



Ministry of Higher Education and  
Scientific Research - Iraq  
Northern Technical University  
Technical Engineering College-Mosul  
Engineering Technological for Chemical and  
Petroleum Industries



## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>ENGINEERING DRAWING</b>		Module Delivery
Module Type	Support		Theory Lecture Lab Tutorial Practical Seminar
Module Code	TEMO101		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"><li>1. Understand the importance of engineering drawing in various fields, and grasp the basic principles and concepts involved in engineering drawing. Recognize the role of engineering drawing in design, manufacturing, and construction processes.</li><li>2. Familiarize yourself with AutoCAD 2D software and its applications in engineering drawing. Explore the advantages and features of AutoCAD in creating accurate and precise drawings. Learn about the AutoCAD user interface and workspace.</li><li>3. Gain proficiency in AutoCAD basics, including setting drawing boundaries, enabling grid display for precise positioning, using object snap modes for accurate object alignment, adjusting the view magnification level, and moving the view within the drawing area.</li><li>4. Develop skills in using the Draw menu in AutoCAD, such as drawing straight lines, creating connected series of lines and arcs, drawing regular polygons and rectangles, creating circular arcs and circles, inserting single points, and adding text annotations to the drawing.</li><li>5. Learn how to utilize the Modify menu in AutoCAD effectively, which includes deleting objects from the drawing, duplicating objects, creating mirrored copies of objects, creating parallel copies of lines and curves, moving objects within the drawing, rotating objects around a specified point, trimming or extending objects to meet specified boundaries, extending objects to meet other objects, and breaking down complex objects into simpler components.</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"><li>1. Demonstrate an understanding of the importance of engineering drawing in various fields and its role in design, manufacturing, and construction processes.</li><li>2. Utilize AutoCAD 2D software to create accurate and precise engineering drawings, demonstrating proficiency in its features and advantages.</li><li>3. Apply the basic principles and concepts of engineering drawing, including setting drawing boundaries, enabling grid display, and using object snap modes for accurate object alignment.</li><li>4. Use the Draw Menu in AutoCAD to create various shapes and objects, such as lines, polygons, rectangles, arcs, circles, points, and text annotations.</li><li>5. Employ the Modify Menu in AutoCAD to perform actions such as erasing objects, copying and mirroring objects, offsetting lines and curves, moving and rotating objects, trimming and extending objects, and exploding complex objects into simpler components.</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"><li><b>1. Introduction to Engineering Drawing:</b><ul style="list-style-type: none"><li>● Importance of engineering drawing in various fields</li><li>● Basic principles and concepts of engineering drawing</li><li>● Role of engineering drawing in design, manufacturing, and construction processes</li></ul></li><li><b>2. Introduction to AutoCAD 2D Software in Engineering Drawing:</b></li></ol>

- Overview of AutoCAD software and its applications in engineering drawing
- Advantages and features of AutoCAD in creating accurate and precise drawings
- Introduction to the AutoCAD user interface and workspace

### **3. AutoCAD Basics:**

- Limits: Setting the drawing boundaries
- Grid: Enabling grid display for precise positioning
- Object Snap: Using object snap modes for accurate object alignment
- View Menu:
  - Zoom: Adjusting the view magnification level
  - Pan: Moving the view within the drawing area

### **4. Draw Menu:**

- Line: Drawing straight lines
- Polyline: Creating connected series of lines and arcs
- Polygon: Drawing regular polygons
- Rectangle: Creating rectangular shapes
- Arc: Drawing circular arcs
- Circle: Creating circles
- Point: Inserting single points
- Text: Adding text annotations to the drawing

### **5. Modify Menu:**

- Erase: Deleting objects from the drawing
- Copy: Duplicating objects
- Mirror: Creating mirrored copies of objects
- Offset: Creating parallel copies of lines and curves
- Move: Moving objects within the drawing
- Rotate: Rotating objects around a specified point
- Trim: Trimming or extending objects to meet specified boundaries
- Extend: Extending objects to meet other objects
- Explode: Breaking down complex objects into simpler components

### **6. Perspective Drawing:**

- Introduction to perspective drawing and its applications
- Basic principles of creating a perspective view in engineering drawing
- Techniques for creating depth and dimension in perspective drawings

### **7. Orthographic Projection:**

- Explanation of orthographic projection and its significance
- Understanding the six principal views (top, front, right side, left side, rear, bottom)
- Techniques for representing objects in orthographic projection

**8. First and Third Angle Projection Method:**

- Difference between the first and third angle projection methods
- Comparative analysis of the two methods
- Application scenarios for each method

**9. Drawing Projection with First Angle Projection Method:**

- Step-by-step process of drawing an object using the first angle projection method
- Creating orthographic views based on the given information
- Techniques for aligning and labeling the views

**10. Drawing Projection with Third Angle Projection Method:**

- Step-by-step process of drawing an object using the third angle projection method
- Creating orthographic views based on the given information
- Techniques for aligning and labeling the views

**11. Drawing Three Projections with First and Third Angle Projection Method:**

- Simultaneously drawing the three orthographic views using both projection methods
- Comparing and contrasting the results of the two methods
- Identifying the advantages and disadvantages of each approach

**12. Configuration of a Printing Layout and Print Scale:**

- Setting up a printing layout in AutoCAD
- Defining the paper size, orientation, and margins
- Configuring the scale for printing drawings accurately

## Strategies

1. **Hands-on AutoCAD Exercises:** Students will engage in a series of hands-on exercises designed to progressively build their skills in AutoCAD. These exercises will require students to apply the principles and techniques of engineering drawing using AutoCAD commands and tools. By actively using the software, students will develop a practical understanding of drawing creation, modification, and projection methods.
2. **Step-by-Step Tutorials:** Step-by-step tutorials will be provided to guide students through specific tasks and functionalities in AutoCAD. These tutorials may be in the form of written instructions or recorded videos, allowing students to follow along and practice using the software. By following these tutorials, students will gain a comprehensive understanding of AutoCAD's features and how to effectively utilize them in engineering drawing.
3. **Project-Based Learning:** A significant component of the course will involve project-based learning, where students will be assigned a comprehensive project that integrates engineering drawing principles with AutoCAD. Students will be tasked with creating a complete drawing or design, applying the concepts learned in class to solve real-world design challenges. Through these projects, students will develop problem-solving skills, critical thinking abilities, and a deeper understanding of the practical applications of engineering drawing using AutoCAD.
4. **Peer Collaboration and Review:** Collaborative learning will be encouraged through peer collaboration and review sessions. Students will have the opportunity to work in pairs or small groups, reviewing each other's AutoCAD drawings and providing constructive feedback. This strategy fosters a supportive learning environment where students can share their insights, exchange ideas, and learn from different perspectives. By engaging in peer collaboration, students will enhance their communication, teamwork, and analytical skills, while also refining their understanding of AutoCAD techniques.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	93	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	6..2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

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

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
<b>1</b>	Introduction to engineering drawing, introduction about Auto CAD 2D software in engineering drawing. Limits, grid, object snap, view menu (zoom, pan).
<b>2&amp;3</b>	Draw menu (line, poly line, polygon, rectangle, arc, circle, point, text).
<b>4&amp;5</b>	Modify menu(erase, copy, mirror, offset, move, rotate, trim, extend, explode)
<b>6&amp;7&amp;8</b>	Perspective
<b>9</b>	Orthographic projection
<b>10</b>	First and third angle projection method
<b>11</b>	Draw the projection with the first angle projection method
<b>12</b>	Draw the projection with the third angle projection method
<b>13</b>	Drawing the three projection with the first and third angle projection method
<b>14,15</b>	Configuration of a printing layout and the print configuration and scale of printing
<b>Week 16</b>	Preparatory week before the final Exam

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Introduction to Engineering Drawing and AutoCAD Basics
<b>Week 2,3</b>	Mastering Limits, Grid, and Object Snap in AutoCAD
<b>Week 4,5</b>	Exploring Drawing Tools - Lines, Shapes, and Text
<b>Week6</b>	Manipulating Drawings - Modify Menu Techniques
<b>Week 7,8,9</b>	Perspective and Orthographic Projection
<b>Week10,11</b>	First Angle Projection Method - Drawing Projections
<b>Week 12,13</b>	Third Angle Projection Method - Drawing Projections
<b>Week 14</b>	Drawing the Three Projections - First and Third Angle Projection
<b>Week 15</b>	Configuring Printing Layout and Print Scale

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>• "Technical Drawing with Engineering Graphics" by Frederick E. Giesecke, Alva Mitchell, Henry C. Spencer, Ivan L. Hill, John T. Dygdon, and James E. Novak</li> <li>• "Engineering Graphics Essentials with AutoCAD 2022 Instruction" by Kirstie Plantenberg</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>• "AutoCAD 2022 for Beginners" by CADFolks</li> <li>• "AutoCAD 2022 Tutorial Second Level 3D Modeling" by Randy H. Shih</li> </ul>	Yes
<b>Websites</b>	<ul style="list-style-type: none"> <li>• <a href="http://www.engineeringgraphics.org">www.engineeringgraphics.org</a></li> <li>• <a href="http://www.udemy.com">www.udemy.com</a></li> </ul>	

## Grading Scheme

### مخطط الدرجات

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





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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>English Language</b>		Module Delivery
Module Type	<b>BASIC</b>		Theory Lecture Seminar
Module Code	<b>NTU101</b>		
ECTS Credits	<b>3</b>		
SWL (hr/sem)	<b>75</b>		
Module Level	1	Semester of Delivery	1
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<b>Module Objectives</b> أهداف المادة الدراسية	<ol style="list-style-type: none"><li>1.Enhance reading comprehension skills.</li><li>2.Develop writing proficiency.</li><li>3.Improve listening comprehension.</li><li>4.Enhance speaking and oral communication skills.</li><li>5.Expand vocabulary and idiomatic expressions.</li><li>6.Develop critical thinking skills.</li><li>7.Foster cultural awareness</li></ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p><b>At the end of this module students will be able to:</b></p> <ol style="list-style-type: none"><li>1. Have improved their overall proficiency in English, including speaking, listening, reading, and writing skills.</li><li>2. Have a solid understanding of English grammar rules and be able to apply them correctly in their spoken and written communication.</li><li>3. Expanded their vocabulary and be able to use a wider range of words and phrases in their speech and writing.</li><li>4. Understand and extract information from various written and spoken texts, such as articles, essays, conversations, and presentations.</li><li>5.Students will have improved their reading comprehension skills, including skimming, scanning, and critical reading.</li><li>6.Enhanced their listening skills, including understanding spoken English in different accents and contexts.</li><li>7.Use English for practical purposes, such as making inquiries, giving directions, writing emails, and engaging in social interactions.</li></ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<ol style="list-style-type: none"><li><b>1. Introduction to English and Language Skills:</b><ul style="list-style-type: none"><li>● Course overview and expectations</li><li>● Importance of English language skills</li><li>● Language learning strategies</li></ul></li><li><b>2. Reading Skills Development:</b><ul style="list-style-type: none"><li>● Effective reading strategies</li><li>● Textual analysis and interpretation</li><li>● Vocabulary building through reading</li></ul></li><li><b>3. Writing Skills Development:</b><ul style="list-style-type: none"><li>● Basic principles of writing</li><li>● Sentence structure and paragraph development</li><li>● Grammar and punctuation review</li><li>● Essay writing techniques</li></ul></li><li><b>4. Listening Skills Development:</b><ul style="list-style-type: none"><li>● Active listening skills</li><li>● Note-taking strategies</li><li>● Understanding different accents and speech patterns</li></ul></li><li><b>5. Speaking Skills Development:</b><ul style="list-style-type: none"><li>● Oral communication techniques</li><li>● Pronunciation and intonation practice</li><li>● Presentations and public speaking exercises</li></ul></li></ol>

	<p><b>6.Vocabulary Expansion:</b></p> <ul style="list-style-type: none"> <li>● Learning new words and phrases</li> <li>● Contextual usage and word relationships</li> <li>● Idiomatic expressions and colloquial language</li> </ul> <p><b>7.Grammar Review and Application:</b></p> <ul style="list-style-type: none"> <li>● Parts of speech and sentence structure</li> <li>● Verb tenses and agreement</li> <li>● Common grammatical errors and their correction</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	The course will be assessed through a combination of examinations, assignments, presentations, and projects. The assessment methods may include written tests, research papers, technical reports, oral presentations, and participation in class activities.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	32	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	2.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.9
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>75</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	<b>Assignments</b>	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	<b>Projects</b>	1	10% (10)	Continuous	All
	<b>Report</b>	1	10% (10)	13	LO #5, #8 and #10
	<b>Midterm Exam</b>	1hr	10% (10)	7	LO #1 - #7

<b>Summative assessment</b>	<b>Final Exam</b>	2hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1,2</b>	Introduction to English and Language Skills
<b>Week 3,4</b>	Reading Skills Development
<b>Week 5,6</b>	Writing Skills Development
<b>Week 7,8</b>	Listening Writing Skills Development
<b>Week 9,10</b>	Speaking Skills Development
<b>Week 11,12,13</b>	Vocabulary Expansion
<b>Week 14,15</b>	Grammar Review and Application
<b>Week 16</b>	Preparatory week before the Final Exam

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>" The language of chemical engineering in English, Roy V. Hughson</li> <li>New headway plus (English Course), Liz &amp; John Soars</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>Life Lines workbook (Pre-intermediate and Intermediate level), Tom Hutchinson ,Oxford University press.</li> <li>English in a simplified way, Tahir Al- Bayati</li> </ul>	Yes
<b>Websites</b>	<ul style="list-style-type: none"> <li><a href="https://www.bbc.co.uk/learningenglish/">https://www.bbc.co.uk/learningenglish/</a></li> <li><a href="https://www.englishcentral.com">https://www.englishcentral.com</a></li> </ul>	

## Grading Scheme

### مخطط الدرجات

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<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 – 100	Outstanding Performance
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Module Information			
معلومات المادة الدراسية			
Module Title	الديمقراطية وحقوق الانسان		Module Delivery
Module Type	BASIC		Theory Lecture Seminar
Module Code	NTU100		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	1	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. فهم تطور حقوق الإنسان: تهدف المادة إلى تزويد الطلاب بفهم شامل لتاريخ حقوق الإنسان من المجتمعات البدائية وحتى القوانين الوضعية والتنظيم الدولي. يتم توضيح العوامل التي أدت إلى تطور حقوق الإنسان على مر العصور وتأثيرها على المجتمعات المختلفة.</li> <li>2. التعرف على أنواع حقوق الإنسان: تعريف الطلاب بالمفاهيم الأساسية لحقوق الإنسان وتقسيماتها. يتم استكشاف حقوق الإنسان الفردية والجماعية وفهم أهميتها في بناء مجتمع عادل ومتوازن.</li> <li>3. التحليل المقارن بين الشريعة والقانون: تناول مقارنة مفصلة بين المبادئ القانونية والشرعية فيما يتعلق بحقوق الإنسان. يتعرف الطلاب على الأسس الشرعية والقانونية للحريات العامة ويتعلمون كيفية تطبيقها في السياق القانوني والشرعي.</li> <li>4. فهم أسس الديمقراطية: مناقشة مفهوم الديمقراطية وأركانها ومركزاتها. يتعلم الطلاب عن نماذج الديمقراطية المختلفة وكيفية تحقيقها وتعزيزها في النظم السياسية.</li> <li>5. التعرف على موقف الإسلام من حقوق الإنسان والديمقراطية: تعلم المواقف والآراء الإسلامية التقليدية والمعاصرة تجاه حقوق الإنسان والديمقراطية. يتم مناقشة قضايا مثل موقف الإسلام من حقوق المرأة وحرية العقيدة وتطور الخطاب الإسلامي في هذا السياق.</li> <li>6. تطوير الوعي القانوني والأخلاقي: تعزيز الوعي القانوني والأخلاقي لدى الطلاب فيما يتعلق بحقوق الإنسان والديمقراطية. يتم تشجيع الطلاب على التفكير النقدي والتحليلي واتخاذ القرارات المستنيرة والأخلاقية في مجال حقوق الإنسان.</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>أولاً: حقوق الإنسان</p> <ul style="list-style-type: none"> <li>● فهم التطور التاريخي لحقوق الإنسان منذ المجتمعات البدائية ومرحلة ما قبل التاريخ إلى الحضارات الشرقية والغربية.</li> <li>● التعرف على دور الشرائع السماوية والديانات الرئيسية في تطور حقوق الإنسان.</li> <li>● فهم أهمية القوانين الوضعية والتنظيم الدولي في تعزيز حقوق الإنسان.</li> </ul> <p>ثانياً: الديمقراطية</p> <ul style="list-style-type: none"> <li>● التعرف على مفهوم الحريات العامة وأسسها اللغوية والتاريخية والقانونية والشرعية.</li> <li>● فهم أهمية العدالة والمساواة والحرية في بناء مجتمع ديمقراطي.</li> <li>● التعرف على حقوق الرأي والفكر والإعلام والمساواة كأهم حقوق الإنسان الوصفية.</li> <li>● فهم الموقف الإسلامي من حقوق المرأة وحرية العقيدة.</li> <li>● التعرف على مفهوم النظم السياسية وأنواعها وشرعيتها.</li> <li>● فهم النظام الديمقراطي وتعريفه ومكوناته وأركانه.</li> <li>● التعرف على أنماط الديمقراطية المختلفة وكيفية التحول إلى الديمقراطية.</li> <li>● فهم أنظمة الإدارة المركزية واللامركزية والتحديات التي تواجه النظام الديمقراطي.</li> <li>● التعرف على موقف الإسلام من الديمقراطية من خلال الخطاب التقليدي والخطاب المعاصر</li> </ul>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>أولاً: حقوق الإنسان</p> <p>القسم الأول: التطور التاريخي لحقوق الإنسان</p> <ul style="list-style-type: none"> <li>● المجتمعات البدائية</li> </ul>

