) forms, while at the same time refining and expanding their critical thinking skills. This will be achieved through a homework, classes, interactive tutorials and by considering type of simple problems and design involving activities that are interesting to the students. The lectures are given in terms of questionable manner and answers are shared among the students.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**HW**	2	(5)10%	Continuous	All
	presentation	2	(5) 10%	Continuous	All
	Quiz	3	15%	Continuous	All
	Online assessment	2	5%	Continuous	All
Summative assessment	**Midterm Exam**	1	10%	4, 8, 11	All
	Final Exam	3 hr	50%	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to Reactor Design** **L1:** Introduction to chemical reactor design: industrial relevance, reaction systems **:** Interpretation of rate data, importance of scale-up, basic design logic **:** Classification of reactors (Batch, CSTR, PFR). :**Emphasis** Safety and environmental considerations in reactor design
Week 2	**Kinetic Parameters and Rate Law** **L2:** Definitions based on reacting compounds and extent of reaction **:** Irreversible and reversible reactions; overview of catalytic systems **:** Relationships between concentration and conversion
Week 3	**Kinetic Parameters and Rate Law** **L3:** Rate laws and their derivation from stoichiometry **:** Elementary vs. complex reactions, Reaction order, molecularity, and rate expressions
Week 4	**Kinetic Parameters and Rate Law** **L4:** Reaction rate constants, Arrhenius equation, and Van't Hoff equation

	: Effects of temperature and pressure on reaction rates **:** Thermal effects and heat of reaction in reactor systems
Week 5	**Reactors Design and Stoichiometry** **L5:** General mole balances for batch and flow systems **:** Stoichiometric relationships in batch systems
Week 6	**Reactors Design and Stoichiometry** **L6:** Design equations of batch reactor **:** Conversion vs. time in batch systems
Week 7	**Reactors Design and Stoichiometry** **L7:** Stoichiometry in continuous flow reactor (PFR and CSTR) : Introduction to design of CSTR and PFR
Week 8	**Reactors Design and Stoichiometry** **L8:** Detailed design of ideal Continuous Stirred-Tank Reactors (CSTR) **:** Reactor performance equations and graphical methods
Week 9	**Reactors Design and Stoichiometry** **L9:** Design of ideal Plug Flow Reactors (PFR) **:** Comparison between CSTR and PFR for first- and second-order reactions
Week 10	**Multiple Reactions, Yield, and Selectivity** **L10:** Classification of multiple reactions: parallel, series, and complex mechanisms **:** Definitions of yield and selectivity with graphical analysis
Week 11	**Multiple Reactions, Yield, and Selectivity** **L11:** Kinetic analysis of parallel and series reactions **:** Consecutive reactions and intermediate formation
Week 12	**Multiple Reactions, Yield, and Selectivity** **L12:**Design considerations for maximizing selectivity and yield :Impact of operating parameters (T, P, residence time) on product distribution
Week 13	**Collection and Analysis of Rate Data *(2 hr)*** **L13:** Differential and integral methods for determining rate laws **:** Initial rate method and half-life approach
Week 14	**Review, Advanced Examples, Case Studie** **L14:** Solved examples: designing reactors based on real kinetics : Case studies: ammonia synthesis, esterification, wastewater oxidation : Discussion: industrial design constraints and decision-making
Week 15	**L15: Review, Advanced Examples, Case Studie** Review of CSTR/PFR performance under multiple reactions
Week 16	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	1- . H. S. Fogler, Elements of Chemical Reaction Engineering, 4th Ed (2006), Prentice Hall,NewYorK.	Yes
Recommended Texts	1- Octave Levenspiel (1999), Chemical Reactor Engineering, 3rd edition, John Wiley & Sons Inc., USA ISBN: 9780471254249. 2. J.M. Smith (1987), Chemical Engineering Kinetics, 3rd edition, McGraw-Hill International Editions, Singapore. ISBN: 9780070587106	Yes

Websites	Elements of Chemical Reaction Engineering

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

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Al-Turath
Petroleum Refining and Gas Engineering Department

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية					
Module Title	Heat Transfer			**Module Delivery**	
Module Type	Core			**Theory** **Lecture** **Tutorial** **Laboratory**	
Module Code	HETR315				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	UGx	**Semester of Delivery**	1		
Administering Department	CES.PR	**College**	CES		
Module Leader	Dr. Abbas J. Sultan	**e-mail**	abbas.j.sultan@uotechnology.edu.iq		
Module Leader's Acad. Title	Associate Professor	**Module Leader's Qualification**	Ph.D.		
Module Tutor		**e-mail**			
Peer Reviewer Name	Dr. Abbas J. Sultan	**e-mail**	abbas.j.sultan@uotechnology.edu.iq		
Review Committee Approval	06/01/2025	**Version Number**	1.0		

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Fluid Flow II (FLFL223)	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	The heat transfer class aims to provide students with a comprehensive understanding of the fundamental principles and practical applications of heat transfer, including conduction, convection, and radiation. Students will also learn about the design and analysis of heat exchangers, as well as the phenomena of boiling and condensation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: **LO1.** Demonstrate understanding of and apply the principles of conduction, convection, and radiation heat transfer. **LO2.** Analyze steady-state and unsteady-state heat conduction in one-dimensional systems. **LO3.** Calculate heat transfer coefficients and apply empirical relations for forced-convection scenarios. **LO4.** Design and analyze various types of heat exchangers using the LMTD and Effectiveness-NTU methods. **LO5.** Explain and apply the mechanisms of condensation and boiling heat transfer. **LO6.** Conduct laboratory experiments and analyze data to validate heat transfer concepts and system performance.
Indicative Contents المحتويات الإرشادية	The detailed Indicative Contents for the Heat Transfer class are as follows: 1. Introduction - Overview of the course and syllabus - Importance and applications of heat transfer in engineering - Temperature scales and conversions - Basics of heat transfer: Conduction, Convection, and Radiation 2. Conduction Heat Transfer - Fourier's Law of Heat Conduction - Thermal conductivity of materials - Steady-state heat conduction in one dimension