- مرحلة ما قبل التاريخ
- الحضارات الشرقية (بلاد وادي الرافدين والحضارة الفرعونية نموذجًا)
- الحضارات الغربية (اليونانية والرومانية نموذجًا)
- القسم الأول: التطور التاريخي لحقوق الإنسان (متابعة)
  - الشرائع السماوية
  - الديانة اليهودية
  - الديانة المسيحية
  - الديانة الإسلامية (بصورة أكثر تفصيلاً)
- القسم الأول: التطور التاريخي لحقوق الإنسان (استكمال)
  - تطور حقوق الإنسان في القوانين الوضعية
  - نظرية العقد الاجتماعي
  - الحروب العالمية وأثرها في حقوق الإنسان
  - التنظيم الدولي
- القسم الثاني: حقوق الإنسان التعريف وأنواعها
  - التحديد والتعريف
  - الحق في الفقه الإسلامي
  - الحق في الفقه القانوني
  - تعريف حقوق الإنسان
- القسم الثاني: حقوق الإنسان التقسيمات (وتتم بدراسة مفصلة ومقارنة بين القانون والشريعة الإسلامية)
  - الحقوق الجماعية (حق تقرير المصير، حق التنمية، الحق في بيئة مناسبة، حق الإنسان في العيش بسلام)
  - الحقوق الفردية (الحقوق الاقتصادية والثقافية، الحقوق المدنية والسياسية، الحقوق الصيغة بالشخصية)
- القسم الثالث: ضمانات احترام وحماية حقوق الإنسان
  - الضمانات في الشريعة الإسلامية
- القسم الثالث: ضمانات احترام وحماية حقوق الإنسان (استكمال)
  - الضمانات على الصعيد الوطني

## ثانياً : الديمقراطية

### ❖ الحريات العامة بين الشريعة والقانون

قسم 1: المقدمة



قسم 2: التعريف بالحرريات العامة

الأصل اللغوي

الأصل التاريخي

الأساس القانوني

الأساس الشرعي

قسم 3: أسس الحرريات العامة

العدالة

المساواة

الحرية

قسم 4: الحرريات العامة الوصفية

حرية الرأي

حرية الفكر

حرية الإعلام

المساواة

قسم 5: الشريعة الإسلامية والحرريات العامة

موقف الإسلام من المرأة (الميراث، الزواج، تولي الوظائف)

موقف الإسلام من حرية العقيدة

## ❖ نظم إدارة الدولة

القسم الاول: في تحديد النظم السياسية

● فكرة النظام السياسي

● شرعية النظم السياسية

● أنواع النظم السياسية

القسم الثاني : في النظام الديمقراطي

● مقدمة تأصيلية

● تعريف الديمقراطية

● أركان ومرتكزات النظام الديمقراطي

القسم الثالث: نماذج الديمقراطية

● الديمقراطية المباشرة

● الديمقراطية غير المباشرة

● الديمقراطية شبه المباشرة

● كيف يتم التحول إلى الديمقراطية

القسم الرابع : الديمقراطية ونظم إدارة الدولة

● النظام المركزي

● النظام اللامركزي

	<ul style="list-style-type: none"> <li>● إشكاليات النظام الديمقراطي</li> <li>القسم الخامس: موقف الإسلام من الديمقراطية</li> <li>● الخطاب الإسلامي التقليدي</li> <li>● الخطاب الإسلامي المعاصر</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<ul style="list-style-type: none"> <li>● المناقشة والتفكير النقدي لمفردات المادة</li> <li>● استخدام اسلوب مجموعات التركيز المصغرة لمناقشة مفردات المادة</li> <li>● استخدام طريقة لعب الادوار في (الصفية او الحضورية فقط) تناول وشرح بعض مفردات المادة</li> <li>● كتابة اوراق تحليلية لمفردات المادة او خارجها والتي لها علاقة مباشرة بمواضيع حقوق الانسان والديمقراطية</li> </ul>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	32	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	2.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.9
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>75</b>		

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

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

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	Material Covered
Week 1,2	(حقوق الإنسان - التطور التاريخي لحقوق الإنسان (مراحل التاريخ والحضارات
Week 3,4	(حقوق الإنسان - التطور التاريخي لحقوق الإنسان (الشرائع السماوية والديانات
Week 5	(حقوق الإنسان - التطور التاريخي لحقوق الإنسان (التطور في القوانين الوضعية والتنظيم الدولي
Week 6	حقوق الإنسان - تعريف حقوق الإنسان
Week 7	حقوق الإنسان - القسم الثاني: حقوق الإنسان التقسيمات :
Week 8	حقوق الإنسان - ضمانات احترام وحماية حقوق الإنسان
Week 9,10	الديمقراطية - الحريات العامة
Week 11,12	الديمقراطية - أسس الحريات العامة
Week 13	الديمقراطية - الشريعة الإسلامية والحريات العامة
Week 14,15	نظم إدارة الدولة
Week 16	The preparation week before the final Exam

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	السندي, ناز. بدرخان. (2012). حقوق الانسان والديمقراطية. كلية التربية ابن رشد للعلوم الانسانية جامعة بغداد.	Yes
Recommended Texts	هادي, رياض عزيز. (2005). حقوق الانسان ( تطورها. مضامينها. حمايتها ) ((بغداد	No

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



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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>MATHMATICS</b>		Module Delivery
Module Type	Support		Theory Lecture Tutorial Seminar
Module Code	TEMO100		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>1. Develop students' conceptual understanding of single variable functions in terms of integration applications and techniques, differential equations (elementary), sequences and series, and parametric and polar curves.</p> <p>2. Train students to efficiently perform fundamental calculations involved in these topics.</p> <p>3. Introduce engineering-related applications of this knowledge and skills.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>After the completion of this course, the students will be able to:</p> <p>1. Effectively write mathematical solutions in a clear and concise manner.</p> <p>2. Demonstrate ability to think critically by recognizing patterns and, determining and using appropriate techniques for solving a variety of integration and differentiation problems.</p> <p>3. Demonstrate ability to think critically by setting up and solving application problems involving definite integrals.</p> <p>4. Demonstrate an intuitive and computational understanding for calculus applications by solving a variety of problems from physics, engineering, and mathematics</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p><b>1. Prerequisites for Calculus:</b> Coordinates and Graphs in the Plane, Slope, and Equations for Lines, Functions and Their Graphs, Shifts, Circles and Parabolas, Trigonometric Function, Absolute Values and Target Values</p> <p><b>2. Limits and Continuity:</b> Limits and Continuity Properties, limits involving infinity, Limits, The Sandwich Theorem and <math>(\sin\theta)/\theta</math>, Limits involving Infinity, Continuous Functions, Defining Limits Formally with Epsilons</p> <p><b>3. Derivatives:</b> Slopes, Tangent Lines and Derivatives, Differentiation Rules, Velocity, Speed and other Rates of Change, Derivatives of trigonometric Functions, Chain Rule, Implicit Differentiation and Fractional Powers, Linear Approximations and Differentials, Newton's Method for Approximating Solutions.</p> <p><b>4. Applications of Derivatives:</b> Related Rates of Change, Maxima, Minima and the Mean value Theorem, Curve Sketching with <math>y'</math> and <math>y''</math>, Graphing Rational Functions-Asymptotes and Dominant Terms, Antiderivatives, Initial Value Problems and Mathematical Modeling.</p> <p><b>5. Integration:</b> Calculus and Area, Formulas for Finite Sums, Definite Integrals, Fundamental Theorems of Integral Calculus, Indefinite Integrals, Integration by Substitution, Numerical Integration, Introduction to Logarithms Exponentials</p> <p><b>6. Applications of Definite Integrals:</b> Area between Curves, Volumes of solid of Revolution, Cylindrical Shells, Lengths of Curves in the plane, Areas of Surfaces of Revolution, Work, Fluid Pressures and Fluid Forces, Centers of Mass</p> <p><b>7. The Calculus of Transcendental Functions:</b> Inverse Functions and their Derivatives, <math>\ln x</math>, <math>e^x</math> and Logarithmic Differentiation, Other Exponential and logarithmic Functions, Growth and Decay, Indeterminate Forms and l'Hopital's Rule, Rate at which Functions Grow, Inverse Trigonometric Functions, Derivatives of Inverse Trigonometric Functions, Related Integrals, Hyperbolic Functions</p>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<ul style="list-style-type: none"> <li>● Provide a clear and concise overview of the key concepts of Mathematics.</li> <li>● Use a variety of teaching methods, including lectures, demonstrations, and hands-on activities, to engage students and help them understand the material.</li> <li>● Encourage students to participate in class discussions and activities.</li> <li>● Provide opportunities for students to apply what they have learned to solve real-world problems.</li> <li>● Assess student learning through a variety of methods, including quizzes, exams, and projects.</li> </ul>
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## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	62	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.9
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1,2</b>	Prerequisites for Calculus
<b>Week 3,4</b>	Limits and Continuity
<b>Week 5,6,7</b>	Derivatives
<b>Week 8,9</b>	Applications of Derivatives
<b>Week 10,11</b>	Integration
<b>Week 12,13,14</b>	Applications of Definite Integrals
<b>Week 15</b>	The Calculus of Transcendental Functions
<b>Week 16</b>	Preparatory week before the final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>• "Calculus" by James Stewart</li> <li>• "Calculus: Early Transcendental" by Howard Anton, Irl Bivens, and Stephen Davis</li> <li>• "Calculus" by Michael Spivak</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>• "Calculus: Concepts and Contexts" by James Stewart</li> <li>• "Calculus Made Easy" by Silvanus P.</li> </ul>	Yes
<b>Websites</b>	<ul style="list-style-type: none"> <li>• <a href="http://www.calculus.org/">http://www.calculus.org/</a></li> <li>• <a href="https://www.calculus-help.com">https://www.calculus-help.com</a></li> <li>• <a href="http://tutorial.math.lamar.edu/Classes/Calcl/Calcl.aspx">http://tutorial.math.lamar.edu/Classes/Calcl/Calcl.aspx</a></li> </ul>	



## Grading Scheme

### مخطط الدرجات

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



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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Principles of Chemical Engineering		Module Delivery
Module Type	Core		Theory Lecture Tutorial
Module Code	ECTP100		
ECTS Credits	10		
SWL (hr/sem)	200		
Module Level	1	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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	
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<b>Module Aims, Learning Outcomes and Indicative Contents</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
<b>Module Objectives</b> أهداف المادة الدراسية	The objective of this course is to present an introduction to chemical engineering calculations, establish mathematical methodologies for the computation of material balances, and present an overview of industrial chemical processes. The course reviews the fundamentals of chemistry and physics as they pertain to chemical problems and applies mathematics to the development of time-dependent equations to describe materials flow through a process. Examples of the processes studied include stoichiometry in combustion and other reactions, and materials flow with recycle stream.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1) Identify and understand the unit operations involved in a process, draw flowcharts, and develop relationships between process variables.</li> <li>2) Perform simple degree-of-freedom analysis to identify the number of unknowns relating to mass, mass flow rate, composition and energy, and develop the linearly independent mass needed to determine unknown quantities.</li> <li>3) Convert from SI unit to British unit system and vice versa.</li> <li>4) Understand the dimension concept, Understand of conversion coefficient concept, and use conversion coefficient.</li> <li>5) Create representative process flow diagrams and use them to organize systems of equations.</li> <li>6) Formulate material balances to solve for compositions and flow rates of process streams.</li> <li>7) Incorporate single and multiple reactions into unit operations within chemical processes.</li> <li>8) Understanding of the degrees of freedom analysis and its significance.</li> <li>9) Ability to make material balances on unit operations and processes.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"> <li>1) <b>Introduction</b></li> <li>2) What Are Chemical Engineering?</li> <li>3) A Brief History of Chemical Engineering</li> <li>4) Where Do Chemical Engineer Work?</li> <li>5) <b>Units and Dimensions:</b> <ul style="list-style-type: none"> <li>● Introduction to units and dimensions</li> <li>● Conversion of units</li> <li>● Dimensional analysis</li> </ul> </li> <li>6) <b>Material Balances:</b> <ul style="list-style-type: none"> <li>● Basis of calculation</li> <li>● Balances on single and multiple units</li> <li>● Balances involving reactions</li> <li>● Recycle and bypass streams</li> </ul> </li> </ol>

	<p><b>7) Stoichiometry:</b></p> <ul style="list-style-type: none"> <li>● Mole and mass relationships in chemical reactions</li> <li>● Limiting reactant calculations</li> <li>● Percent yield calculations</li> </ul> <p><b>8) General Strategy for Solving Material Balance Problems.</b></p> <p><b>9) Solving Material Balance Problems for Single Units without Reaction.</b></p> <p><b>10) The Chemical Equation and Stoichiometry.</b></p> <p><b>11) Material Balances for Processes Involving Reaction.</b></p> <p><b>12) Material Balance Problems Involving Multiple Units.</b></p> <p>Recycle, Bypass, and Purge and the Industrial Application of Material Balances</p> <p><b>13) Gases, Vapors</b></p> <ul style="list-style-type: none"> <li>● Ideal Gases</li> <li>● The Ideal Gas Law</li> <li>● Ideal Gas Mixtures and Partial Pressure</li> <li>● Material Balances and Energy balances Involving Ideal Gases</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	77	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	123	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	8.2
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>200</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Units Dimensions and the conversion
Week 2	Moles density and concentration
Week 3	Choosing a basic temperature and pressure
Week 4	Introduction to material balances
Week 5	Solving material balance problems for single units without reaction
Week 6	The chemical reaction equations and stoichiometry
Week 7	Material balances for processes involving reaction by species material balances
Week 8	Material balances for processes involving reaction by element material balances
Week 9	Material balances for processes involving combustion
Week 10	Material balances for processes involving recycling without chemical reaction
Week 11	Material balances for processes involving recycling with chemical reaction
Week 11	Gases and Vapors Ideal gas law, Ideal gas mixtures
Week 12	Ideal gases material balance and Energy balance
Week 13	Real gases: compressibility
Week 14-15	Real gas : equation of state

Week 16	Final Exam
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Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"> <li>David M. Himmelblau and James B. Riggs, "Basic Principles and Calculations in Chemical Engineering", Seventh Edition, (2004).</li> </ul>	
Recommended Texts	<ul style="list-style-type: none"> <li>Richard M. Felder and Ronald W. Rousseau, "Elementary Principles of Chemical Processes", Third Edition, (1999).</li> <li>David M. Himmelblau, "Basic Principles and Calculations in Chemical Engineering", Sixth Edition, (1996).</li> <li>David M. Himmelblau, "Basic Principles and Calculations in Chemical Engineering", Fifth Edition, (1989)</li> </ul>	
Websites		

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

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



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Technical Engineering College-Mosul  
Engineering Technological for Chemical and  
Petroleum Industries



## MODULE DESCRIPTOR FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Arabic Language</b>		Module Delivery
Module Type	<b>Support</b>		Theory Lecture Seminar
Module Code	<b>NTU200</b>		
ECTS Credits	<b>2</b>		
SWL (hr/sem)	<b>50</b>		
Module Level	1	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. تعلم قواعد الكتابة والإملاء بدقة في اللغة العربية.</li> <li>2. اكتساب مهارات التمييز بين الحروف المشددة والمقصورة واستخدامها بشكل صحيح.</li> <li>3. فهم واستخدام صحيح للحروف الضاد والطاء والهمزة والحروف الشمسية والقمرية.</li> <li>4. تطوير مهارات الكتابة والتواصل اللغوي واستخدام العلامات الترتيبية بفعالية.</li> <li>5. تعلم مفاهيم الجمل والمفاعيل والعدد وقواعد حروف الجر وكتابة الخطابات الإدارية بمهنية.</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>بناءً على المواضيع المذكورة، يمكن تلخيص ما يتعلمه الطالب في نهاية الكورس على النحو التالي:</p> <ul style="list-style-type: none"> <li>● مهارات الكتابة: يكتسب الطالب مهارات أساسية للكتابة العربية، بما في ذلك قواعد الكتابة، والتفرقة بين الأحرف المشددة والمقصورة، واستخدام العلامات الترتيبية بشكل صحيح.</li> <li>● النطق والإملاء: يتعلم الطالب كيفية نطق واستخدام الحروف الصوتية العربية مثل الضاد والطاء بدقة، وكذلك كتابة الهمزة في الكلمات.</li> <li>● القواعد اللغوية: يستفيد الطالب من معرفة القواعد اللغوية الأساسية مثل الأجزاء الأساسية للجمل والمفاعيل والعدد.</li> <li>● التفرقة بين الشمسية والقمرية: يتعرف الطالب على الحروف الشمسية والقمرية ويتعلم استخدامها بشكل صحيح.</li> <li>● مهارات الكتابة الإدارية: يكتسب الطالب مهارات كتابة الخطابات الإدارية بشكل محترف ويصبح قادرًا على التفاعل بفعالية في بيئة عمل إدارية.</li> </ul>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"> <li>1. قواعد كتابة الالف الممدودة والمقصورة – الحروف الشمسية والقمرية</li> <li>2. الضاد والطاء</li> <li>3. كتابة الهمزة</li> <li>4. علامات الترتيب</li> <li>5. الاسم والفعل والتفريق بينهما</li> <li>6. المفاعيل</li> <li>7. العدد</li> <li>8. تطبيقات الأخطاء اللغوية الشائعة</li> <li>9. النون والتنوين. معاني حروف الجر</li> </ol>
	<ol style="list-style-type: none"> <li>10. الجوانب الشكلية للخطاب الإداري</li> <li>11. لغة الخطاب الإداري</li> <li>12. نماذج من المراسلات الإدارية</li> </ol>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<p><b>Strategies</b></p>	<p>سيتم تقييم المقرر الدراسي من خلال مجموعة متنوعة من الامتحانات والواجبات والعروض والمشاريع. قد تشمل أساليب التقييم اختبارات مكتوبة، أبحاث علمية، تقارير تقنية، عروض شفوية، والمشاركة في أنشطة الصف.</p>
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Student Workload (SWL)			
الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	32	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	2.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	68	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	4.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>50</b>		

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

Delivery Plan (Weekly Syllabus)		
المنهاج الاسبوعي النظري		
Material Covered		
مقدمة عن الأخطاء اللغوية – التاء المربوطة والطويلة والتاء المفتوحة		الاسبوع الاول
قواعد كتابة الالف الممدودة والمقصورة – الحروف الشمسية والقمرية		الاسبوع الثاني
الضاد والطاء		الاسبوع الثالث
كتابة الهمزة		الاسبوع الرابع
علامات الترقيم		الاسبوع الخامس
الاسم والفعل والتفريق بينهما		الاسبوع السادس
المفاعيل		الاسبوع السابع

العدد	الاسبوع الثامن
تطبيقات الأخطاء اللغوية الشائعة	الاسبوع التاسع، العاشر
النون والتنوين . معاني حروف الجر	الاسبوع الحادي عشر
الجوانب الشكلية للخطاب الإداري	الاسبوع الثاني عشر
لغة الخطاب الإداري	الاسبوع الثالث عشر، الرابع عشر
نماذج من المراسلات الإدارية	الاسبوع الخامس عشر

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"> <li>6، الاملاء الواضح: عبد المجيد النعيمي، دحام الكيال، مكتبة دار المتنبى، بغداد ط</li> <li>دروس في اللغة والنحو والاملاء لموظفي الدولة : اسماعيل حمود عطوان واخرون مطبعة وزارة التربية رقم (3) بغداد، ط 2، 1984م.</li> </ul>	Yes
Recommended Texts	<ul style="list-style-type: none"> <li>اللغة العربية العامة لأقسام غير الاختصاص : عبد القادر حسن امين واخرون، وزارة التعليم العالي والبحث العلمي، ط 2، 2000م.</li> <li>من وحي الادب العربي: هفال محمد امين، مطبعة السعدون، بغداد.</li> </ul>	Yes
Websites	<ul style="list-style-type: none"> <li><a href="http://www.dalilalarab.com">www.dalilalarab.com</a></li> <li><a href="http://www.learningarabic.net">www.learningarabic.net</a></li> </ul>	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition

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



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Petroleum Industries



MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Computer Principles</b>		Module Delivery
Module Type	<b>BASIC</b>		Theory Lecture Lab Tutorial Practical
Module Code	<b>NTU102</b>		
ECTS Credits	<b>4</b>		
SWL (hr/sem)	<b>100</b>		
Module Level	<b>1</b>	Semester of Delivery	
Administering Department	<b>ETCP</b>	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<b>Module Objectives</b> أهداف المادة الدراسية	<ol style="list-style-type: none"><li>1.Familiarize students with the basic components and functions of a computer system.</li><li>2.To develop practical skills in using popular software applications for word processing, spreadsheets, and presentations.</li><li>3.To enable students to effectively browse the internet, search for information, and evaluate online resources.</li><li>4. Introduce students to computer security best practices and data management techniques.</li><li>5.To enhance students' digital communication skills through email, messaging, and online collaboration tools.</li><li>6. Promote critical thinking and problem-solving skills related to computer use</li></ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p><b>At the end of the semester the student should be able to:</b></p> <ol style="list-style-type: none"><li>1.Understand the basic components and functions of a computer system.</li><li>2.Explain the purpose and operation of major hardware components, such as the CPU, memory, storage devices, and input/output devices.</li><li>3.Identify and navigate various operating systems and understand their key features.</li><li>4.Demonstrate proficiency in using common software applications, including word processing, spreadsheets, and presentations.</li><li>5.Utilize basic file management techniques to organize and retrieve files and folders.</li><li>6.Recognize and apply essential computer security practices to protect personal data and systems.</li><li>7. Students will be familiar with common computer applications and tools, such as, web browsers and email clients.</li></ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<ol style="list-style-type: none"><li><b>1.Introduction to Computers:</b><ul style="list-style-type: none"><li>● Overview of computer hardware and software</li><li>● Understanding operating systems</li><li>● Computer peripherals and accessories</li></ul></li><li><b>2.Computer Basics and File Management:</b><ul style="list-style-type: none"><li>● Navigating the desktop and file organization</li><li>● Creating, copying, moving, and deleting files and folders</li><li>● Basic troubleshooting techniques</li></ul></li><li><b>3.Word Processing:</b><ul style="list-style-type: none"><li>● Creating and formatting documents</li><li>● Editing and proofreading text</li><li>● Inserting images, tables, and other elements</li></ul></li><li><b>4.Spreadsheets:</b><ul style="list-style-type: none"><li>● Creating, formatting, and modifying spreadsheets</li><li>● Working with formulas and functions</li><li>● Data visualization and chart creation</li></ul></li><li><b>5.Presentations:</b><ul style="list-style-type: none"><li>● Creating visually appealing slideshows</li><li>● Adding text, images, and multimedia elements</li><li>● Applying transitions and animations</li></ul></li></ol>

	<p><b>6. Internet Skills:</b></p> <ul style="list-style-type: none"> <li>● Navigating web browsers and search engines</li> <li>● Evaluating online information and sources</li> <li>● Understanding internet safety and privacy</li> <li>● Email and Online Communication:</li> <li>● Setting up and managing email accounts</li> <li>● Composing and organizing emails</li> </ul> <p><b>7. Computer Security and Data Management:</b></p> <ul style="list-style-type: none"> <li>● Best practices for password management and online security</li> <li>● Protecting against viruses and malware</li> <li>● Backing up and organizing digital files</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<ul style="list-style-type: none"> <li>● Provide a clear and concise overview of the key concepts of computer principles .</li> <li>● Use a variety of teaching methods, including lectures, demonstrations, and hands-on activities, to engage students and help them understand the material.</li> <li>● Encourage students to participate in class discussions and activities.</li> <li>● Provide opportunities for students to apply what they have learned to solve real-world problems.</li> <li>● Assess student learning through a variety of methods, including quizzes, exams, and projects.</li> </ul>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	100	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	6.6
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1,2</b>	Introduction to Computers
<b>Week 3,4</b>	Computer Basics and File Management
<b>Week 5,6,7</b>	Word Processing
<b>Week 8,9</b>	Spreadsheets
<b>Week 10,11,12</b>	Presentations
<b>Week 13,14</b>	Internet Skills
<b>Week 15</b>	Computer Security and Data Management
<b>Week 16</b>	Preparatory week before the Final Exam

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

	Material Covered
Week 1,2	<b>Introduction to Computers:</b> <ul style="list-style-type: none"><li>● Navigating the desktop and accessing programs</li><li>● Using the Start menu and taskbar</li><li>● Exploring computer hardware components</li><li>● Introduction to the operating system (e.g., Windows, macOS)</li></ul>
Week 3,4	<b>File Management</b> <ul style="list-style-type: none"><li>● Creating, renaming, copying, moving, and deleting files and folders</li><li>● Organizing files and folders into directories</li><li>● Using search tools to locate files</li><li>● Managing file extensions and file types</li></ul>
Week 5,6,7	<b>Word Processing:</b> <ul style="list-style-type: none"><li>● Creating a new document</li><li>● Formatting text (e.g., font, size, colour, style)</li><li>● Applying paragraph formatting (e.g., alignment, indentation, spacing)</li><li>● Inserting and formatting images, tables, and bullets</li><li>● Printing documents</li></ul>
Week 8,9	<b>Spreadsheets:</b> <ul style="list-style-type: none"><li>● Creating and saving a new spreadsheet</li><li>● Entering and formatting data in cells</li><li>● Using basic formulas and functions (e.g., sum, average, max, min)</li><li>● Creating charts and graphs from spreadsheet data</li><li>● Printing spreadsheet</li></ul>
Week 10,11,12	<b>Presentations:</b> <ul style="list-style-type: none"><li>● Creating a new presentation</li><li>● Formatting slides (e.g., layout, background, design)</li></ul>



	<ul style="list-style-type: none"> <li>• Adding text, images, and multimedia elements to slides</li> <li>• Applying transitions and animations to enhance presentation</li> <li>• Printing slides</li> </ul>
<b>Week 13,14</b>	<b>Internet Skills:</b> <ul style="list-style-type: none"> <li>• Navigating web browsers (e.g., Google Chrome, Mozilla Firefox)</li> <li>• Searching for information using search engines (e.g., Google, Bing)</li> <li>• Evaluating the credibility of online sources</li> <li>• Saving and organizing bookmarks/favorites</li> </ul>
<b>Week 15</b>	<b>Email and Online Communication:</b> <ul style="list-style-type: none"> <li>• Setting up and configuring an email account</li> <li>• Composing, replying to, and forwarding emails</li> <li>• Attaching files to email messages</li> <li>• Managing email folders and filters</li> </ul>
<b>Week 14,15</b>	<b>Computer Security and Data Management:</b> <ul style="list-style-type: none"> <li>• Creating strong passwords and managing password security</li> <li>• Installing and updating antivirus software</li> <li>• Backing up files and folders</li> <li>• Managing digital privacy settings and protecting personal information</li> </ul>
<b>Week 16</b>	<b>Preparatory week before the Final Exam</b>

<b>Learning and Teaching Resources</b>		
مصادر التعلم والتدريس		
	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>• "Discovering Computers" by Misty E. Vermaat, Susan L. Sebok, and Steven M. Freund</li> <li>• "Computer Concepts and Microsoft Office 365 &amp; Office 2019" by Misty E. Vermaat, Susan L. Sebok, and Steven M. Freund</li> <li>• "New Perspectives on Computer Concepts" by June Jamrich Parsons, Dan Oja, and Lisa Ruffolo</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>• "GO! with Microsoft Office 365, Word, Excel, PowerPoint &amp; Access" by Shelley Gaskin, Alicia Vargas, Debra Geoghan, and Nancy Graviett</li> </ul>	Yes

	<ul style="list-style-type: none"> <li>"Technology in Action" by Alan Evans, Kendall Martin, and Mary Anne Poatsy</li> </ul>	
<b>Websites</b>	www.khanacademy.org	

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



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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Electrical Circuits</b>		Module Delivery
Module Type	Support		Theory Lecture Lab Tutorial Practical
Module Code	TEMO102		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"><li>1. Gain a thorough understanding of basic elements of electrical circuits, including current sources, voltage sources, resistors, and Ohm's Law. Analyze series and parallel circuits and understand the loading effects on circuits.</li><li>2. Learn about current dividers and voltage dividers, and their applications in circuit analysis. Calculate the division of current and voltage in different circuit configurations.</li><li>3. Understand Kirchhoff's Laws (KCL and KVL) and apply them to solve DC circuits. Analyze complex circuits and determine currents and voltages.</li><li>4. Learn the loop currents and node voltages methods in DC circuit analysis. Apply these methods to solve circuits with multiple loops or nodes, providing a systematic approach to circuit analysis.</li><li>5. Explore the Superposition Theorem and Source Conversion Theorem in DC circuit analysis. Apply these theorems to simplify circuit analysis and solve complex circuits with multiple sources.</li><li>6. Understand AC circuits, sinusoidal waveforms, and their characteristics. Introduce phasors and the phasor representation of AC quantities for analyzing AC circuits.</li><li>7. Understand impedance in AC circuits and calculate reactance for inductive and capacitive elements. Understand the relationship between resistance, inductance, and capacitance in AC circuits.</li><li>8. Construct and interpret phasor diagrams to visualize magnitude and phase relationships in AC circuits. Learn phasor addition and subtraction techniques to analyze complex AC circuits.</li><li>9. Explore complex power in AC circuits, including real power, reactive power, and apparent power. Calculate complex power using phasor notation for understanding power flow and efficiency in AC circuits.</li><li>10. Delve into power factor and its significance in AC circuits. Calculate power factor using real and reactive power to assess the efficiency and quality of power consumption in electrical systems.</li><li>11. Analyze series and parallel AC circuits with resistive, inductive, and capacitive elements. Understand how impedance affects circuit behavior and learn techniques to effectively analyze and solve these types of circuits</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"><li>1. Students will gain a thorough understanding of basic elements of electrical circuits, including current sources, voltage sources, resistors, and Ohm's Law. They will learn how to analyze series and parallel circuits, and understand the loading effects on circuits.</li><li>2. Students will learn about current dividers and voltage dividers, and their applications in circuit analysis. They will understand how to calculate the division of current and voltage in different circuit configurations.</li><li>3. Students will be introduced to Kirchhoff's Laws, specifically Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL). They will learn how to</li></ol>

	<p>apply these laws to solve DC circuits, enabling them to analyze complex circuits and determine currents and voltages.</p> <ol style="list-style-type: none"> <li>4. Students will learn about the loop currents and node voltages methods in DC circuit analysis. They will understand how to apply these methods to solve circuits with multiple loops or nodes, providing a systematic approach to circuit analysis.</li> <li>5. Students will explore the Superposition Theorem and Source Conversion Theorem in DC circuit analysis. They will learn how to apply these theorems to simplify circuit analysis and solve complex circuits with multiple sources.</li> <li>6. Students will learn about AC circuits, including an introduction to sinusoidal waveforms and their characteristics such as amplitude, frequency, and period. They will also be introduced to phasors and the phasor representation of AC quantities, which will aid in analyzing AC circuits.</li> <li>7. Students will gain an understanding of impedance in AC circuits and the concept of reactance. They will learn how to calculate reactance for inductive and capacitive elements, as well as understand the relationship between resistance, inductance, and capacitance in AC circuits.</li> <li>8. Students will learn how to construct and interpret phasor diagrams, which will help visualize the magnitude and phase relationships in AC circuits. They will also learn phasor addition and subtraction techniques to analyze complex AC circuits.</li> <li>9. Students will explore complex power in AC circuits, including real power, reactive power, and apparent power. They will learn how to calculate complex power using phasor notation, which is crucial for understanding power flow and efficiency in AC circuits.</li> <li>10. Students will delve into power factor and its significance in AC circuits. They will learn how to calculate power factor using real and reactive power, helping them assess the efficiency and quality of power consumption in electrical systems.</li> <li>11. Students will analyze series and parallel AC circuits with resistive, inductive, and capacitive elements. They will understand how impedance affects circuit behavior and learn techniques to analyze and solve these types of circuits effectively.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"> <li>1. <b>Introduction to Electrical Circuits:</b> <ul style="list-style-type: none"> <li>● Basic elements of circuits</li> <li>● Current sources and voltage sources</li> <li>● Loading effects in circuits</li> <li>● Resistors and Ohm's Law</li> <li>● Series and parallel circuit analysis</li> </ul> </li> <li>2. <b>Current Dividers and Voltage Dividers:</b> <ul style="list-style-type: none"> <li>● Current divider's law and its applications</li> <li>● Voltage divider's law and its applications</li> </ul> </li> <li>3. <b>DC Circuit Analysis: Kirchhoff's Laws:</b> <ul style="list-style-type: none"> <li>● Kirchhoff's Current Law (KCL)</li> </ul> </li> </ol>