	- Heat conduction through a composite wall - Radial heat conduction in cylindrical and spherical coordinates - The Overall Heat-Transfer Coefficient - Critical thickness of insulation - Heat-source systems: Cylinders with heat sources - Conduction-convection systems - Extended surfaces (Fins): Types, efficiency, and effectiveness 3. Unsteady-State Conduction - Introduction to transient heat conduction - Lumped-heat-capacity system: Assumptions and applications - Solutions to the transient heat conduction equations 4. Principles of Convection - Introduction to fluid mechanics: Viscous and inviscid flow - Laminar boundary layer on a flat plate - Energy equation of the boundary layer - Thermal boundary layer: Concept and significance - Calculation of the heat transfer coefficient for flow over a flat plate - The relation between fluid friction and heat transfer 5. Empirical and Practical Relations for Forced-Convection Heat Transfer - Empirical correlations for pipe and tube flow - Heat transfer in turbulent and laminar flow in pipes - Flow across tube banks: Single-phase heat transfer - Use of dimensionless numbers in forced convection 6. Heat Exchangers - Types of heat exchangers: Shell and tube, plate, finned-tube, etc. - The Overall Heat-Transfer Coefficient in heat exchangers - Fouling factors and their impact on performance - Log Mean Temperature Difference (LMTD) method - Effectiveness-NTU method: Definitions and calculations - Heat exchanger design considerations: Thermal and mechanical design aspects 7. Shell and Tube Heat Exchanger Design - Complete design procedure for shell and tube heat exchangers - Types and various specifications - Design calculations by conventional methods - Effectiveness (NTU) methods and optimal design calculations 8. Condensation and Boiling Heat Transfer - Introduction to phase change heat transfer - Condensation heat-transfer phenomena: Dropwise and filmwise condensation - The Condensation Number and its applications - Film condensation inside horizontal tubes: Nusselt's theory and practical correlations - Boiling heat transfer: Pool boiling and flow boiling - Simplified relations for boiling heat transfer with water - Critical heat flux and its significance
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**1. Lectures** - Objective: Deliver core theoretical content and foundational principles. - Approach: Use a combination of traditional lectures, multimedia presentations, and real-world examples to explain key concepts of heat transfer. - Frequency: Weekly lectures. **2. Tutorials** - Objective: Reinforce lecture material through problem-solving and discussion. - Approach: Small group sessions where students solve practical problems and receive personalized feedback from the instructor. - Frequency: Weekly or bi-weekly. **3. Laboratory Sessions**

	- Objective: Provide hands-on experience with heat transfer equipment and experiments. - Approach: Conduct experiments that illustrate key principles of conduction, convection, and radiation. Include data collection, analysis, and interpretation exercises. - Frequency: Scheduled throughout the semester, typically every two to three weeks. **4. Online Resources** - Objective: Supplement classroom learning and provide flexible access to materials. - Approach: Utilize an online learning platform to share lecture notes, recorded lectures, discussion forums, and additional reading materials. Include online quizzes and interactive simulations. - Frequency: Continuous access throughout the semester. **5. Continuous Assessment** - Objective: Monitor and support student progress throughout the course. - Approach: Use a combination of quizzes, assignments, and midterm exams to provide ongoing feedback and identify areas needing improvement. - Frequency: Regular intervals throughout the semester.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (15)	4,8,12	LO2, LO3, LO4, LO5
	Assignments	5	10% (10)	Ongoing	LO2, LO3, LO4, LO5
	Classwork	2	5% (5)	As scheduled	LO2, LO3
	Lab.	1	10% (10)	14	LO1, LO6
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO1–LO5
	Final Exam	3hr	50% (60)	16	LO1–LO6
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction** ● Cover syllabus and introduction to class ● Temperature scales ● Conduction Heat Transfer ● Thermal Conductivity ● Convection Heat Transfer ● Radiation Heat Transfer
Week 2	**Steady State Heat Conduction in One Dimension:** ● The Plane Wall

	● Heat conduction through a composite wall ● Radial Systems ● Conduction-Convection Systems ● The Overall Heat-Transfer Coefficient
Week 3	**General conduction equation** ● Temperature distribution ● Heat-Source Systems ● Cylinder with Heat Sources
Week 4	**Critical Thickness of Insulation**
Week 5	**Extended surfaces (fins)**
Week 6	**Extended surfaces (fins)**
Week 7	**Unsteady-State Conduction** ● Introduction ● Lumped-Heat-Capacity System
Week 8	**Principles of Convection:** ● Viscous Flow ● Inviscid Flow ● Laminar Boundary Layer on a Flat Plate
Week 9	**Principles of Convection:** ● Energy Equation of the Boundary Layer ● The Thermal Boundary Layer ● Calculation of the heat transfer coefficient for flow over a flat plate ● The Relation Between Fluid Friction and Heat Transfer
Week 10	**Empirical and Practical Relations for Forced-Convection Heat Transfer** ● Introduction ● Empirical Relations for Pipe and Tube Flow ● Flow Across Tube Banks
Week 11	**Midterm Exam**
Week 12	**Heat Exchangers:** ● Introduction ● Types of Heat Exchangers ● The Overall Heat-Transfer Coefficient ● Fouling Factors ● The Log Mean Temperature Difference ● Heat-Exchanger Design Considerations
Week 13	**Shell and Tube Exchanger:** ● Presenting a complete design of shell and tube heat exchanger. ● Types and various specifications, design calculations by conventional and by effectiveness (NTU) methods and optimum design calculation.
Week 14	**Condensation and Boiling Heat Transfer:** ● Introduction ● Condensation Heat-Transfer Phenomena ● The Condensation Number ● Film Condensation Inside Horizontal Tubes
Week 15	**Condensation and Boiling Heat Transfer:** ● Boiling Heat Transfer ● Simplified Relations for Boiling Heat Transfer with Water.
Week 16	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**

Required Texts	1- Holman, J.P. (2009) Heat Transfer. 10th Edition, McGraw-Hill, New York.	Yes
Recommended Texts	2- Harker, J. H., J. R. Backhurst, and J. F. Richardson. Chemical Engineering Volume 1. Vol. 1. Elsevier, 2013. 3- Incropera, Frank P., David P. DeWitt, Theodore L. Bergman, and Adrienne S. Lavine. Fundamentals of heat and mass transfer. Vol. 6. New York: Wiley, 1996.	Yes
Websites		

GRADING SCHEME

مخطط الدرجات

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

Note:

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Al-Turath
Petroleum Refining and Gas Engineering Department

MODULE DESCRIPTOR FORM

Module Information

معلومات المادة الدراسية

Module Title	Petroleum and Gas Field Processing	**Module Delivery**

Module Type	**Core**		**Theory** **Lecture** **Tutorial**
Module Code	PGFP316		
ECTS Credits	**3**		
SWL (hr/sem)	75		
Module Level	U(	**Semester of Delivery**	1
Administering Department	CES.PR	**College**	CES
Module Leader	Dr. Firas K. AL-Zuhairi	**e-mail**	150009@uotechnology.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name	Prof. Dr. Adnan A. AbdulRazak	**e-mail**	adnan.a.alsalim@uotechnology.edu.iq
Review Committee Approval	24/06/2024	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Petroleum Chemistry	**Semester**	1
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. To provide an understanding of the general principles and importance of petroleum and gas field processing in the petroleum industry. 2. A comprehensive understanding the fundamentals of the Petroleum and Gas Field Processing mechanisms at the basis of the processes. 3. Provide criteria affect the processing options and the processing equipment required in a petroleum and gas field processing at developing critical thinking skills, solving open-ended problems and to work in teams.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Analyze the parameters' effect on oil and gas formation, reservoirs, and energy drive mechanisms and apply this knowledge to choose appropriate strategies in production methods. 2. Understanding the general information and concepts of separation methods. 3. Gain and/or improve their ability to synthesize, integrate, and utilize process information in the phase's separation, treatment of gas and petroleum, and design of a two-phase separator. 4. Apply concepts in solving interdisciplinary problems of phase separation. 5. Understanding the difference between two-phase and three-phase separators, separation theory, and solving interdisciplinary problems of three-phase separation. 6. Explain the primary objectives of crude oil treatment, including the removal of water, salts, and other impurities.

	7. Describe the key processes involved in crude oil treatment, such as desalting, dehydration, stabilization, and separation. 8. Understand the principles and operation of equipment used in crude oil treatment (e.g., heaters, separators, desalters). 9. Explain the primary objectives of natural gas processing, including the removal of contaminants and the separation of marketable products. 10. Describe key gas processing techniques, such as dehydration, sweetening, separation, and liquefaction. 11. Understand the principles and operation of equipment used in gas processing, including separators, absorbers, compressors, and cryogenic units.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Oil and Gas, From Formation to Production:** Formation and Accumulation of Oil and Gas. Types of Petroleum Reservoir. [4 hrs] **Two-Phase Gas-Oil Separation:** Introduction, The Separation Problem, Theory of Gas-Oil Separation, Methods of Separation, Gas-Oil Separation Equipments. [10 hrs] **Three-Phase Oil-Water-Gas:** Introduction, Separation Theory, Separator Types, Separator Sizing Equation and Rules. [10 hrs] **Treatment of Crude Oil :** Emulsion Treatment and Dehydration of Crude Oil, Desalting of Crude Oil, Crude Oil Stabilization and Sweetening. [6 hrs] **Field Processing and Treatment of Natural Gas:** Overview of Gas Field Processing, Sour Gas Treatment, Gas Dehydration, Recovery, Separation, and Fractionation of Natural Gas Liquids. [30 hrs]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something Like the main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive and tutorials.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

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

Formative assessment	**Quizzes**	3	15% (5)	4,8,12	LO # 2, 3, 5 ,7,8, 10 and 11
	Online Assignments	2	10% (5)	Continuous	
	Onset Assignments	2	10% (5)	Continuous	
	Report	1	5% (5)	14	LO # 1,4, 6, and 9
Summative assessment	**Midterm Exam**	2hr	10% (10)	10	LO # 2, 3, 5 ,7,8, 10 and 11
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Formation and Accumulation of Oil and Gas. Types of Petroleum Reservoir.
Week 2	Two-Phase Gas-Oil Separation : Introduction, The Separation Problem.
Week 3	Theory of Gas-Oil Separation. Methods of Separation.
Week 4	Gas-Oil Separation Equipments.
Week 5	Three-Phase Oil-Water-Gas: Introduction, Separation Theory, Separator Types.
Week 6	Separator Sizing Equation and Rules.
Week 7	Treatment of Crude Oil : Emulsion Treatment and Dehydration of Crude Oil.
Week 8	Desalting of Crude Oil, Crude Oil Stabilization and Sweetening.
Week 9	Field Processing and Treatment of Natural Gas : Overview of Gas Field Processing.
Week 10	Sour Gas Treatment.
Week 11	Sour Gas Treatment.
Week 12	Gas Dehydration.
Week 13	Recovery of Natural Gas
Week 14	Gas Separation.
Week 15	Fractionation of Natural Gas Liquids.
Week 16	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	• H. K. Abdel- Aal, Mohamed eggour, M. M Fahim "Petroleum and Gas Field Processing, (2016).	Yes
Recommended Texts	• H. K. Abdel- Aal, Mohamed eggour, M. M Fahim "Petroleum and Gas Field Processing, (2003). • Francis S. Manning-Oilfield Processing of Petroleum, Vol. 1_ Natural Gas, (1991). • Francis S. Manning, Richard E. Thompson-Oilfield	Yes

	Processing, Vol. 2_ Crude Oil, (1995).	
Websites	https://www.linkedin.com/pulse/top-oil-gas-websites-jaya-priya	

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

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Al-Turath
Petroleum Refining and Gas Engineering Department

MODULE DESCRIPTOR FORM

Module Information
معلومات المادة الدراسية

Module Title	Thermodynamics II	**Module Delivery**	
Module Type	**Core**	**Theory** **Lecture** **Tutorial** **Lab**	
Module Code	THER321		
ECTS Credits	**5**		
SWL (hr/sem)	125		
Module Level	UG	**Semester of Delivery**	2

Administering Department	CES.PR	**College**	CES
Module Leader	Dr. AbdulMonem A. Karim	**e-mail**	Abdulmonem.a.karim@uotechnology.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Dr. AbdulMonem A. Karim	**e-mail**	Abdulmonem.a.karim@uotechnology.edu.iq
Peer Reviewer Name	Dr. AbdulMonem A. Karim	**e-mail**	Abdulmonem.a.karim@uotechnology.edu.iq
Review Committee Approval	01/06/2025	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Thermodynamics I	**Semester**	1
Co-requisites module	Unit Operation I	**Semester**	2
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Aims أهداف المادة الدراسية	1. Apply the laws of thermodynamics to refrigeration and liquefaction cycles. 2. Establish thermodynamic constraint that apply to VLE, and explain qualitatively the VLE diagram. 3. Apply thermodynamics to VLE of pure components and solutions in terms of fugacity and fugacity coefficients. 4. Apply equilibrium criteria to chemical reactions and evaluate the effect of temperature. 5. Revision for thermodynamic analysis of processes.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students will be able to understand the theoretical foundation for applications of thermodynamics to systems of variable composition, e.g., gas mixtures and liquid solutions. 2. Because of the practical importance of distillation as a means of separating and purifying chemical species, VLE is the most studied type of phase equilibrium. Students will be able to analysis of VLE problems by developing a general formulation in terms of vapor-phase fugacity coefficients and liquid-phase activity coefficients. 3. Students must be familiar with chemical reactor design, analysis, and operation by understanding the rate and the equilibrium conversion of a chemical reaction depend on the temperature, pressure, and composition of reactants. 4. Students will be able to make thermodynamic analyzes of cooling systems. 5. Students will be able for the analysis of practical processes from a thermodynamic perspective		