- Kirchoff's Voltage Law (KVL)
- Applying KCL and KVL to solve DC circuits

**4. DC Circuit Analysis: Loop Currents and Node Voltages Methods:**

- Introduction to loop currents and node voltages
- Applying loop currents and node voltages methods to solve DC circuits with multiple loops or nodes

**5. DC Circuit Analysis: Superposition Theorem and Source Conversion Theorem:**

- Superposition theorem and its application in DC circuits
- Source conversion theorem and its application in DC circuits

**6. DC Circuit Analysis: Thevenin and Norton Theorems and Maximum Power Theorem:**

- Thevenin theorem and its application in DC circuits
- Norton theorem and its application in DC circuits
- Maximum power transfer theorem in DC circuits

**7. AC Circuits: Introduction to Alternating Current:**

- Introduction to sinusoidal waveforms
- Characteristics of sinusoidal waveforms (amplitude, frequency, period)
- Phasors and phasor representation of AC quantities

**8. AC Circuit Analysis: Impedance and Reactance:**

- Introduction to impedance in AC circuits
- Understanding resistance, inductance, and capacitance
- Calculation of reactance for inductive and capacitive elements

**9. AC Circuit Analysis: Phasor Diagrams:**

- Construction and interpretation of phasor diagrams
- Phasor addition and subtraction for AC quantities

**10. AC Circuit Analysis: Complex Power:**

- Real power, reactive power, and apparent power in AC circuits
- Calculation of complex power using phasor notation

**11. AC Circuit Analysis: Power Factor:**

- Definition and significance of power factor
- Calculation of power factor using real and reactive power

**12. AC Circuit Analysis: Series and Parallel Impedances:**

- Analysis of series AC circuits with resistive, inductive, and capacitive elements
- Analysis of parallel AC circuits with resistive, inductive, and capacitive elements

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

#### Strategies

1. Use a combination of lectures, demonstrations, and hands-on activities to introduce and explain concepts.
2. Provide practical examples and real-world applications to enhance understanding.
3. Utilize visual aids, such as diagrams, graphs, and phasor diagrams, to enhance comprehension.
4. Assign regular homework and practice exercises to reinforce learning and provide opportunities for self-assessment.
5. Provide opportunities for students to engage in laboratory experiments to apply theoretical knowledge to practical scenarios.
6. Offer additional resources, such as textbooks, online tutorials, and supplementary readings, to support self-directed learning.
7. Provide timely feedback on assignments and assessments to guide students' progress and address any misconceptions.
8. Encourage students to collaborate and discuss concepts with their peers to foster a deeper understanding of the material.
9. Conduct periodic assessments, quizzes, and exams to evaluate students' knowledge and ensure comprehension of the course material.

## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	78	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Electrical Circuits
Week 2	Loading Effects in Circuits
Week 3	Current Dividers and Voltage Dividers
Week 4	DC Circuit Analysis: Kirchhoff's Laws
Week 5	DC Circuit Analysis: Loop Currents and Node Voltages Methods
Week 6	DC Circuit Analysis: Superposition Theorem and Source Conversion Theorem
Week 7	DC Circuit Analysis: Thevenin and Norton Theorems and Maximum Power Theorem
Week 8	AC Circuits: Introduction to Alternating Current
Week 9	AC Circuit Analysis: Impedance and Reactance
Week 10	AC Circuit Analysis: Phasor Diagrams
Week 11	AC Circuit Analysis: Complex Power
Week 12	AC Circuit Analysis: Power Factor
Week 13	AC Circuit Analysis: Series and Parallel Impedances
Week 14	AC Circuit Analysis: Series and Parallel Impedances (continued)
Week 15	Review and Practice
<b>Week 16</b>	<b>Preparatory week before the final Exam</b>



## Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to Circuit Components
Week 2	Ohm's Law
Week 3	Current and Voltage Divider Circuits
Week 4	Kirchhoff's Laws
Week 5	Analysis of Multi-Loop Circuits
Week 6	Superposition Theorem Application
Week 7	Thevenin and Norton Equivalent Circuits
Week 8	AC Voltage and Frequency Measurement
Week 9	Measurement of Impedance in AC Circuits
Week 10	Phasor Diagram Construction
Week 11	Measurement of Power in AC Circuits
Week 12	Power Factor Correction
Week 13	Analysis of Series AC Circuits
Week 14	Analysis of Parallel AC Circuits
Week 15	Comprehensive Circuit Analysis
<b>Week 16</b>	The preparation week before the final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
<b>Recommended Texts</b>	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
<b>Websites</b>	<a href="https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering">https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering</a>	

## Grading Scheme

### مخطط الدرجات

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



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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Engineering Mechanics &amp; Strength of Materials</b>		Module Delivery
Module Type	Support		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ETCP102		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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	

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**Module Aims, Learning Outcomes and Indicative Contents**

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. Understand the theory of friction and its practical applications, particularly friction on inclined planes.</li> <li>2. Enable students to determine the centroid and center of gravity of various objects and structures.</li> <li>3. Provide students with the ability to calculate and interpret moment of inertia values for different shapes and axis configurations.</li> <li>4. introduce students to the concepts of stress and strain, as well as stress-strain diagrams.</li> <li>5. Familiarize students with the proportional limits, elastic limit, stiffness elasticity, plasticity, hardness, and working stress of materials. Students learn to determine the safe operating limits of materials and structures, ensuring they can withstand applied loads without experiencing excessive deformation or failure.</li> <li>6. Provide students with a fundamental understanding of hook's law, which describes the linear relationship between stress and strain in elastic materials.</li> <li>7. Introduce students to the concept of poisson ratio, volumetric stress, bulk modulus, and composite stresses</li> <li>8. Educate students about the effects of temperature variations on materials and structures.</li> <li>9. To enable students to analyze the internal forces and moments in beams, particularly shear and bending moments</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p><b>At the end of the semester the student should be able to:</b></p> <ol style="list-style-type: none"> <li>1. Understand the theory of friction and its practical applications, particularly on inclined planes.</li> <li>2. Determine the centroid and center of gravity of various objects and structures. Analyze equilibrium and calculate resultant forces.</li> <li>3. Calculate and interpret moment of inertia values for different shapes and axis configurations.</li> <li>4. Analyze the rotational behavior of objects and systems.</li> <li>5. Interpret stress-strain diagrams and analyze the mechanical behavior of materials.</li> <li>6. Identify and define proportional limits, elastic limit, stiffness elasticity, plasticity, hardness, and working stress.</li> <li>7. Determine the safe operating limits of materials and structures.</li> <li>8. Apply Hook's Law to analyze the linear relationship between stress and strain in elastic materials.</li> <li>9. Understand the concept of Poisson Ratio, volumetric stress, bulk modulus, and composite stresses.</li> <li>10. Analyze the effects of temperature variations on materials and structures. Consider thermal stress and thermal expansion coefficients in design.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"> <li><b>1. Friction:</b> Theory of Friction, friction on an inclined plane</li> <li><b>2. Centroid and Center of Gravity</b></li> <li><b>3. Moment of Inertia (Second moment of the axis):</b></li> </ol>

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	<p>Polar moment of inertia, Transfer formula for moment of inertia</p> <p><b>4. Introduction Force in Rigid Bodies.</b> Definitions of Stress and Strain, Stress-Strain Diagrams</p> <p><b>5. Proportional Limits.</b> Elastic limit, Stiffness elasticity, Plasticity, Hardness and working stress.</p> <p><b>6. Hook 's Law</b></p> <p><b>7. Poisson Ratio, Composite Stresses:</b> Volumetric Stress, Bulk Modulus, Thin Walled Cylinders</p> <p><b>8. Thermal Stress</b></p> <p><b>9. Shear and Bending Moments in Beam</b></p>
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**Learning and Teaching Strategies**

استراتيجيات التعلم والتعليم

<b>Strategies</b>	The course utilizes lectures, problem-solving sessions, laboratory work, tutorials, , case studies, assignments, assessments, online resources, and individual support to deliver theoretical concepts, encourage critical thinking, foster hands-on experience, promote collaboration and discussion, connect theory to real-world applications, assess understanding, provide online learning materials, and offer personalized guidance to students.
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**Student Workload (SWL)**

الحمل الدراسي للطلاب محسوب ل ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	93	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	6.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	57	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	3.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>150</b>		

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**Module Evaluation**

تقييم المادة الدراسية

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

**Delivery Plan (Weekly Syllabus)**

المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1,2</b>	Friction
<b>Week 3,4</b>	Centroid and Center of Gravity
<b>Week 5,6</b>	Moment of Inertia (Second moment of the axis)
<b>Week 7</b>	Introduction Force in Rigid Bodies
<b>Week 8</b>	Proportional Limits
<b>Week 9,10</b>	Hook 's Law
<b>Week 11,12</b>	Poisson Ratio, Composite Stresses
<b>Week 13,14</b>	Thermal Stress
<b>Week 15</b>	Shear and Bending Moments in Beam
<b>Week 16</b>	Preparatory week before the Final Exam

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**Delivery Plan (Weekly Lab. Syllabus)**

المنهاج الاسبوعي للمختبر

	<b>Material Covered</b>
<b>Week 1</b>	Tensile Test.
<b>Week 2</b>	Compression Test
<b>Week 3</b>	Hardness Test.
<b>Week 4</b>	Impact Test
<b>Week 5</b>	Torsion Test
<b>Week 6</b>	Wear Test Solve algebraic equations symbolically and numerically
<b>Week7</b>	Bending Test
<b>Week 8</b>	Shear Test
<b>Week 9</b>	Creep Test
<b>Week 10</b>	Fatigue Test
<b>Week 11</b>	Microscopy of Metals samples
<b>Week 12</b>	Microscopy of Alloys samples
<b>Week 13</b>	Tensile Test of composite materials
<b>Week 14</b>	Impact Test of composite materials
<b>Week 15</b>	Bending Test of composite materials
<b>Week 16</b>	Preparatory week before the Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<b>Technical Engineering College-Mosul Engineering Technological for Chemical and Petroleum Industries</b> <ul style="list-style-type: none"><li>• Engineering Mechanic-Statics and Dynamics volume 1; Higdon, A. and Stiles, W.B.</li><li>• Strength of Materials; Singer, F.L. and Pytel, A., 3<sup>ed</sup> Edition, Harper and Row, London.</li></ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"><li>• "Materials Science and Engineering: Properties" by Charles Gilmore</li></ul>	Yes
<b>Websites</b>	<ul style="list-style-type: none"><li>• <a href="http://www.asminternational.org">www.asminternational.org</a></li></ul>	

Grading Scheme



**Ministry of Higher Education and  
Scientific Research - Iraq**

مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 – 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 – 89	Above average with some errors
	<b>C - Good</b>	جيد	70 – 79	Sound work with notable errors
	<b>D - Satisfactory</b>	متوسط	60 – 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 – 59	Work meets minimum criteria
<b>Fail Group (0 – 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	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  
Northern Technical University  
Technical Engineering College-Mosul  
Engineering Technological for Chemical and  
Petroleum Industries



## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	General Chemistry		Module Delivery
Module Type	CORE		Theory Lecture Lab Practical Seminar
Module Code	ETCP101		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<b>Module Objectives</b> أهداف المادة الدراسية	The aim of this module is to: <ol style="list-style-type: none"><li>1- Have a perspective of the scope of modern general chemistry and its implication for society.</li><li>2- Have an understanding of the scientific methods and how it is used to answer questions in science.</li><li>3- Display mastery of these concepts of chemistry needed to success in upper level petroleum engineering courses.</li></ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<b>Students will learn to use the language of chemistry:</b> <ol style="list-style-type: none"><li>1. Understand the periodic table and the arrangement of elements, including their properties and trends.</li><li>2. Gain knowledge and skills in analytical chemistry, which involves the identification and quantification of substances.</li><li>3. Learn about titrimetric analysis and titration, which are techniques used to determine the concentration of a substance in a solution.</li><li>4. Explore organic chemistry, including the study of organic functional groups, which are specific groups of atoms that give organic compounds their characteristic properties.</li><li>5. Understand natural organic compounds, which are compounds found in living organisms, such as carbohydrates, lipids, proteins, and nucleic acids.</li><li>6. Study macromolecules, which are large organic compounds made up of repeating units, such as polymers.</li><li>7. Learn about petroleum chemistry, which focuses on the composition, properties, and reactions of hydrocarbons found in crude oil and natural gas.</li><li>8. Gain knowledge in spectral chemical analysis, which involves the use of various techniques (such as spectroscopy) to study the interaction of matter with electromagnetic radiation.</li></ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<b>1.An introduction to general chemistry:</b> <ul style="list-style-type: none"><li>● Atomic structure</li><li>● Orbital shell</li><li>● Types of bonds</li></ul> <b>2.Periodic table:</b> <ul style="list-style-type: none"><li>● Electronegative</li><li>● ionization energy</li><li>● electronic affinity</li></ul> <b>3.Analytical chemistry:</b> <ul style="list-style-type: none"><li>● Types of analysis and their uses</li><li>● concentration and solutions</li><li>● Chemical equilibrium</li></ul> <b>4.Analytical chemistry :</b> <ul style="list-style-type: none"><li>● Gravimetric analysis</li><li>● Volumetric analysis</li></ul>

- Example

**5.Titer metric analysis:**

- Acid-base titrations
- Precipitation Titrations

**6.Titration :**

- Complex metric titrations
- Reduction-oxidation titrations.