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. **Solution Thermodynamics: theory** Fundamental property relations; The chemical potential and phase equilibrium, Ideal gas mixtures, fugacity and fugacity coefficient; The fundamental residual property relations; Generalized correlations for the fugacity coefficient; The ideal solutions. (**9 hrs**) 2. **Vapor / liquid equilibrium; Introduction :** The nature of equilibrium, the phase rule, Duhem's theorem, diagrams for vapor liquid equilibrium, Excess Gibbs energy and activity coefficients, The gamma/phi formulation of VLE, Simplifications: Raoult's law, modified Raoult's law , and Henry's law, Correlations for liquid-phase activity coefficients, Fitting activity coefficient models to VLE data, VLE from K value correlations, Flash calculations. (**15 hrs**) 3. **Chemical Reaction Equilibrium:** The reaction coordinate, standard Gibbs energy change and equilibrium constant, effect of temperature on equilibrium constant, evaluation of equilibrium constant, liquid phase reactions, equilibrium conversion for single reactions. (**12 hrs**) 4. **Refrigeration and Liquefaction:** The Carnot refrigerator, the vapor compression cycle, the choice of refrigerant, absorption refrigeration, the heat pump, liquefaction processes. (**6 hrs**) 5. **Thermodynamic Analysis of Processes:** Second law relation for steady state flow processes, calculation of ideal work, thermodynamic analysis of steady state flow processes. (**3 hrs**)

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive and tutorials.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

	Time/Nu	Weight (Marks)	Week Due	Relevant Learning

		mber			Outcome
Formative assessment	Quizzes	2	10 % (5)	4,8,12	LO #1, 2 and 3
	Onset Assignments	3	12 % (4)	Continuous	All
	Online Assignments	2	8 % (4)	Continuous	All
	Lab	1	10 % (10)	Continuous	All
Summative assessment	Midterm Exam	2hr	10 % (10)	10	LO # 1,2 and 3
	Final Exam	3hr	50 % (50)	16	All
Total assessment			100 % (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Solution thermodynamics: theory** Fundamental property relations; The chemical potential and phase equilibrium; Ideal gas mixtures
Week 2	Fugacity and fugacity coefficient; The Fundamental residual property relations.
Week 3	Generalized correlations for the fugacity coefficient; The ideal solutions.
Week 4	**Vapor / liquid equilibrium; introduction:** The nature of equilibrium, the phase rule; Duhem's theorem; Diagrams for vapor -liquid equilibrium.
Week 5	Simple models for VL equilibrium: Raoult's law; Dew point and bubble point calculations
Week 6	Henrys law, VLE by modified Raoult's law; Correlations for liquid-phase activity coefficients
Week 7	Fitting activity coefficient models to VLE data,
Week 8	VLE from K value correlations; Flash calculations.
Week 9	**Chemical Reaction equilibrium:** The reaction coordinate, standard Gibbs energy change and equilibrium constant.
Week 10	Effect of temperature on equilibrium constant.
Week 11	Evaluation of equilibrium constant.
Week 12	Liquid phase reactions, equilibrium conversion for single reactions.
Week 13	**Refrigeration and liquefaction:** The Carnot refrigerator, the vapor compression cycle, the choice of refrigerant.
Week 14	Absorption refrigeration, the heat pump, liquefaction processes.
Week 15	**Thermodynamic analysis of processes:** Second law relation for steady state flow processes, calculation of ideal work, thermodynamic analysis of steady state flow processes.
Week 16	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	J. M. Smith, H. C. Van Ness, Introduction to Chemical Engineering Thermodynamics, 8th edition (International Edition), McGraw Hall, 2018.	Yes
Recommended Texts	1. K. V. Narayanan, A textbook of chemical engineering thermodynamics, prentice Hall of India, New Delhi, 2011. 2. B. G. Kyle, Chemical and process thermodynamics, (3rd Edition), prentice Hall Inc. New Jersey, 1984. 3. J. Rayner, Basic engineering thermodynamics in SI units, printed in great Britain,1971.	Yes

Websites	

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

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Al-Turath
Petroleum Refining and Gas Engineering Department

MODULE DESCRIPTOR FORM

Module Information
معلومات المادة الدراسية

Module Title	Applied Mathematics		**Module Delivery**
Module Type	Core		**Theory** **Lecture** **Tutorial**
Module Code	APMA322		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	U	**Semester of Delivery**	2
Administering Department	CES.PR	**College**	CES
Module Leader	Prof.Dr. Salman Hussein Abbas	**e-mail**	Salman.h.ali@uotechnology.edu.iq
Module Leader's Acad. Title	Professor Dr. Salman Hussein Abbas	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	

Peer Reviewer Name	Prof. Dr. Zainab Yousif	**e-mail**	zainab.y.shnain@uotechnology.edu.iq
Review Committee Approval	1/05/2025	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

rerequisite module	Mathematics II	**Semester**	
-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

dule Aims أهداف المادة الدراسية	For Applied mathematics, students will learn how to: 1. Develop a mathematical relation for a given physical problem, 2. Solving the mathematical equations to get the unknown variables, 3. Choosing the appropriate solution method for the given differential equations, 4. Solving first, second and higher order of differential equations, using different method in classical mathematics 5. Solving partial differential equations to get unknown variables used in chemical engineering processes 6. Using Laplace Transforms methods to solve several types of differential equations
e Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Develop a deep understanding of issues related to the basic principles of calculus, and how to solve problems in chemical engineering. 2. The ability to understand and analysis problems related to specific field. 3. Understanding the necessary of all subjects of mathematics in other sciences. 4. Understanding the necessary of derivatives and its application in other sciences. 5. An ability to apply effective, creative and innovative solutions, both independently and cooperatively, to current and future problems. 6. Characterization and analyses the performance of any problems in any object of chemical engineering.
Indicative Contents المحتويات الإرشادية	First Order Ordinary Differential Equations, Applications of The First Order Ordinary Differential Equations in The Chemical Engineering, Second Order Ordinary Differential Equations, The Inverse D-Operator Method, Applications of The Second Order Ordinary Differential Equations in Chemical Engineering, Higher Order Ordinary Differential Equations, Partial Differential Equations, Laplace Transforms, Formulation of Chemical Engineering Problems (Modeling).

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Applications of The First Order Ordinary Differential Equations in The Chemical Engineering. Second Order Ordinary Differential Equations. The Inverse D-Operator Method Applications of The Second Order Ordinary Differential Equations in Chemical Engineering. Higher Order Ordinary Differential Equations Partial Differential Equations Laplace Transforms Formulation of Chemical Engineering Problems (Modeling).

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem)	48	**Structured SWL (h/w)**	3

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (5)	4,8,12	LO #2, 3, 4 and 5
	Online Assignments	2	10% (5)	Continuous	
	Onset Assignments	2	10% (5)	Continuous	
	Report	1	5% (5)	14	LO # 1 and 6
Summative assessment	Midterm Exam	2hr	10% (10)	10	LO # 2, 3, 4 and 5
	Final Exam	2hr	50% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered

Week 1	• First Order Ordinary Differential Equations.
	  ○ Variable Separable Equations
	  ○ Homogeneous Equations
	  ○ Exact Equations
	  ○ Linear Equations
	  ○ Bernoulli's Equations

Week 2	• Applications of The First Order Ordinary Differential Equations in The Chemical Engineering.

Week 3	• Second Order Ordinary Differential Equations.
	  ○ Non-Linear Differential Equations
	  ○ Equations with Dependent Variable Missing
	  ○ Equations with Independent Variable Missing
	• Homogeneous Equations
	• Linear Differential Equations
	  ○ Equations with Constant Coefficient
	  ○ Equations with Coefficients as a Function of The Independent Variable
	• Method of Undetermined Coefficient

Week 4	• The Inverse D-Operator Method
Week 5	• Applications of The Second Order Ordinary Differential Equations in Chemical Engineering

Week 6	• Higher Order Ordinary Differential Equations.
	  ○ Simultaneous Differential Equations.
	  ○ Series Solution of Differential Equations.

Week 7	• Partial Differential Equations:
	  ○ Method of Direct Integration.
	  ○ Separation of Variables (Fourier Transforms).

Week 8	○ Combination of Variables (Variation of Parameters).

Week 9	• Laplace Transforms
	  ○ Definitions (Laplace Transforms of Some Elementary Functions, Rules of Laplace Transforms).
	  ○ The First Shifting Theorem, Multiplicity by X or X^n.

	○ The Inverse of Laplace Transforms (Completing the Square in the Denominator, By Partial Fractions, By Convolution Integral, By Conversion Integral)
Week 10	○ Laplace Transform of Derivatives ○ Solution of Ordinary Differential Equations (Ordinary Differential ○ Equations with Constant Coefficient, Ordinary Differential Equations with Variable Coefficient).
Week 11	● Partial Differential Equations. ● The Unit Step Function, The Unit Impulse Function. ● The Second Shifting Theorem
Week 12	● Formulation of Chemical Engineering Problems (Modeling): ○ Storage Tanks. ○ Mixing Tanks.
Week 13	○ Chemical Reaction Vessels. ○ Heat Transfer Problems.
Week 14	○ Mass Transfer Problems. ○ Momentum Transfer Problems.
Week 15	○ Process Control System. ○ Another Problems.
Week 16	● Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	- Mathematical Methods in Chemical Engineering, Jenson. V.J. and Jefferey, G.V, 2nd Edition, Academic Press New York, 1977. - Applied Mathematics and Modeling for Chemical Engineers", Rice R G. and. Do, D. D., John Wiley and Sons, New York, 1995.	Yes
Recommended Texts	- Applied Mathematical Methods for Chemical Engineers", Loney, Norman W., 2nd edition, CRC Press Taylor & Francis Group, Boca Raton, 2007.	Yes

GRADING SCHEME

مخطط الدرجات

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

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Al-Turath
Petroleum Refining and Gas Engineering Department

MODULE DESCRIPTOR FORM

Module Information
معلومات المادة الدراسية

Module Title	Unit operation I	**Module Delivery**	
Module Type	**Core**	**Theory** **Lecture** **Tutorial**	
Module Code	UNOP323		
ECTS Credits	**5**		
SWL (hr/sem)	125		
Module Level	U(	**Semester of Delivery**	2
Administering Department	CES.PR	**College**	CES
Module Leader	Dr. Amer A. Abdulrahman	**e-mail**	amer.a.abdulrahman@uotechnology.edu.iq
Module Leader's Acad. Title	Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Dr. Amer A. Abdulrahman	**e-mail**	amer.a.abdulrahman@uotechnology.edu.i

			q
Peer Reviewer Name	Dr. Amer A. Abdulrahman	**e-mail**	amer.a.abdulrahman@uotechnology.edu.iq
Review Committee Approval	15/06/2025	**Version Number**	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Mass transfer	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	4. **Develop a strong conceptual and analytical understanding of distillation processes**, covering differential, flash, and continuous multistage operations, vapor–liquid equilibrium (VLE), and the application of McCabe–Thiele, Underwood, and Gilliland methods for binary and multicomponent systems. 5. **Introduce the fundamental principles and design methodologies of tray and packed columns**, including stage-wise and continuous contact operations, with emphasis on graphical and algebraic techniques for determining the number of stages and packing height under various flow regimes. 6. **Enable students to evaluate and apply mass transfer correlations and performance metrics**, including tray efficiency, minimum liquid flow rate, and mass transfer coefficients, while integrating theoretical models with practical process design for separation systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. **Analyze and design distillation systems**, including differential, flash, and continuous multistage operations, using vapor–liquid equilibrium data and methods such as McCabe–Thiele, Underwood, and Gilliland correlations for both binary and multicomponent mixtures. 2. **Explain the principles and operational differences between tray and packed columns**, including stage-wise and continuous contact operations, and apply graphical and algebraic methods to determine the number of stages or packing height under various flow conditions. 3. **Evaluate mass transfer performance and separation efficiency** by applying empirical correlations, calculating tray efficiency, determining minimum liquid flow rates, and estimating mass transfer coefficients.
Indicative Contents المحتويات الإرشادية	**Chapter 1: Fundamentals of Distillation and VLE** • Introduction to separation via distillation • Vapor–liquid equilibrium (VLE) concepts • Differential (Rayleigh) distillation and flash distillation principles **Chapter 2: Stage-Wise Distillation and Tray Column Design** • Continuous multistage distillation • Tray column configurations and operating principles • McCabe–Thiele graphical method