**7.Organic chemistry :**

- classification of organic compounds
- Functional groups
- Alkanes and cycloalkanes

**8.Organic functional group:**

- Alkenes, Alkynes
- Aromatic compounds
- Heterocyclic compounds

**9.Organic functional group:**

- Alkyl halides
- Alcohols, Ethers

**10.Organic functional group:**

- Aldehydes and Ketones
- Amides
- amines

**11.Organic functional group:**

- Carboxylic acids
- Salts of carboxylic acids
- Esters

**12.Natural organic compounds:**

- Lipids
- Carbohydrates

**13.Macro molecules organic compound**

**14.Petroleum chemistry:**

- Classification of petroleum chemicals
- Physical and chemicals properties of petroleum

**15.spectral chemical analysis:**

- An introduction to spectral chemical analysis
- Types of spectral methods

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	Power points, youtubes when necessary using board for problem solving and diagramming and any other explanations' student will be highly engaged in the activities during the lecture.
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## Student Workload (SWL)

### الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	138	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	9.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	62	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	4.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>200</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	Material Covered
Week 1	An introduction to general chemistry
Week 2	Periodic table
Week 3	Analytical chemistry
Week 4	Analytical chemistry
Week 5	Titer metric analysis
Week 6	Titration
Week 7	Organic chemistry
Week 8	Organic functional group
Week 9	Organic functional group
Week 10	Organic functional group
Week 11	Organic functional group
Week 12	Natural organic compound
Week 13	Macro molecules organic compound
Week 14	Petroleum chemistry
Week 15	spectral chemical analysis
Week 16	Final Exam

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Classification of glassware in the chemistry laboratory and General Safety
Week 2	Melting point
Week 3	Recrystallization
Week 4	Separation and Extraction
Week 5	Distillation
Week 7,8	Preparation of Methane gas
Week 8	Preparation of Acetylene gas
Week 9	Preparation of benzoic acid from benzaldehyde
Week 10	Methods for expressing the concentrations of solutions
Week 11	Prepare a standard solution
Week 12	Calculate the concentration of a strong acid with a weak base
Week 13-14	Finding the molarity of the strong base NaOH using HCl
Week 15	Oxidation-reduction denaturation. Determination of iron (ferrous sulphate) using a standard solution of potassium permanganate.
Week 16	Final Exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"> <li>Atkins, P., de Paula, J."Physical Chemistry"8ed edition, W. H. Freeman and Company. 2006</li> </ul>	
Recommended Texts	<ul style="list-style-type: none"> <li>Chemistry: The molecular nature of matter and change, by: M.S.Silberberg, 2013.</li> <li>General Chemistry: Principles and Modern Application, by: Petrucci,Harwood,Herring ,2002.</li> </ul>	
Websites	<ul style="list-style-type: none"> <li>www.chemguide.co.uk</li> <li>www.rsc.org</li> </ul>	

## Grading Scheme

### مخطط الدرجات

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

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Engineering Technological for Chemical and  
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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Workshop Technology</b>		Module Delivery
Module Type	Support		Theory Lecture Lab Practical
Module Code	TEMO103		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<b>Module Objectives</b> أهداف المادة الدراسية	<p>1.Workshop Technology is a module that focuses on providing students with a comprehensive understanding of various workshop processes, tools, and techniques used in manufacturing and fabrication.</p> <p>2. The module covers a wide range of topics related to workshop practices and aims to develop practical skills required for working in a workshop environment.</p> <p>3. Students will gain hands-on experience and theoretical knowledge in areas such as machining, welding, casting, forging, sheet metal work, and woodworking</p>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>At the end of the semester the student should be able to</p> <ol style="list-style-type: none"><li>1.Understand and apply various workshop processes, such as machining, welding, casting, forging, sheet metal work, and woodworking.</li><li>2.Operate workshop tools and equipment proficiently.</li><li>3.Perform machining, fabrication, and assembly tasks with precision and efficiency.</li><li>4.Demonstrate knowledge of safety practices and regulations in a workshop environment.</li><li>5.Interpret engineering drawings and translate them into practical fabrication tasks.</li><li>6.Apply quality control measures and inspection techniques to ensure product standards.</li><li>6.Work effectively in a team and communicate with colleagues.</li><li>7.Utilize problem-solving skills to troubleshoot workshop-related challenges.</li></ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p><b>1.Tools</b> Include recognition of different tools. Employed for surface preparation and methods of application correctly, Devices of measuring dimensions, Calipers , types and uses , drill types and dimensions</p> <p><b>2.Tools Measuring</b> Steel miler , Veneer , Micrometer , Height &amp; height gauge hand tools , Saws , Hammers , Files , Scriber , Chisels , Taps and dies , Surface plate , Bench working.</p> <p><b>3.Workshop Welding</b> Include recognition of tools and materials employed – Gas cylinder of oxy – Acetylene welding of surface – Electrical are welding exercise – Welding spot.</p> <p><b>4.Workshop Lathing</b> lathe machine – Parts – Operation - Practice on longitudinal lathing –Making center – Puncturing – Making external teeth – Practice -Employing measuring tools – internal &amp; external lath machining.</p> <p><b>5. Workshop Alloying</b> Contents of alloying workshops – Alloying sands and characteristics –Additives for improvement – Metals melts – Method of casting – Sand mould shaping – Heat treatment.</p> <p><b>6. Workshop Carpentry</b> tools, machinery in the carpentry workshop, Fundamental principles –types of wood – application samples preparation</p>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<ol style="list-style-type: none"> <li>1. Emphasize conceptual understanding before calculations.</li> <li>2. Use interactive lectures with multimedia resources.</li> <li>3. Assign problem-solving practice with increasing complexity.</li> <li>4. Encourage group work and collaboration.</li> <li>5. Connect static mechanics to real-life applications.</li> <li>6. Integrate technology tools for visualization and interactivity.</li> </ol>
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## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1,2	Tools
Week 3,4	Tools Measuring
Week 5,6,7	Workshop Welding
Week 8,9,10	Workshop Lathing
Week 11,12,13	Workshop Alloying
Week 14,15	Workshop Carpentry
Week 16	<b>Final Exam</b>

<b>Delivery Plan (Weekly Lab. Syllabus)</b> المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1,2	Tools
Week 3,4	Tools Measuring
Week 5,6,7	Workshop Welding
Week 8,9,10	Workshop Lathing
Week 11,12,13	Workshop Alloying
Week 14,15	Workshop Carpentry
Week 16	<b>Final Exam</b>

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>"Workshop Technology: Volume 1 &amp; 2" by W.A. Chapman</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>"Machine Tool Practices" by Richard R. Kibbe, John E. Neely, Roland O. Meyer, and Warren T. White</li> </ul>	Yes
<b>Websites</b>	www.linkedin.com/learning	

## Grading Scheme

### مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors
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<b>Fail Group (0 - 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	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.



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Engineering Technological for Chemical  
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Module Information			
معلومات المادة الدراسية			
Module Title	<b>ENGINEERING ANALYSIS</b>		Module Delivery
Module Type	Support		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	TEMO300		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"><li>1. Students will have a solid understanding of the basic concepts and principles underlying engineering analysis, such as mathematical modeling, data analysis, and problem-solving techniques.</li><li>2. Students will be equipped with the skills necessary to apply mathematical and computational methods to analyze and solve engineering problems. This includes proficiency in mathematical modeling</li><li>3. Students will learn how to collect, organize, and analyze data relevant to engineering analysis. They will be able to apply statistical techniques to interpret data and draw meaningful conclusions.</li><li>3. Students will gain knowledge about different software tools and resources available for engineering analysis. They will develop the ability to evaluate the suitability of various tools for specific engineering tasks and make informed decisions regarding their use.</li><li>4. Students will learn how to design and conduct simulations and experiments to validate engineering models and analyze their performance. They will understand the importance of testing and validation in engineering analysis.</li><li>5. Students will be able to communicate their analysis results effectively through technical reports, presentations, and visualizations. They will develop skills in conveying complex engineering concepts and analysis outcomes to both technical and non-technical audiences.</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>After the completion of this course, the students will be able to:</p> <ol style="list-style-type: none"><li>1. Apply mathematical and computational tools to solve engineering problems.</li><li>2. Formulate and model engineering problems using mathematical techniques.</li><li>3. Analyze and interpret data using statistical methods.</li><li>4. Utilize numerical methods to solve engineering problems.</li><li>5. Perform engineering simulations and validate designs.</li><li>6. Apply critical thinking and make informed decisions based on engineering analysis.</li><li>7. Communicate technical findings effectively through reports and presentations.</li><li>8. Collaborate in interdisciplinary teams to solve complex problems.</li><li>9. Apply engineering analysis skills across various disciplines.</li><li>10. Demonstrate professional ethics and responsibility in engineering analysis work.</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"><li>1. Mathematical Tools for Analysis:<ul style="list-style-type: none"><li>● Review of essential mathematical concepts such as functions, vectors, matrices, and calculus.</li><li>● Linear algebra and matrix operations.</li></ul></li><li>2. Fourier Series and Transforms:<ul style="list-style-type: none"><li>● Fourier series for periodic functions</li><li>● Fourier series for a non-periodic function</li><li>● Even and odd functions and half-range Fourier series.</li><li>● Fourier series over any range.</li><li>● A numerical method of harmonic analysis.</li></ul></li></ol>

	<ul style="list-style-type: none"> <li>● The complex or exponential form of a Fourier series.</li> </ul> <p>3.Laplace transforms:</p> <ul style="list-style-type: none"> <li>● Introduction, Properties of Laplace Transform</li> <li>● Laplace Transform of Functions</li> <li>● The Initial and Final Value Theorems</li> <li>● Inverse Laplace transform ,Inverse Laplace transform using Partial Fraction</li> <li>● Solution of differential equation using Laplace transformation</li> </ul> <p>4. Partial differential equations, Finite differences</p> <p>5.Application of boundary conditions to solve differential equation</p> <p>6.Case Studies and Applications:</p> <ul style="list-style-type: none"> <li>● Practical engineering problems and case studies.</li> <li>● Analysis of real-world systems using the techniques learned.</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<ul style="list-style-type: none"> <li>● Provide a clear and concise overview of the key concepts of Engineering Analysis.</li> <li>● Use a variety of teaching methods, including lectures, demonstrations, and hands-on activities, to engage students and help them understand the material.</li> <li>● Encourage students to participate in class discussions and activities.</li> <li>● Provide opportunities for students to apply what they have learned to solve real-world problems.</li> <li>● Assess student learning through a variety of methods, including quizzes, exams, and projects.</li> </ul>



### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

### Module Evaluation

تقييم المادة الدراسية

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

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1</b>	Mathematical Tools for Analysis
<b>Week 2,3,4</b>	Fourier Series and Transforms
<b>Week 5,6,7</b>	Laplace transforms
<b>Week 8,9,10</b>	Partial differential equations, Finite differences
<b>Week 11,12,13</b>	Application of boundary conditions to solve differential equation
<b>Week 14,15</b>	Case Studies and Applications
<b>Week 16</b>	Final Exam

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to Matlab
Week 2,3	Matrix Functions in Matlab
Week 4	Mathematical Operations using MATLAB
Week 5,6	implement Bessel's equation, modified Bessel's equation, and the generalized Bessel equation in MATLAB
Week 7,8	Fourier Series and Transforms using matlab
Week 9,10,11	Laplace and Inverse Laplace Transformation Using Matlab
Week 12,13	Partial differential equations using matlab
Week 14,15	Projects using matlab
Week 16	Final Exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"> <li>"Advanced Engineering Mathematics" by Erwin Kreyszig</li> <li>"Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale</li> <li>"MATLAB: An Introduction with Applications" by Amos Gilat</li> </ul>	Yes
Recommended Texts	<ul style="list-style-type: none"> <li>"Statistics for Engineers and Scientists" by William Navidi</li> </ul>	Yes
Websites	<a href="https://www.engineering.com/">https://www.engineering.com/</a>	

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

<b>Fail Group (0 – 49)</b>	<b>FX – Fail</b>	راسب (فيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	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.



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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Heat Transfer</b>		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical
Module Code	<b>ETCP301</b>		
ECTS Credits	8		
SWL (hr/sem)	<b>200</b>		
Module Level	3	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>This course covers:</p> <ol style="list-style-type: none"> <li>1) Introducing and developing an understanding of the modes of heat transfer (conduction, convection, and radiation).</li> <li>2) Derive and discusses all types of the equation in these modes of heat transfer. Analyze heat transfer rate data in different modes.</li> <li>3) Derive the necessary equations for hydrodynamics and thermal boundary layer.</li> <li>4) Characterization the design procedures for different heat transfer equipment is as heat exchanger.</li> <li>5) Discuss the heat transfer in boiling and condensation processes.</li> <li>6) Characterization the design procedures for furnace.</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>at the end of the semester the student should be able to:-</p> <ol style="list-style-type: none"> <li>1) Develop a deep understanding of issues related to the heat and energy balance for different chemical process</li> <li>2) Define and solve problems in heat transfer mechanisms in various engineering applications.</li> <li>3) Explain and derive heat equations for the conduction and convection heat transfer.</li> <li>4) Apply the analytical equations and correlations in convection heat transfer problems.</li> <li>5) Design heat exchanger equipment.</li> <li>6) Define and solve problems in boiling and condensation heat transfer.</li> <li>7) Design the furnace and understand the radiation heat transfer.</li> <li>8) Solve problems in heat transfer applications.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"> <li>1) <b>Modes of Heat Transfer:</b> Conduction, Convection, and Radiation.</li> <li>2) <b>Steady State Heat Conduction in One Dimension:</b> General heat conduction equation in different coordinates, Plane wall, Radial systems, heat source systems, Boundary surrounded by fluids, Overall heat transfer coefficient, Conduction convection systems, and fins.</li> <li>3) <b>Unsteady State Heat Transfer:</b> Temperature as a function of time, lumped capacity system, quenching of small bodies, and heating of tank.</li> <li>4) <b>Principles of Convection:</b> Transport equations, Fluid mechanism aspect of convection, laminar boundary layer, a turbulent portion of the boundary layer, and The laminar sub-layer. Thermal boundary layer, Empirical and practical relations for pipe and tube flow and flow normal to single and tube banks. Reynolds analogy.</li> <li>5) <b>Heat Exchangers:</b></li> </ol>

	<p>Various types and their general characteristics, Overall heat transfer coefficient, fouling factor, Heat exchangers mean temperature differences, and Co-current and counter-current flow.</p> <p><b>6) Shell and Tube Exchanger:</b></p> <p>Types and various specifications, design calculations by conventional and effective (NTU) methods, and optimum design calculation.</p> <p><b>7) Condensation and Boiling Heat Transfer:</b></p> <p>Condensation of single vapors, Laminar film condensation Design calculations for condenser, Pool and flow boiling, Boiling regime, General aspects, Boiling correlations.</p> <p><b>8) Radiation and Furnace design:</b></p> <p>Radiation properties, shape factor, heat exchange for nonblack bodies, parallel planes, shields, gas tradition.</p>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<p>Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture, in addition to practical part inside Lab.</p>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	123	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	8.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>200</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1-2</b>	Modes of Heat Transfer
<b>Week 3-4</b>	Steady State Heat Conduction in One Dimension
<b>Week 5-6</b>	Unsteady State Heat Transfer
<b>Week 7-8</b>	Principles of Convection
<b>Week 9-10</b>	Heat Exchangers
<b>Week 11-12</b>	Shell and Tube Exchanger
<b>Week 13</b>	Condensation and Boiling Heat Transfer
<b>Week 14</b>	Condensation and Boiling Heat Transfer
<b>Week 15</b>	Radiation and Furnace design
<b>Week 16</b>	<b>Final Exam</b>

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Temperature measurements
Week 2	Thermal conductivity.
Week 3	Calibration of thermocouple
Week 4	Flow across tube banks
Week 5	Heat exchangers
Week 6	Critical Heat Flux
Week 7	Heat Transfer through the Lagged Pipe
Week 8	Thermal Conductivity of Insulating Powder
Week 9	Heat Transfer from a Pin-Fin Apparatus
Week 10	Heat Transfer through Composite Wall
Week 11	Heat Transfer in Forced Convection
Week 12	Parallel Flow / Counter Flow Heat Exchanger
Week 13	Heat Transfer in Natural Convection
Week 14	Thermal Conductivity of Metal Rod
Week 15	Emissivity Measurement Apparatus
Week 16	Final Exam

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ol style="list-style-type: none"> <li>1) J.P. Holman, Heat Transfer, Ninth edition.</li> <li>2) Frank P. Incropera &amp; David P. Dewitt, Fundamentals of Heat and Mass Transfer, Fifth Edition.</li> </ol>	



<b>Recommended Texts</b>	1) Coulson, J.M and Richardson J.F. "Chemical Engineering, volume 1", 3rd edition.	
<b>Websites</b>		

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



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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	<b>Industrial Safety</b>		Module Delivery	
Module Type	Core		Theory Lecture Tutorial Seminar	
Module Code	<b>ETCP204</b>			
ECTS Credits	4			
SWL (hr/sem)	<b>100</b>			
Module Level	3	Semester of Delivery		5
Administering Department	ETCP		College	TEMO
Module Leader	Name	e-mail	E-mail	
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail	
Peer Reviewer Name	Name	e-mail	E-mail	
Scientific Committee Approval Date	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

<b>Module Objectives</b> أهداف المادة الدراسية	Introduction to industrial safety, Risk Assessment & Hazard Identification Fire and explosion, Toxicology, Leaks and leakage , Safety in process design
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	at the end of the semester, the student should be able to : <ol style="list-style-type: none"> <li>1) The course attained to give the student knowledge about the risk of chemical processes</li> <li>2) The student be capable to use safety policy to eliminate accidents</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	The general outline of topics typically covered in such a course: <ol style="list-style-type: none"> <li>1) <b>Introduction to industrial safety</b>                      Important of industrial safety, History and development of safety movement, Need for safety, Safety legislation: Acts and rules, Safety standards and codes, Safety policy: safety organization and responsibilities and authorities of different levels. Accident sequence theory, Causes of accidents, Accident prevention, and control techniques, Plant.</li> <li>2) <b>Risk Assessment &amp; Hazard Identification</b>                      Risk definition, Risk analysis, Major hazard control, Identification of hazard, Categorization methods for elimination of hazard, Mechanical hazards, machine guarding, Pressure vessel hazards and their control, Safety in material handling: hazards and safe Practices, safety with storage of materials, Electrical hazards: classification, safe work practices, Chemical hazards: laboratory safety, bulk handling of chemicals.</li> <li>3) <b>Fire and explosion</b>                      Introduction-Industrial processes and hazards potential, mechanical electrical, thermal and process hazards. Safety and hazards regulations, Industrial hygiene. Shock wave propagation, vapour cloud and boiling liquid expanding vapours explosion , mechanical and chemical explosion, multiphase reactions, transport effects and global rates. Fire and explosion hazards, Fire detection, Prevention ,control, and extinguishments, Industrial layout, Industrial waste management.</li> <li>4) <b>Toxicology Hazards</b>                      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).</li> <li>5) <b>Leaks and leakage</b>                      Spill and leakage of liquids, vapors, gases and their mixture from storage tanks and equipment; Estimation of leakage/spill rate through hole, pipes and vessel burst;</li> </ol>