	• Feed stage placement and operating line construction **Chapter 3: Analytical and Packed Column Methods in Distillation** • Total and minimum reflux conditions • Underwood and Gilliland methods for stage calculation • Tray efficiency and deviations from ideality • Packed column design: HETP and HTU/NTU methods • Packed column performance for concentrated mixtures and minimum liquid flow rate **Chapter 4: Fundamentals of Gas-Liquid Absorption** • Overview of isothermal gas–liquid absorption • Assumptions: dilute systems, constant temperature, steady-state • Single-Stage Absorption: One Component Transferred • Counter current flow operation • Mass balance derivation • Operating line and equilibrium line definitions • Graphical representation **Chapter 5: Determination of Minimum Solvent-to-Gas Ratio $(L_s/G_s)_{min}$** • Physical significance of minimum solvent flow • Tangency condition with equilibrium line • Conditions under which absorption becomes infeasible • Methodology to Determine $(L_s/G_s)_{min}$ • Step-by-step procedure • Graphical and analytical techniques **Chapter 6: Analytical Method to Determine the Number of Trays** • Kremser Equation for absorption: • Use of absorption factor (A = L/mG)
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises electronic (weekly) and paper (monthly) forms, while at the same time refining and expanding their critical thinking skills. This will be achieved through a homework, classes, interactive tutorials and by considering type of simple problems and design involving activities that are interesting to the students. The lectures are given in terms of questionable manner and answers are shared among the students.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	HW	2	(5) 10%	Continuous	All
	Quiz	2	(5) 10%	Continuous	All
	Online assessment	2	(5) 10%	Continuous	All
	LAB	1	10%	Continuous	All
Summative assessment	Midterm Exam	1	10%	Continuous	All
	Final Exam	3 hr	50%		All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Separation via Distillation
Week 2	Vapor–Liquid Equilibrium (VLE) Concepts
Week 3	Differential (Rayleigh) and Flash Distillation Principles
Week 4	Continuous Multistage Distillation
Week 5	Tray Column Configurations and Operating Principles
Week 6	McCabe–Thiele Graphical Method (Part I)
Week 7	McCabe–Thiele Method (Part II): Feed Stage and Operating Lines
Week 8	Total Reflux and Minimum Reflux Conditions
Week 9	Underwood and Gilliland Methods for Stage Calculation
Week 10	Tray Efficiency and Deviations from Ideality
Week 11	Packed Column Design: HETP and HTU/NTU Methods
Week 12	Packed Column Performance and Minimum Liquid Flow Rate
Week 13	Fundamentals of Isothermal Gas–Liquid Absorption
Week 14	Determination of Minimum Solvent-to-Gas Ratio $(L_s/G_s)_{min}$
Week 15	Analytical Methods to Determine the Number of Trays (Kremser Equation)
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي العملي (المختبر)

	Material Covered
Week 1	Guidance instructions for students to deal with laboratory and safety equipment
Week 2	Liquid-Liquid diffusio
Week 3	Report discussion and assessmen

Week 4		Absorptio
Week 5		Report discussion and assessmer
Week 6		Batch Distillation Colum
Week 7		Report discussion and assessmer
Week 8		Midterm exar
Week 9		Fluid Mechanics of Packed Be
Week 10		Report discussion and assessmer
Week 11		Sieve Analysi
Week 12		Report discussion and assessmer
Week 13		Gas Solid Fluidizatio
Week 14		Report discussion and assessmer
Week 15		Final term exar

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Colulsson ,J.M and Richardson J.F. "Chemical Engineering , volume 1", Fifth edition 2002, Elsevier Science, Linacre House, Jordan Hill, Oxford.	Yes
Recommended Texts	Colulsson ,J.M and Richardson J.F. "Chemical Engineering , volume 2", Fifth edition 2002, Elsevier Science, Linacre House, Jordan Hill, Oxford.	Yes
Websites		

GRADING SCHEME
مخطط الدرجات

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

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Al-Turath
Petroleum Refining and Gas Engineering Department

MODULE DESCRIPTOR FORM

Module Information
معلومات المادة الدراسية

Module Title	Reactor Design	**Module Delivery**	
Module Type	**Basic**	**Theory** **Lecture** **Tutorial**	
Module Code	REDE324		
ECTS Credits	**5**		
SWL (hr/sem)	125		
Module Level	UG	**Semester of Delivery**	2
Administering Department	CES.PE	**College**	CES
Module Leader	Dr. Farah Talib Al-Sudani	**e-mail**	Farah.t.jasim@uotechnology.edu.iq
Module Leader's Acad. Title	Assistant Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Dr. Farah Talib Al-Sudani	**e-mail**	Farah.t.jasim@uotechnology.edu.iq
Peer Reviewer Name	Dr. Farah Talib Al-Sudani	**e-mail**	Farah.t.jasim@uotechnology.edu.iq
Review Committee Approval	08/07/2024	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CHRK314	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	The module is designed to: 1. **Introduce and compare a range of reactor types and configurations**, including multiple reactors (stirred-tank, plug flow), semi-batch, packed bed, and recycle reactors, with emphasis on their operating principles, performance characteristics, and typical applications. 2. **Develop student understanding of non-isothermal reactor behavior**, incorporating energy balance equations to analyze temperature effects and thermal stability in batch and continuous reactor systems. 3. **Promote safe and effective reactor design**, ensuring that energy management, process control, and environmental and safety considerations are integrated into reactor selection and operational strategies.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this module, students will be able to: 1. **Describe and compare the operational characteristics** of stirred tank, plug flow, semi-batch, packed bed, and recycle reactors, and **evaluate their suitability** for different chemical processes based on conversion, residence time, and reaction kinetics. 2. **Apply energy balance principles** to analyse and design **non-isothermal reactors**, including batch and continuous systems, and predict temperature effects on reactor performance and stability. 3. **Identify potential safety and environmental risks** in reactor operation and **incorporate appropriate control measures and design modifications** to ensure safe, efficient, and sustainable reactor performance.
Indicative Contents المحتويات الإرشادية	**Introduction and Course Overview** [2 hr] - Introduction to reactor design objectives - Overview of Fundamental Reactor Types: Batch, CSTR, PFR - Role of reaction kinetics, stoichiometry, and reactor performance - Basic safety and environmental considerations in reactor selection **Multiple reactor System** [6 hr] - CSTR reactors in series and/or parallel (first order and second order reactions) - Plug flow reactors in series and/or parallel - Mixed Reactor Systems. Types of Configurations: CSTR → PFR PFR → CSTR Reaction-based Selection • Favouring desired products in **parallel/series reactions** • Improving conversion for **reversible reactions**

	Special Reactor Designs: Recycle, and Semi-Batch [6 hr] - Introduction to recycle reactor configurations - Derivation of design equations with recycle ratio - Effects of recycle on conversion, selectivity, and reactor size. - Design and operation of semi-batch reactors - Differences between batch, continuous, and semi-batch modes - Basic safety and environmental considerations in special reactor selection **Non-Isothermal Reactor Design and Energy Analysis** [14 hr] - Impact of temperature variation during reactions (Exothermic vs. endothermic reactions) - Energy balances in batch and continuous systems - Non-isothermal operation of batch, CSTR, and PFR reactors - Temperature control strategies and thermal stability - Influence of heat effects on conversion and reactor behaviour. Influence of thermal effects on conversion, rate, and safety **Group Project, Reactor Safety and Risk Considerations** [2 hr] - Small group presentations on selected reactor configurations - Justification of reactor choices based on process conditions - Peer review and instructor feedback - Safety risks in exothermic and runaway reactions - Design strategies for thermal control and containment - Examples of safety devices: cooling systems, relief valves, quenchin
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises electronic (weekly) and paper (monthly) forms, while at the same time refining and expanding their critical thinking skills. This will be achieved through a homework, classes, interactive tutorials and by considering type of simple problems and design involving activities that are interesting to the students. The lectures are given in terms of questionable manner and answers are shared among the students.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**HW**	2	(5)10%	Continuous	All
	presentation	1	5%	Continuous	All
	Quiz	2	15%	Continuous	All
	Online assessment	2	(5)10%	Continuous	All

Summative assessment	**Midterm Exam**	2	10%	4, 8, 11	All
	Final Exam	3 hr	50%	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction and Course Overview** • Introduction to reactor design objectives • Overview of fundamental reactor types: Batch, CSTR, PFR • Role of reaction kinetics, stoichiometry, and performance • Safety and environmental considerations in selecting reactors
Week 2	**Multiple Reactor Systems** • CSTR reactors in series and/or parallel (1st & 2nd order reactions) • Analysis of performance, conversion, and space-time
Week 3	• Plug Flow Reactors (PFRs) in series and/or parallel • Performance enhancement and volume reduction strategies
Week 4	• Mixed reactor configurations (e.g., CSTR → PFR, PFR → CSTR) • Reactor selection based on desired products and reversibility • Case examples: yield and selectivity optimization
Week 5	**Special Reactor Designs – Recycle & Semi-Batch** • Recycle reactor design concepts • Derivation of recycle ratio equations and performance effects
Week 6	• Impact of recycle on conversion, selectivity, and volume • Industrial applications of recycle reactors
Week 7	• Semi-batch reactor operation principles • Comparison with batch and continuous systems • Safety/environmental concerns in special reactor selection
Week 8	**Non-Isothermal Reactor Design and Energy Analysis *(10 hr)*** • Thermal behaviour: Exothermic vs. endothermic reactions • How temperature affects reaction rate and conversion
Week 9	• Energy balances for batch and continuous systems • Incorporating heat of reaction and heat capacity
Week 10	• Non-isothermal batch reactor behaviour • Cooling and heating requirements, temperature–time analysis
Week 11	• Design Problem Solving I non-isothermal reactor behaviour
Week 12	• Non-isothermal CSTR and PFR designs Steady-state analysis, temperature profiles, and stability
Week 13	• Design Problem Solving II non-isothermal CSTR and PFR reactor
Week 14	**Reactor Safety and Risk Considerations** • Hazards in exothermic reactions and runaway risks • Design strategies for safety and thermal containment • Safety devices: cooling jackets, relief valves, quenching systems
Week 15	**Group Project – Process Justification** • Student group presentations on selected reactor configurations • Design justification based on process conditions
Week 16	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	2- . H. S. Fogler, Elements of Chemical Reaction Engineering, 4th Ed (2006), Prentice Hall,NewYorK.	Yes
Recommended Texts	1- Octave Levenspiel (1999), Chemical Reactor Engineering, 3rd edition, John Wiley & Sons Inc., USA ISBN: 9780471254249. 2. J.M. Smith (1987), Chemical Engineering Kinetics, 3rd edition, McGraw-Hill International Editions, Singapore. ISBN: 9780070587106	Yes
Websites	Elements of Chemical Reaction Engineering	

GRADING SCHEME
مخطط الدرجات

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

Note:

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	Ministry of Higher Education and Scientific Research - Iraq University of Al-Turath Petroleum Refining and Gas Engineering Department	

MODULE DESCRIPTOR FORM

Module Information
معلومات المادة الدراسية

Module Title	Equipment Design	**Module Delivery**	
Module Type	Core	**Theory** **Lecture** **Tutorial** **Lab**	
Module Code	EQDE325		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level		**Semester of Delivery**	2
Administering Department	CES.PR	**College**	CES
Module Leader	Riyadh Almukhtar	**e-mail**	Riyadh.s.almukhtar @uotechnology.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph. D
Module Tutor	None	**e-mail**	None
Peer Reviewer Name		**e-mail**	
Review Committee Approval	01/06/2025	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Heat Transfer, Mass Transfer,	**Semester**	1
Co-requisites module	Unit operation 1	**Semester**	2

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

Module Aims أهداف المادة الدراسية	To provide students with the principles and methodologies required for the design and analysis of core chemical process equipment, including vessels, heat exchangers, and separation units.