	<p>Isothermal and adiabatic flows of gases, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxics and dispersion.</p> <p><b>6) Safety in process design and pressure system design</b></p> <p>Design process, conceptual design and detail design, assessment, inherently safer design chemical reactor, types, batch reactors, reaction hazard evaluation, assessment, reactor safety, operating conditions, unit operations and equipments, utilities. Pressure system, pressure vessel design, standards and codes- pipe works and valves- heat exchangers- process machinery over pressure protection, pressure relief devices and design, fire relief, vacuum and thermal relief, special situations, disposal- flare and vent systems failures in pressure system</p>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<ol style="list-style-type: none"> <li>1) Use a variety of teaching methods</li> <li>2) Provide opportunities for students to apply what they are learning</li> <li>3) Create a supportive and collaborative learning environment.</li> <li>4) Provide regular feedback to students</li> </ol>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	47	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	53	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1-2	Introduction to industrial safety
Week 3-5	Risk Assessment & Hazard Identification
Week 6-8	Fire and explosion
Week 9-10	Toxicology Hazards
Week 11-13	Leaks and leakage
Week 14-15	Safety in process design and pressure system design
Week 16	Final Exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1) Crowl D.A. and Louvar J.F., "Chemical Process Safety: Fundamentals with Applications", 2nd Ed., Prentice Hall.2001.	
Recommended Texts	1) Fawcett, H.and Wood, "Safety and Accident Prevention in Chemical Operations" Wiley inters, Second Edition. 2) David B., "Engineering Safety", McGraw-Hill UK, Copyright 1992.	
Websites		

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



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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mass Transfer		Module Delivery
Module Type	Core		Lecture Lab Tutorial Practical
Module Code	ETCP300		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	3	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>This course covers diffusion and mass transfer in binary &amp; multi-components, molecular diffusion in fluids, convective mass transfer, mass transfer coefficients, mass transfer correlations, interphase mass transfer, and mass transfer theories, gas absorption, stripping, and distillation for binary and multi-component mixtures. Concepts to design mass transfer equipment.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>at the end of the semester the student should be able to:-</p> <ol style="list-style-type: none"> <li>1) Understand the basics of diffusion as applicable to mass transfer phenomena.</li> <li>2) Estimate Molar fluxes in convective and interphase mass transfer.</li> <li>3) Explain the concept of diffusion theories.</li> <li>4) Applying the convective mass transfer correlations to calculate mass transfer rates in many units operating.</li> <li>5) Understand the basics of gas absorption, stripping, and distillation.</li> <li>6) Design absorbers, strippers, and distillation columns.</li> <li>7) Find Operating lines, feed line, and No. of trays or amounts of packing required.</li> <li>8) Calculate column efficiency.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"> <li>1) <b>Introduction :</b> Fundamentals of mass transfer processes, concentrations, velocities, mass &amp; molar fluxes.</li> <li>2) <b>Diffusion in binary gaseous :</b> Fick's first law of diffusion. Diffusion in gas mixtures, Equimolecular diffusion, and diffusion in the stationary layer. Correlations to calculate diffusivity, correcting diffusivity.</li> <li>3) <b>Diffusion in multi-component mixtures:</b> Multi-component gas phase systems, effective diffusivity. Maxwell's law of diffusion,</li> <li>4) <b>Diffusion in liquids.</b></li> <li>5) <b>Diffusion in solids.</b></li> <li>6) <b>Diffusion theories:</b> Diffusion across phase boundary, Film theory, two film theory, Mass transfer coefficients (individual &amp; overall) in a laminar and turbulent flow.</li> <li>7) <b>Diffusion resistances:</b> Calculating the resistance to mass transfer in both phases. Calculating intermediate concentrations.</li> <li>8) <b>Unsteady state mass transfer:</b></li> </ol>



	<p>Introduction to unsteady state mass transfer, mass transfer accompanied by a chemical reaction.</p> <p><b>9) Introduction to separation processes:</b></p> <p>General separation techniques. The mechanism of absorption and stripping processes. Flow regimes.</p> <p><b>10) Absorption in packed bed columns:</b></p> <p>Constructions, mass transfer coefficients &amp; specific area, capacity, height of columns based on gas film, liquid film, and based on overall conditions, operating line, the transfer units, the importance of gas and liquid flow rates.</p> <p><b>11) Absorption in Tray towers :</b></p> <p>Types of trays, number of trays analytically and graphically. How to calculate the tray and column efficiency.</p> <p><b>12) Introduction to distillation process:</b></p> <p>Partial pressure, Dalton's, Raoult's &amp; Henry's laws. Relative volatility, non ideal systems. Method of diffusion, binary mixtures, batch distillation, flash distillation, steam distillation. Fractionating column.</p> <p><b>13) Fractionating process:</b></p> <p>Number of plates required importance of reflux ratio, location of feed point, multiple feeds and side streams.</p> <p><b>14) Multi-component Distillation :</b></p> <p>Key components. Components distributions, equilibrium data, feed &amp; product compositions, minimum reflux ratio, calculation number of trays required, the relation between reflux ratio &amp; a number of plates.</p> <p><b>15) Plate &amp; packed distillation columns:</b></p> <p>General designed methods, column efficiency</p>
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<p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p>	
<b>Strategies</b>	<p>Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture, in addition to the practical part inside Lab.</p>

<p><b>Student Workload (SWL)</b></p> <p>الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا</p>
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<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	123	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	8.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	77	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	5.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>200</b>		

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

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	Material Covered
<b>Week 1</b>	Introduction
<b>Week 2</b>	Diffusion in binary gaseous
<b>Week 3</b>	Diffusion in multi-component mixtures
<b>Week 4</b>	Diffusion in liquids
<b>Week 5</b>	Diffusion in solids
<b>Week 6</b>	Diffusion theories
<b>Week 7</b>	Diffusion resistances
<b>Week 8</b>	Introduction to separation processes
<b>Week 9</b>	Absorption in packed bed columns
<b>Week 10</b>	Absorption in Tray towers
<b>Week 11</b>	Introduction to distillation process:

<b>Week 12-13</b>	Fractionating process
<b>Week 14</b>	Multi-component Distillation :
<b>Week 15</b>	Plate & packed distillation columns:
<b>Week 16</b>	<b>Final Exam</b>

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1</b>	Introduction to Lab + Report Preparation
<b>Week 2-3</b>	Diffusion
<b>Week 3-5</b>	Packed Bed
<b>Week 6</b>	Simple Distillation
<b>Week 7-8</b>	Batch Distillation Column
<b>Week 9-10</b>	Fraction Distillation
<b>Week 11-12</b>	Steam Distillation
<b>Week 13-14</b>	Tray Tower
<b>Week 15</b>	Scientific Trip to Refinery
<b>Week 16</b>	<b>Final Exam</b>

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	1) Coulson, J. M & Richardson J. F. (2006). "Chemical engineering, Volume 1", 3 <sup>rd</sup> Edition, Robert Maxwell. M. C. 2) Dutta Binary K. (2007), "Principles of Mass Transfer & Separation Process", Bvt. Ltd. Prentice Hall, ISBN 8-1203-2990-2.	
<b>Recommended Texts</b>	1) Treybal Robert E. (1975), "Mass transfer Operation" 2ed Edition, Mc-Graw-Hill Book. 2) McCabe, W., Smith, J., Harriott, P. (2004), "Unit Operations of Chemical Engineering", Mc-Graw-Hill Co., 7th Edition, ISBN0072848235.	

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



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Technical Engineering College-Mosul  
Engineering Technological for Chemical  
and Petroleum Industries



## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Natural Gas Engineering</b>		Module Delivery
Module Type	Core		Theory Lecture Seminar
Module Code	ETCP303		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>The aim of this module is to students be familiar with:</p> <ol style="list-style-type: none"><li>1) The necessary properties of natural gas and its uses</li><li>2) gas power plant</li><li>3) gas treatment steps</li><li>4) sour and sweet gas processing, natural gas recovery</li><li>5) Natural Gas industry.</li></ol> <p>Natural gas Pipeline and natural gas storage</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>At the end of this module students will be able to:</p> <ol style="list-style-type: none"><li>1) To know the properties of natural gas</li><li>2) To size the natural gas processing equipment</li><li>3) To communicate the results of engineering results</li><li>4) To understand the methods of treatment and purification of natural gas</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"><li>1) Introduction to Natural Gas and its Uses, Gas Plant</li><li>2) Properties of natural gas</li><li>3) Ideal Gas</li><li>4) Real Gas</li><li>5) Apparent molecular weight, <math>M_a</math></li><li>6) Specific gravity, <math>g</math></li><li>7) Compressibility factor,</li><li>8) Density, <math>\rho_g</math></li><li>9) Specific volume</li><li>10) Gas formation volume factor, <math>B_g</math></li><li>11) Isothermal gas compressibility coefficient, <math>C_g</math></li><li>12) Viscosity, <math>\mu</math></li><li>13) Separation</li><li>14) Gas hydrates</li><li>15) Natural Gas Dehydration</li><li>16) Natural Gas Sweetening</li><li>17) LPG</li><li>18) GAS Flaring</li></ol>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p>Different forms of teaching will be used to reach the objectives of the course PowerPoint for main parts (head titles, definitions, objectives, figures, design, tables and charts ...etc.) of each subject.</p> <p>Whiteboard will be used for presenting mathematical equations and solving examples.</p> <p>For the student to achieve a level of excellence in this subject, the following points should be given utmost consideration:</p> <ul style="list-style-type: none"> <li>● Class attendance on a regular basis for learning.</li> <li>● Active participation in class discussions</li> <li>● Reviewing the lecture notes and topics on a weekly basis, noting the ambiguous points, if any, and requesting clarification during instructor office hours</li> <li>● Scientific Visiting</li> </ul>
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## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	47	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	53	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1</b>	Introduction to Natural Gas and its Uses, Gas Plant
<b>Week 2</b>	Properties of natural gas
<b>Week 3-4</b>	Ideal Gas
<b>Week 5-7</b>	Real Gas Apparent molecular weight, $M_a$ Specific gravity, $g$ Compressibility factor, Density, $\rho_g$ Specific volume
<b>Week 8</b>	Gas formation volume factor, $B_g$ Isothermal gas compressibility coefficient, $C_g$
<b>Week 9</b>	Viscosity, $\mu$
<b>Week 10-11</b>	Gas hydrates
<b>Week 12</b>	Natural Gas Dehydration
<b>Week 13</b>	Natural Gas Sweetening
<b>Week 14</b>	LPG Production
<b>Week 15</b>	Gas flaring
<b>Week 16</b>	<b>Final Exam</b>



Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1) "Gas Purification" by Arthur L. Kohl and Richard Nielsen 2) "Natural Gas Engineering: Production and Storage" by Dr. Mohammed Khalid Al-Ali and Dr. M. A. Al-Marhoun.	Yes
Recommended Texts	1) "Natural Gas Engineering Handbook" by Boyun Guo, Ali Ghalambor, and William Lyons.  2) "Fundamentals of Natural Gas Processing" by Arthur J. Kidnay, William R. Parrish, and Daniel G. McCartney.	No
Websites		

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

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



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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Chemical Engineering Thermodynamics		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ETCP304		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	3	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Physical Chemistry	Semester	3
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>The course of chemical engineering thermodynamics comprises the study of volumetric properties of pure fluids; Entropy and second law analysis of engineering systems; Thermodynamic properties of fluids; Applications of thermodynamics to flow processes. The discussion of the study of Power cycles; Refrigeration and liquefaction process; Theory and application of solution thermodynamics; Vapor/liquid equilibrium in both: binary and multi-components; Ideal and non-ideal solutions are discussed using Raoult's and modified Raoult's law; Fugacity and fugacity coefficient definitions; Chemical reaction equilibrium and thermodynamic analysis of processes.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>at the end of the semester the student should be able to:-</p> <ol style="list-style-type: none"> <li>1) To familiarize the students with basic concepts of the first and second laws of thermodynamics and their applications in engineering problems.</li> <li>2) Develop a practical ability to solve energy balance problems and minimum work.</li> <li>3) Students will demonstrate a basic understanding of the basics and definitions of thermodynamics and properties of pure substances.</li> <li>4) Describe the reversible and irreversible processes (macroscopic description of ideal and real processes).</li> <li>5) Apply the laws of thermodynamics to the power, refrigeration and liquefaction cycle.</li> <li>6) Establish thermodynamic constraints that apply to VLE, and explain qualitatively the VLE diagram.</li> <li>7) Apply thermodynamics to VLE of pure components and solutions in terms of fugacity and fugacity coefficients.</li> <li>8) Apply equilibrium criteria to chemical reactions and evaluate the effect of temperature.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"> <li>1) <b>Volumetric properties of pure fluids :</b> Review on the virial equation of state, cubic equation of state, generalized correlations for gases and for liquids.</li> <li>2) <b>The 2nd law of thermodynamics :</b> Review on the 2nd law and Carnot heat engine, entropy balance for open system, calculation of ideal work, lost work.</li> <li>3) <b>Thermodynamic properties of fluids :</b> Review on the property relations (<math>\Delta H</math>, <math>\Delta S</math>, <math>\Delta U</math> and <math>\Delta G</math>) residual properties, two phase systems, thermodynamic diagrams and tables, generalized property correlations for gases.</li> <li>4) <b>Applications of thermodynamics to flow processes</b> Duct flow of compressible fluids, pipe flow, nozzles, throttling process, turbines, compression processes compressors, ejectors.</li> </ol>

	<p><b>5) Production of power from heat:</b></p> <p>The steam power plant, Rankin cycle, the regenerative cycle, internal combustion engines Otto engine, diesel engine, gas turbine engine.</p> <p><b>6) Refrigeration and liquefaction:</b></p> <p>The Carnot refrigerator, the vapor compression cycle, the choice of refrigerant, absorption refrigeration, the heat pump, liquefaction processes.</p> <p><b>7) Vapor\liquid equilibrium; introduction :</b></p> <p>The nature of equilibrium, the phase rule, Duhem,s theorem, diagrams for vapor liquid equilibrium, simple models for VL equilibrium: Rault,s law, dew point and bubble point calculations, Henrys law, VLE by modified Raults law, VLE from K value correlations, flash calculations.</p> <p><b>8) Solution thermodynamics:</b></p> <p>theory Fundamental property relations, the chemical potential and phase equilibrium, ideal gas mixtures, fugacity and fugacity coefficient, the fundamental residual property relations, the ideal solutions.</p> <p><b>9) Chemical Reaction equilibrium:</b></p> <p>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.</p> <p><b>10) Thermodynamic analysis of processes:</b></p> <p>Second law relation for steady state flow processes, calculation of ideal work, thermodynamic analysis of steady state flow processes.</p>
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<b>Learning and Teaching Strategies</b>	
استراتيجيات التعلم والتعليم	
<b>Strategies</b>	Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture, in addition to the practical part inside Lab.

<b>Student Workload (SWL)</b>
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	123	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	8.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	77	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	5.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>200</b>		

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

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	Material Covered
<b>Week 1-2</b>	Volumetric properties of pure fluids
<b>Week 3-4</b>	The 2nd law of thermodynamics
<b>Week 5-6</b>	Thermodynamic properties of fluids
<b>Week 7</b>	Applications of thermodynamics to flow processes
<b>Week 8</b>	Production of power from heat
<b>Week 9</b>	Production of power from heat
<b>Week 10-11</b>	Refrigeration and liquefaction:
<b>Week 12</b>	Vapor\liquid equilibrium; introduction
<b>Week 13</b>	Solution thermodynamics
<b>Week 14</b>	Chemical Reaction equilibrium
<b>Week 15</b>	Thermodynamic analysis of processes
<b>Week 16</b>	<b>Final Exam</b>

## Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Calibration of Thermocouple
Week 2	Joules law
Week 3	Boyles low
Week 4	Calorific Value
Week 5	Specific heat
Week 6	Determination of the sensible heat
Week 7	Determination of the Evaporation of latent heat
Week 8-9	Pressure and Temperature relationship for steam
Week 10-12	Refrigeration and Heat Pump
Week 13	Calculating the Cooling Effect in the Heat Pump
Week 14	Measurements of Specific Heat Ratio of Air
Week 15	The efficiency of Steam Boiler
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1) J. M. Smith, H.C. Van Ness, Introduction to chemical engineering thermodynamics, 6th edition (International Edition), Mc-Grew Hall, 2008.	
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	
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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	F – Fail	راسب	(0-44)	Considerable amount of work required
<p><b>Note:</b> 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.</p>				



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MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Instrumental of Chemical Analysis</b>		Module Delivery
Module Type	CORE		Theory Lecture Lab Tutorial Practical Seminar
Module Code	<b>ETCP308</b>		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	6	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"><li>1. Understand the fundamental principles and concepts of analytical chemistry, including qualitative and quantitative analysis.</li><li>2. Gain proficiency in operating and utilizing spectrophotometers for various analytical purposes.</li><li>3. Comprehend the laws of UV-Visible absorption radiation, such as Beer's Lambert law, and identify deviations from this law.</li><li>4. Acquire knowledge of the principles and components of flame photometry and its advantages and disadvantages.</li><li>5. Familiarize oneself with the principles, components, and applications of atomic absorption spectroscopy (AAS), including different types of atomizers.</li><li>6. Explore the phenomenon of interference in flame atomic absorption, including fluorescence and phosphorescence, and understand the functioning and applications of fluorimeters.</li><li>7. Develop an understanding of the principles and components of turbidimetry and nephelometry, and recognize their advantages, disadvantages, and applications.</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p><b>At the end of the semester the student should be able to:</b></p> <ol style="list-style-type: none"><li>1. Students will gain knowledge and comprehension of the fundamental principles and concepts of analytical chemistry, including qualitative and quantitative analysis.</li><li>2. Students will learn about the principles, components, and types of spectrophotometers, as well as the advantages, disadvantages, and applications of spectrophotometry in analytical chemistry.</li><li>3. Students will study the laws of radiation absorption, including Beer's Lambert law, and understand deviations from this law. They will also explore the principles of flame photometry and its components.</li><li>4. Students will be introduced to AAS, including its principles, components, atomizers, and reaction in the hollow cathode lamp. They will also learn about the advantages, disadvantages, and applications of AAS.</li><li>5. Students will study fluorescence and phosphorescence, factors affecting them, and the components, advantages, disadvantages, and applications of fluorimeters. They will also explore Chemiluminescence.</li><li>6. Students will understand the principles and components of turbidimetry and nephelometry, factors affecting light scattering, and the advantages, disadvantages, and applications of these techniques.</li><li>7. Students will learn the general principles of chromatography, including separation methods based on the physical state of stationary or mobile phases. They will also explore different types of chromatography, such as column chromatography, thin-layer chromatography, and paper layer chromatography. Additionally, students will understand the advantages and disadvantages of chromatograph</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p><b>1. Analytical Chemistry</b></p> <ul style="list-style-type: none"><li>• qualitative analysis</li><li>• electromagnetic radiation</li><li>• properties electromagnetic radiation</li></ul>

- absorption and emission of electromagnetic spectrum
  - kind of transition
  - spectroscopy photo analysis
  - spectra types
- 2.Spectrophotometer:**
- principles of spectrophotometer
  - component of spectrophotometer
    - a) Types of radiation source
    - b) Types of monochromators
    - c) Sample cell
    - d) types of detector
  - types of spectrophotometer
- 3.advantage and disadvantage of spectrophotometer**
- application of spectrophotometer and visible absorption radiation
  - laws of radiation absorption
  - beer's Lambert law
  - deviation from Beer's Lambert law
- 4.Flame photometry:**
- Principles of a flame photometry
  - Components of flame photometry
  - Advantages and disadvantages of flame photometry
- 5.Atomic absorption spectroscopy (AAS):**
- Introduction
  - principles of (AAS)
  - components (AAS)
  - Reaction in the hollow cathode lamp
  - atomizer
  - types of atomizer
  - applications of (AAS)
  - Advantages and disadvantages of flame (AAS)
  - Advantages and disadvantages of electro thermal
  - Atomization
- 6.Interference in flame Atomic absorption:**
- fluorescence of phosphorescence
  - factors affecting fluorescence of phosphorescence
  - Fluorimeter
  - Components of Fluorimeter
  - Advantages and disadvantages of Fluorimeter
  - Application of Fluorimeter
  - Types of Fluorimeter
  - Chemiluminescence

### **7.Turbidimetry and nephelometry:**

- introduction
- Components
- factors affecting light scattering
- Advantages and disadvantages
- Application of turbidimetry and nephelometry

### **9.Electrophoresis :**

- turbidimetry and nephelometry of Electrophoresis
- Factors impacting Electrophoresis
- Electrophoresis Components
- Types of Electrophoresis
- Paper Electrophoresis
- Gel Electrophoresis
- Capillary

### **10.Chromatography:**

- general principles of chromatography
- chromatography separation method
- based on physical state of stationary or mobile phase
- based on basic principles involved

### **11.Classification based on nature of equipment used:**

- column chromatography
- Thin layer chromatography
- Paper layer chromatography
- An advantage and disadvantages of chromatography
- Gas chromatography
- general principles of Gas chromatography
- components of gas chromatography
- An advantage and disadvantages of Gas chromatography

### **12.Electrochemistry**

- introduction
- electrode
- types of electrode
- reference electrode
- saturated calomel electrode
- saturated hydrogen electrode
- silver/silver chloride electrode
- direct indicator electrode
- metallic electrode
- membrane electrode
- glass membrane electrode
- ion selective membrane electrode

	<ul style="list-style-type: none"> <li>•an electrochemical general principles, types of electrochemical cell</li> <li>•galvanic cell and , electrolytic cell</li> </ul>
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### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<ol style="list-style-type: none"> <li>1.Hands-on laboratory work: Engage students in practical experiments to develop their analytical skills and reinforce theoretical concepts.</li> <li>2.Case studies and real-world applications: Integrate real-life examples to help students connect theory to practical scenarios and enhance their problem-solving abilities.</li> <li>3.Interactive discussions and debates: Encourage critical thinking through debates and small group discussions on analytical chemistry topics.</li> </ol>
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### Student Workload (SWL)

#### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	93	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	6.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

### Module Evaluation

#### تقييم المادة الدراسية

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

<b>Delivery Plan (Weekly Syllabus)</b>	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	analytical chemistry
Week 2	spectrophotometer
Week 3	Advantages and disadvantages of spectrophotometer
Week 4	Flam photometry
Week 5,6	Atomic absorption spectroscopy (AAS)
Week 7	Interference in flame Atomic absorption
Week 8	Turbidimetry and nephelometry
Week 9	Electrophoresis
Week 10	Types of Electrophoresis
Week 11	Chromatography
Week 12	classification based on nature of equipment used
Week 13,14,15	Electrochemistry
Week 16	spectrophotometer

<b>Delivery Plan (Weekly Lab. Syllabus)</b> المنهاج الاسبوعي للمختبر	
	<b>Material Covered</b>
<b>Week 1</b>	Work security in chemical laboratories.
<b>Week 2</b>	Preparation of different types of solution.
<b>Week 3</b>	Quantitative and qualitative analysis using Spectro photo meter.
<b>Week 4</b>	Deter amination $\lambda$ max of potassium permanganate solution.
<b>Week 5</b>	Beers lambert law.
<b>Week 6</b>	Determination paracetamol by Spectro photometric method
<b>Week 7</b>	Determination dyes by Spectro photometric method
<b>Week 8</b>	Determination paracetamol by Spectro photometric method
<b>Week 9</b>	Determination sodium by flame photometry.
<b>Week 10</b>	Determination potassium by flame photometry.
<b>Week 11</b>	Determination aluminum in water by atomic absorption Spectro photometer.
<b>Week 12</b>	Determination calcium by atomic absorption Spectro photometer.
<b>Week 13</b>	Turbidity.
<b>Week 14</b>	Gas liquid chromatography.
<b>Week 15</b>	Work security in chemical laboratories.
<b>Week 16</b>	Preparatory week before the Final Exam

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>" Principles and Practice of Analytical Chemistry" by F.W. Fifield and David Kealey</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>"Instrumental Analysis" by Robert M. Granger</li> </ul>	Yes
<b>Websites</b>	<ul style="list-style-type: none"> <li>analytical--chemistry.com</li> <li>chromedia.org</li> </ul>	

## Grading Scheme

### مخطط الدرجات

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



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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Process Simulation		Module Delivery
Module Type	Core		Lecture Lab Tutorial Project
Module Code	ETCP306		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0



## Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

<b>Prerequisite module</b>	None	<b>Semester</b>	
<b>Co-requisites module</b>	None	<b>Semester</b>	

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Objectives</b> أهداف المادة الدراسية	The objective of the subject is to engage students with chemical plants by explaining to them the main items of plant design and teaching them procedures to design different equipment with Aspen Hysys software.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	at the end of the semester the student should be able to:- <ol style="list-style-type: none"> <li>1) The course will help students to bridges theoretical study and practical</li> <li>2) Students will execute many operations in oil, gas, and petrochemicals</li> <li>3) The course qualifies the students to enter and pass the exam from the American company (Aspentech) to get a certificate of Aspen User.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"> <li>1) <b>Introduction:</b> History, how to use Aspen Hysys and deal with its Graphic User Interface (GUI).</li> <li>2) <b>Starting with Aspen HYSYS</b> <ul style="list-style-type: none"> <li>• Starting Aspen HYSYS and how to select the right components and fluid package for simulation purposes.</li> <li>• Knowing how to start Aspen HYSYS and get familiar with its desktop is very important.</li> <li>• How to enter and reenter the simulation environment and get familiar with the simulation flowsheet. In this part, users will be informed of some important features of Aspen HYSYS.</li> <li>• Dealing with how to add and specify material streams for simulation.</li> <li>• Variables specification is one of the important steps that users need to understand when dealing with Aspen HYSYS.</li> </ul> </li> <li>3) <b>Simulation</b> for Pressure vessels, pumps, and compressors flash drum, gas-liquid separator, liquid-liquid separator, gas movers, and compressors with Aspen Hysys.</li> <li>4) <b>Simulation of heat transfer equipment</b> (shell And tube heat exchanger, plate heat exchanger, coil type exchanger, condenser, vaporizer, air cooler .....etc) with Aspen Hysys.</li> <li>5) <b>Simulation of mass transfer equipment</b> (distillation column, absorber column, leaching equipment, scrubber.....etc) with Aspen Hysys.</li> <li>6) <b>Flash Calculations</b></li> <li>7) <b>Gas Liquefaction</b></li> <li>8) <b>Mixing Two Raw Gas Streams</b></li> </ol>

	<p>9) Simple Vapor Compression Refrigeration Cycle</p> <p>10) Gas Compression Station</p> <p>11) Gas Pipeline Calculations</p> <p>12) Raw Gas Dehydration Using TEG</p> <p>13) Raw Gas Sweetening Using DEA</p> <p>14) Production of Propylene Glycol (PG)</p>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	Power points, and YouTube when necessary to help the students to understand before excitation the case study using the computer for 1 h students will be highly engaged in the activities during the lecture, and follow the practical part inside Lab for 3 h.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

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

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري + العملي (Case Study)

	Material Covered
Week 1	Introduction
Week 2	Starting with Aspen HYSYS
Week 3-4	Pressure vessels, pumps, compressors flash drum, gas-liquid separator, liquid-liquid separator, gas movers and compressors
Week 5	Heat transfer equipment
Week 6-7	Mass Transfer Equipments
Week 8	Flash Calculations
Week 9	Gas Liquefaction
Week 10	Mixing Two Raw Gas Streams
Week 11	Simple Vapor Compression Refrigeration Cycle
Week 12	Gas Compression Station
Week 13	Gas Pipeline Calculations
Week 14	Raw Gas Dehydration Using TEG
Week 15	Raw Gas Sweetening Using DEA
Week 15	Production of Propylene Glycol (PG)
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites	<ul style="list-style-type: none"><li>• <a href="https://www.aspentech.com/en">https://www.aspentech.com/en</a></li><li>• <a href="https://www.aspentech.com/en/training-and-support/training-courses">https://www.aspentech.com/en/training-and-support/training-courses</a></li></ul>	

## Grading Scheme

## مخطط الدرجات

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



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Engineering Technological for Chemical  
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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Reactor Design		Module Delivery
Module Type	Core		Lecture Tutorial Seminar
Module Code	ETCP		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester of Delivery	6
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Kinetics	Semester	4
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Objectives</b> أهداف المادة الدراسية	This course covers Theory, design fundamentals, and mass conservation equations for ideal reactors, isothermal reactors for homogeneous reactions, non-isothermal reactors, and multiple reactor Systems.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	at the end of the semester the student should be able to: <ol style="list-style-type: none"> <li>1) Apply reaction kinetics principles in chemical reactor engineering.</li> <li>2) Identify and formulate problems in chemical reactor engineering and find appropriate solutions.</li> <li>3) specify and size the most common industrial chemical reactors to achieve production goals for processes involving homogeneous reaction systems</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	The general outline of topics typically covered in such a course: <ol style="list-style-type: none"> <li>1) <b>Introduction to reactor design:</b> <ul style="list-style-type: none"> <li>• Interpretation of rate data, scale-up, and design</li> <li>• Classification of reactors.</li> </ul> </li> <li>2) <b>Design fundamentals and mass conservation equations for ideal reactors:</b> <ul style="list-style-type: none"> <li>• Conservation of mass in reactors.</li> <li>• The ideal stirred-tank reactor (Batch and steady-state flow)</li> <li>• The ideal tubular flow reactor (PFR)</li> <li>• Space-time and space velocity</li> </ul> </li> <li>3) <b>Isothermal reactors for homogeneous reactions:</b> <ul style="list-style-type: none"> <li>• Design procedure: Batch reactor (constant volume and constant pressure)</li> <li>• Design procedure: Continuous stirred-tank reactors (Single and multiple reactions)</li> <li>• Design procedure: Tubular-flow reactors</li> <li>• Comparison of the stirred tank and tubular-flow reactors.</li> <li>• Flow recycle reactors</li> <li>• Non-steady flow (semi-batch) reactors</li> </ul> </li> <li>4) <b>Non-isothermal reactors:</b> <ul style="list-style-type: none"> <li>• L11: Energy conservation equations</li> <li>• L12: Batch stirred-tank reactors</li> <li>• L13: Continuous stirred-tank reactors</li> </ul> </li> <li>5) <b>Multiple reactor System:</b> <ul style="list-style-type: none"> <li>• Plug flow reactors in series and/or parallel</li> <li>• Equal-size mixed flow reactors in series (first-order and second-order reactions)</li> <li>• Mixed Flow Reactors of different sizes in series.</li> <li>• Best arrangement of a set of ideal reactors</li> </ul> </li> </ol>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture.
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## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	77	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	5.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1-2	Introduction to reactor design
Week 3-6	Design fundamentals and mass conservation equations for ideal reactors
Week 7-9	Isothermal reactors for homogeneous reactions
Week 9-12	Non-isothermal reactors
Week 12-15	Multiple reactor Systems
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ol style="list-style-type: none"> <li>1) Octave Levenspiel (1999), CHEMICAL REACTOR ENGINEERING, 3rd edition, John Wiley &amp; Sons Inc., USA ISBN: 9780471254249.</li> <li>2) H. S. Fogler, Elements of Chemical Reaction Engineering, 4th Ed (2006), Prentice Hall, NewYork.</li> </ol>	
Recommended Texts	<ol style="list-style-type: none"> <li>1) Ronald W. Missen; Charles A. Mims; Bradley A. Saville (1999), INTRODUCTION TO CHEMICAL REACTION ENGINEERING AND KINETICS, 1<sup>st</sup> edition, John Wiley &amp; Sons Inc., USA.</li> <li>2) J.M. Smith (1987), CHEMICAL ENGINEERING KINETICS, 3rd edition, McGraw-Hill International Editions, Singapore.</li> </ol>	
Websites		



## Grading Scheme

### مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors
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	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
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## MODULE DESCRIPTOR FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Arabic Language</b>		Module Delivery
Module Type	<b>Support</b>		Theory Lecture Seminar
Module Code	<b>NTU200</b>		
ECTS Credits	<b>4</b>		
SWL (hr/sem)	<b>100</b>		
Module Level	<b>2</b>	Semester of Delivery	
Administering Department	<b>ETCP</b>	College	<b>TEMO</b>
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	<b>Professor</b>	Module Leader's Qualification	<b>Ph.D.</b>
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	<b>01/06/2023</b>	Version Number	<b>1.0</b>