	To develop students' ability to interpret and create process flow diagrams, P&IDs, and equipment specifications in alignment with industrial standards and safety codes. To enhance practical skills in equipment simulation and design using software tools such as HYSYS for process modeling, phase separation, and property estimation
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Apply engineering principles to design and evaluate chemical process equipment such as vessels, heat exchangers, and separation columns under specified operating conditions. Interpret and prepare technical documents including process flow diagrams (PFDs), piping and instrumentation diagrams (P&IDs), and equipment data sheets. Use process simulation software (e.g., HYSYS) to model equipment performance, analyze phase behavior, and support design decisions.
Indicative Contents المحتويات الإرشادية	- To understand the nature of chemical design structure and the anatomy of chemical process , the nature of chemical design structure and the anatomy of chemical process (3 hrs) -Types of flow sheet use in chemical engineering drawing and Equipment symbols To get the knowledge for preparing PFD and P&I D diagrams The effective factors consider in site layout and plant layout (9 hrs) -Explain design procedure for vessels design by example + the concepts of simulation , prepare data sheets for vessels + the ability to utilize computer software HYSYS (6 hrs) -Ability to design gas-liquid and liquid -liquid separator then prepare data sheet (9 hrs) -Calculate Overall heat transfer coefficient. And area required for heat exchanger design .The ability to calculate individual heat transfer coefficients and pressure drop for heat exchangers (9 hrs) - Understand the main concept of tower or column in chemical engineering Practices the . equipment and the differences between tray and packed column necessary steps for towers internal design (9 hrs)
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	5% (5)	3,7,11,13	1,2,3,4
	Report	3	15% (5)	4.9,15	1,2,3,4
	Onset Asses.	2	10%(5)		
	Lab	10	10% (1)	12	4
Summative assessment	Midterm Exam	2hr	10% (10)	10	LO ALL
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction, Nature of design ,the organization of a chemical engineering :Process planning projects Scheduling .Standards and codes. Utilities.
Week 2	- Flow sheet design, flow sheet types and designation .Block diagram .Process flow sheet .Piping . and instrumentation diagram
Week 3	Computer aided drafting ,process simulation programs .Layout and plot plan .Project evaluation and cost estimation
Week 4	Vessels Design: Types of vessels, Criteria in vessel design, Stress considerations, Material of construction,
Week 5	Vessel supports and foundation, vessels heads and covers, Thickness of vessels under pressure or vacuum
Week 6	- Design of Gas – liquid separators,
Week 7	Liquid – liquid separators,
Week 8	Heat Transfer Equipments Heat exchanger types and applications.
Week 9	Mechanical Design of Heat Exchanger Heat exchanger data sheet.
Week 10	Design Procedure for condensers, Design Procedure for vaporizers
Week 11	Mass Transfer Equipments Columns types . Plate Types. Packing types . Pressure drops in columns . Column data sheets
Week 12	Towers Column internals Design, Mechanical Towers Design and Data Sheets
Week 13	Packed column internals Design,
Week 14	Mechanical Towers Design and Data Sheets
Week 15	Exam.
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: **How HYSYS is structured**
Week 2	Lab 2: **Basis Environment-**
Week 3	Lab 3: **Simulation Environment**
Week 4	Lab 4: **Physical Properties**
Week 5	Lab 5: **Phase Separation**
Week 6	Lab 6: **Problem - Heat Exchanger**
Week 7	Lab 7: **Condensers**
Week 8	Lab 8: **Vaporizers**
Week 9	Lab 9: **Distillation column**
Week 10	Lab 10: **Distillation column**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Sinnott R. and Towler C; 2016 " chemical Engineering Design" 5th edition Butterworth-Heinemann 1. Coke,A.K ;2007"Ludwig s Applied Process Design of Chemical and petrochemical Plant" vol. 1 4th edition Gulf professional Publisher 2. Coulson ,J.M and Richardson J.F. "Chemical Engineering , volume 2", Fifth edition 2002, Elsevier Science, Linacre House, Jordan Hill, Oxford 3. Green D ,Perry,J.H, 2008" chemical engineering handbook ",8th edition Mc-Graw –Hill Book com.	yesw
Recommended Texts	Couper J. , Penny R. , Fair J and Wallas S " Chemical Process Equipment " 2nd edition 2010 Elesvier 1.	
Websites		

GRADING SCHEME
مخطط الدرجات

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

	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

Ministry of Higher Education and Scientific Research - Iraq
University of Al-Turath
Petroleum Refining and Gas Engineering Department

MODULE DESCRIPTOR FORM

Module Information
معلومات المادة الدراسية

Module Title	Chemicals from Petroleum	**Module Delivery**	
Module Type	Core	**Theory Lecture**	
Module Code	CHPE326		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	3	**Semester of Delivery**	2
Administering Department	CES.PR	**College**	CES
Module Leader	Salam H. Rasheed	**e-mail**	salam.h.rasheed@uotechnology.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name	Prof. Dr. Adnan Abdulrazak	**e-mail**	adnan.a.alsalim@uotechnology.edu.iq
Review Committee Approval	24/06/2024	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Petroleum Chemistry	**Semester**	2
Co-requisites module	None	**Semester**	

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

Module Aims أهداف المادة الدراسية	1- To know sources of feed stock. These sources are petroleum fractions and natural gases. 2- To introduce petrochemicals generations: first (basic petrochemicals), 2nd derivatives, 3rd and product.

	3- Ability to select of appropriate equipment for the production of materials in process plant.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- The chemical engineering student should be able to think critically, solve problems, manage resources and time, describe the specialty of chemical and petroleum refinery engineering and its concepts in a scientific and engineering way, and make appropriate changes to that. 2- The ability to perform engineering analysis and scientific thinking by applying laws in science, mathematics, and engineering and attaching to guidelines and instructions for any activity and framework in implementing a project or confronting an engineering problem and solving it.
Indicative Contents المحتويات الإرشادية	[2 hr] **Introduction :** Raw material, characterization [10 hr] **Primary Petrochemicals:** Olefins, Diolefins, Higher Olefins, LAB, Aromatics, separation Aromatics, Syn gas, H2 production, steam reforming ,PO [12 hr] **Derivatives Syn gas derivatives:** Methanol, Acetic acid . Ethylene derivatives : Vinyl chloride M, Ethylene Oxide. Ethylene glycol, MEA, DEA&TEA Propylene derivatives : Acrylonitrile, Derivatives of C4 hydrocarbon : MTBE, Adipic acid. Benzene derivatives Ethyl benzene, styrene, nitrobenzene, aniline, cyclohexane, cumene, Phenol, acetone. Toluene derivatives : Benzoic acid Xylene derivatives : Terephthalic acid Products: [6 hr] **polymers: LDPE, HDPE, PVC, PP.**
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive and tutorials.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (5)	4,8,12	1,2
	Online Assignments	2	10% (5)	Continuous	
	Onset Assignments	2	10% (5)	Continuous	
	Report	1	5% (5)	14	1,2
Summative assessment	Midterm Exam	2hr	10% (10)	10	1,2
	Final Exam	2hr	50% (50)	16	1,2
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction** : Raw material, characterization
Week 2	**Primary Petrochemicals:** Olefins, Diolefins, Higher Olefins
Week 3	LAB, Aromatics
Week 4	Syn gas,
Week 5	H2 production
Week 6	Steam reforming, PO
Week 7	**Derivatives Syn gas derivatives:** Methanol, Acetic acid
Week 8	Ethylene derivatives: Vinyl chloride M, Ethylene Oxide.
Week 9	Ethylene derivatives: Ethylene glycol, MEA, DEA&TEA
Week 10	Propylene derivatives, Acrylonitrile, Derivatives of C4 hydrocarbon: MTBE, Adipic acid.
Week 11	Benzene derivatives Ethyl benzene, styrene, nitrobenzene, aniline, cyclohexane, cumene, Phenol, acetone.
Week 12	Toluene derivatives: Benzoic acid, Xylene derivatives: Terephthalic acid
Week 13	Products: **polymers: LDPE, HDPE**
Week 14	**PVC**
Week 15	**PP**
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the

		Library?
Required Texts	Sami Matar, Lewis F. Hatch, Chemistry of Petrochemical Process, 2nd edition.	Yes
Recommended Texts	William D. Callister, David G. Rethwisc, Materials Science and Engineering.	Yes
Websites		

GRADING SCHEME
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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