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	<b>None</b>	Semester	
Co-requisites module	<b>None</b>	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Objectives</b> أهداف المادة الدراسية	<ol style="list-style-type: none"><li>1. تعلم قواعد الكتابة والإملاء بدقة في اللغة العربية.</li><li>2. اكتساب مهارات التمييز بين الحروف المشددة والمقصورة واستخدامها بشكل صحيح.</li><li>3. فهم واستخدام صحيح للحروف الضاد والطاء والهمزة والحروف الشمسية والقمرية.</li><li>4. تطوير مهارات الكتابة والتواصل اللغوي واستخدام العلامات الترتيبية بفعالية.</li><li>5. تعلم مفاهيم الجمل والمفاعيل والعدد وقواعد حروف الجر وكتابة الخطابات الإدارية بمهنية</li></ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>بناءً على المواضيع المذكورة، يمكن تلخيص ما يتعلمه الطالب في نهاية الكورس على النحو التالي:</p> <ul style="list-style-type: none"><li>● مهارات الكتابة: يكتسب الطالب مهارات أساسية للكتابة العربية، بما في ذلك قواعد الكتابة، والفرق بين الأحرف المشددة والمقصورة، واستخدام العلامات الترتيبية بشكل صحيح.</li><li>● النطق والإملاء: يتعلم الطالب كيفية نطق واستخدام الحروف الصوتية العربية مثل الضاد والطاء بدقة، وكذلك كتابة الهمزة في الكلمات.</li><li>● القواعد اللغوية: يستفيد الطالب من معرفة القواعد اللغوية الأساسية مثل الأجزاء الأساسية للجملة والمفاعيل والعدد.</li><li>● التفرقة بين الشمسية والقمرية: يتعرف الطالب على الحروف الشمسية والقمرية ويتعلم استخدامها بشكل صحيح.</li><li>● مهارات الكتابة الإدارية: يكتسب الطالب مهارات كتابة الخطابات الإدارية بشكل محترف ويصبح قادرًا على التفاعل بفعالية في بيئة عمل إدارية.</li></ul>
<b>Indicative Contents</b> المحتويات الإرشادية	<ol style="list-style-type: none"><li>1. قواعد كتابة الالف الممدودة والمقصورة – الحروف الشمسية والقمرية</li><li>2. الضاد والطاء</li><li>3. كتابة الهمزة</li><li>4. علامات الترتيب</li><li>5. الاسم والفعل والتفريق بينهما</li><li>6. المفاعيل</li><li>7. العدد</li><li>8. تطبيقات الأخطاء اللغوية الشائعة</li><li>9. النون والتنوين. معاني حروف الجر</li></ol>
	<ol style="list-style-type: none"><li>10. الجوانب الشكلية للخطاب الإداري</li><li>11. لغة الخطاب الإداري</li><li>12. نماذج من المراسلات الإدارية</li></ol>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	سيتم تقييم المقرر الدراسي من خلال مجموعة متنوعة من الامتحانات والواجبات والعروض والمشاريع. قد تشمل أساليب التقييم اختبارات مكتوبة، أبحاث علمية، تقارير تقنية، عروض شفوية، والمشاركة في أنشطة الصف.
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Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	32	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	2.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	68	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

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

Delivery Plan (Weekly Syllabus)		
المنهاج الاسبوعي النظري		
Material Covered		
مقدمة عن الأخطاء اللغوية – التاء المربوطة والطويلة والتاء المفتوحة		الاسبوع الاول
قواعد كتابة الالف الممدودة والمقصورة – الحروف الشمسية والقمرية		الاسبوع الثاني
الضاد والطاء		الاسبوع الثالث
كتابة الهمزة		الاسبوع الرابع
علامات الترقيم		الاسبوع الخامس

الاسم والفعل والتفريق بينهما	الاسبوع السادس
المفاعيل	الاسبوع السابع
العدد	الاسبوع الثامن
تطبيقات الأخطاء اللغوية الشائعة	الاسبوع التاسع، العاشر
النون والتنوين . معاني حروف الجر	الاسبوع الحادي عشر
الجوانب الشكلية للخطاب الإداري	الاسبوع الثاني عشر
لغة الخطاب الإداري	الاسبوع الثالث عشر، الرابع عشر
نماذج من المراسلات الإدارية	الاسبوع الخامس عشر

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"> <li>6، الاملاء الواضح: عبد المجيد النعيمي، دحام الكيال، مكتبة دار المتنبي، بغداد ط</li> <li>• دروس في اللغة والنحو والاملاء لموظفي الدولة : اسماعيل حمود عطوان واخرون مطبعة وزارة التربية رقم (3) بغداد، ط 2، 1984م.</li> </ul>	Yes
Recommended Texts	<ul style="list-style-type: none"> <li>• اللغة العربية العامة لأقسام غير الاختصاص : عبد القادر حسن امين واخرون، وزارة التعليم العالي والبحث العلمي، ط 2، 2000م.</li> <li>• من وحي الادب العربي: هفال محمد امين، مطبعة السعدون، بغداد.</li> </ul>	Yes
Websites	<ul style="list-style-type: none"> <li>• <a href="http://www.dalilalarab.com">www.dalilalarab.com</a></li> <li>• <a href="http://www.learningarabic.net">www.learningarabic.net</a></li> </ul>	

## Grading Scheme

### مخطط الدرجات

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



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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Engineering MATHEMATICS</b>		Module Delivery
Module Type	Support		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input type="checkbox"/> Seminar
Module Code	ETCP201		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester of Delivery	3
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Mathematics	Semester	
Co-requisites module	None	Semester	



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**Module Aims, Learning Outcomes and Indicative Contents**

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> <li>1 Students will learn how to evaluate double integrals, which involve integrating over a region in two-dimensional space. They will understand the geometric interpretation of double integrals as finding the volume under a surface.</li> <li>2. Students will delve into power series, which are infinite series in which each term is a power of a variable multiplied by a coefficient. They will explore the interval of convergence for power series and understand the concept of the radius of convergence. Power series have significant applications in areas such as calculus, differential equations, and physics.</li> <li>3. Students will learn about Taylor and Maclaurin series, which are power series representations of functions.</li> <li>4. Students will become proficient in performing operations with Matrices</li> <li>5. Students will become proficient in performing operations with vectors, such as vector addition, scalar multiplication, dot product, and cross product and study vector projections and their applications.</li> <li>6. Students will explore applications of infinite sequences and series in various areas, including calculus, differential equations, physics, engineering, and finance. They will learn to model real-world phenomena using sequences and series and apply their knowledge to solve practical problems</li> <li>7. Students will understand and work with polar coordinates, which represent points in a plane using radial distance and angle.</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p><b>After studying engineering mathematics, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Evaluate double and triple integrals ,understand the geometric interpretation of multiple integrals.</li> <li>2. Perform matrix operations, including matrix multiplication and addition, calculate determinants and matrix inverses and analyse properties of matrices, such as eigenvalues and eigenvectors.</li> <li>3. develop a deep understanding of ODEs, learn various solution techniques, apply them to model engineering systems, and enhance problem-solving skills for real-world engineering applications.</li> <li>4. Determine the convergence and divergence of series ,work with different types of series, including arithmetic, geometric, and power series.</li> <li>5. Apply Taylor and Maclaurin series expansions for approximations and solving differential equations.</li> <li>6. Apply the fundamental theorems of vector calculus .</li> <li>7. Understand the properties and representations of plane curves, and to analyse and manipulate equations using polar coordinates for engineering applications</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"> <li>1. <b>Multiple Integrals:</b> Double Integral, Area, Volume, Double Integral in polar coordinates, Triple Integral in rectangular coordinates, physical application of double and triple integration.</li> <li>2. <b>Matrix Theory:</b></li> </ol>





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Definition, Properties, System of Linear Equation, Gauss Elimination, Linear Independence and Rank, Determinants, Inverse, Gauss-Jordan Elimination, Matrix Eigen-Values Problem, Special Matrices

**3. Ordinary Differential Equation:** Definition, Type, Order, Degree, First order Ordinary Differential Equation (Separable Variable Equation, Homogeneous Equation, Linear Differential Equation, Exact Equation, Substitution Method, Integrating Factor Method, Second Order Differential Equation, Homogeneous Second Order, Non-Homogeneous Second Order (Undetermined Coefficients, Variation of Parameters), Engineering Applications, Third and Fourth Order, Solution of Differential Equation by Series

**4. Infinite Series:**

Limits, Infinite Series, Series without Negative Terms, Series with Nonnegative Terms, Alternating Series and Absolute Convergence, Power Series, Taylor Series and Maclaurin Series

**5. Vector Calculus:**

Scalar and Vector, Components of Vector, Vector Addition, and Multiplication of Vector, Scalar Product, Vector Product, and Line Integral Using Parametric Equation of the Path, Line Integral in Vector Field Work.

**6. Plane Curves and Polar Coordinates:**

Conic Sections and Quadratic Equations, Graph of Quadratic Equations, Parametric Equations for Plane Curves, Calculus of Parametric Equations, Polar Coordinates, Graphing in Polar coordinates, Polar Equations of Conic Sections, Integration in Polar Coordinates

**Learning and Teaching Strategies**

استراتيجيات التعلم والتعليم

**Strategies**

- Provide a clear and concise overview of the key concepts of Engineering Mathematics.
- Use a variety of teaching methods, including lectures, demonstrations, and hands-on activities, to engage students and help them understand the material.
- Encourage students to participate in class discussions and activities.
- Provide opportunities for students to apply what they have learned to solve real-world problems.
- Assess student learning through a variety of methods, including quizzes, exams, and projects.



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Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	62	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.9
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1,2	Multiple Integrals
Week 3,4,5	Matrix Theory
Week 6,7,8,9	Ordinary Differential Equation
Week 10,11	Infinite Series
Week 12,13	Vector Calculus
Week 14,15	Plane Curves and Polar Coordinates
Week 16	Preparatory week before the Final Exam



Ministry of Higher Education and  
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Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"><li>" Higher Engineering Mathematics "by Dr.B.S.Grewal, Khanna Publishers</li></ul>	Yes
Recommended Texts	<ul style="list-style-type: none"><li>"Advanced Engineering Mathematics "by Erwin Kreyszig</li></ul>	Yes
Websites	<a href="https://www.khanacademy.org/math/engineering-math">https://www.khanacademy.org/math/engineering-math</a>	

Grading Scheme

مخطط الدرجات

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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Fluid Flow		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical
Module Code	ETCP200		
ECTS Credits	9		
SWL (hr/sem)	225		
Module Level	2	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>Fluid flow is the study of the behavior of liquids and gases, particularly the forces that they produce.</p> <p>The purpose of this course is to teach the fundamentals of engineering fluid mechanics in a very general manner so that the students understand the way that forces are produced and transmitted by fluids that are, first, essentially at rest and, second, in motion. This will allow us to apply the physical principles behind some of the most common applications of fluid mechanics in engineering. Most of these principles should be familiar – conservation of energy, Newton's laws of motion – and so the subject concentrates on their application to liquids.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>By the end of this course, the students should be able to:</p> <ol style="list-style-type: none"> <li>1) recognize some fluid properties and types of flow;</li> <li>2) understand the transmission of pressure in liquids and its application to hydraulics</li> <li>3) use a manometer to calculate pressures</li> <li>4) calculate hydrostatic forces on plane and curved submerged surfaces;</li> <li>5) understand Archimedes' principle and buoyancy</li> <li>6) employ the concept of continuity of flow</li> <li>7) define viscosity</li> <li>8) calculate pressure drops in pipe flow</li> <li>9) use Bernoulli's equation to measure flow rate and velocity</li> <li>10) Apply the momentum principle to liquids in jets and pipes</li> <li>11) Define the operation principles of the different types of flow measurement, and solve problems in fluid flow through flow measurement devices with applications for steady and unsteady flow.</li> <li>12) Demonstrate knowledge of compressible fluid flows, with differences of equations using depending on compressible flow conditions, sonic (sub)(super)sonic flow, conversion*diversion nozzle, and types of gas pumping devices.</li> <li>13) Provide the ability to estimate the energy (power) consumption for liquid mixing equipment and to design it by predicting necessary fluid parameters of full-scale projects by performing simple model experiments.</li> <li>14) 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...</li> <li>15) Share ideas and work in a team in an efficient and effective manner under controlled supervision or independently.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"> <li>1) <b>Introduction:</b></li> </ol>

Definition of fluid, fluid mechanics; Physical properties of fluids: Density, specific gravity, viscosity, kinematic viscosity, surface tension and capillarity, bulk modulus of elasticity, Pressure and shear stress; Types of Fluids: Newtonian, non-Newtonian fluids ideal and real fluids, Newton's law of viscosity.

**2) Dimensional Analysis:**

Units and dimensions; Fundamental dimensions; Dimensional homogeneity; Dimensionless number Methods of dimensional analysis,

- 1) Rayleigh's method (power series)
- 2) Buckingham's  $\Pi$ - method / Theorem

**3) Fluid Statics:**

Basic consideration of fluid statics; Pressure head of liquid; Pressure force on surfaces; Buoyancy; Measurement of pressure: (Piezometer, Manometers, types of Manometers, Mechanical Gauges).

**4) Basic consideration of fluid statics:**

Pressure head of liquid; Pressure force on surfaces; Buoyancy; Measurement of pressure: (Piezometer, Manometers, types of Manometers, Mechanical Gauges)

Fluid Dynamics, Newtonian's Incompressible Fluid: Fluid kinematics Continuity equation, types of flow.

**5) Fluid dynamics**

- Bernoulli's and Euler's equation+ Lab.
- flow through pipes
- Pumping of Liquids

**6) Head loss due to friction, fitting, contraction, expansion**

**1) Pumps:**

Total heads, NPSH, Horse Power and cost consumption, Pumping Efficiency Characteristics curves Types of pumps, Selection of Pumps. Centrifugal pump relations, homologous centrifugal pump, centrifugal pumps in series and in parallel

**2) Flow Measurement:**

Pitot tubes, orifice meter, venturi meter, nozzle meter, Rotameters other types of flow meters, flow in open channels and weirs with steady and unsteady applications compression cycle and calculation of compressor work.

**3) Flow of Compressible Fluid:**

General equation, equation of state, sonic velocity in fluids, Mach No. Isothermal, Non-isothermal and Adiabatic flow of an ideal gas in horizontal pipes, Converging-diverging nozzle for gas flow. Types of gas pumping devices (fans, blowers compressors) compressors types and gas compression cycle and calculations of work and efficiency of compressor.

**4) Liquid Mixing :**

Stirring and mixing and rotational force, effective forces and dimensionless numbers for rotational fluid flow. Stirred vessels (power consumption, power curve, scaled-up), equipment.

	<p><b>5) Flow of Fluid through Granular Bed and Packed Columns:</b>  Motion of particles in a fluid, Drag force on a particle, terminal falling velocities, Sedimentation of fine and coarse particles, Pressure drop in granular beds, packed columns: packing types, Pressure drop estimation (Kozeny and Carmen equations), Fluidization Minimum fluidization velocity, Pressure, Pressure drop, Ergun equation, bed expansion and transport of particles.</p> <p><b>6) Pumps:</b>  Total heads, NPSH, Horse Power and cost consumption, Pumping Efficiency Characteristics curves Types of pumps, Selection of Pumps. Centrifugal pump relations, homologous centrifugal pump, centrifugal pumps in series and in parallel</p> <p><b>7) Flow Measurement:</b>  Pitot tubes, orifice meter, venturi meter, nozzle meter, Rotameters other types of flow meters, flow in open channels and weirs with steady and unsteady applications compression cycle and calculation of compressor work.</p> <p><b>8) Flow of Compressible Fluid:</b>  General equation, equation of state, sonic velocity in fluids, Mach No. Isothermal, Non-isothermal and Adiabatic flow of an ideal gas in horizontal pipes, Converging-diverging nozzle for gas flow. Types of gas pumping devices (fans, blowers compressors) compressors types and gas compression cycle and calculations of work and efficiency of compressor.</p> <p><b>9) Liquid Mixing :</b>  Stirring and mixing and rotational force, effective forces and dimensionless numbers for rotational fluid flow. Stirred vessels (power consumption, power curve, scaled-up), equipment.</p> <p><b>10) Flow of Fluid through Granular Bed and Packed Columns:</b>  Motion of particles in a fluid, Drag force on a particle, terminal falling velocities, Sedimentation of fine and coarse particles, Pressure drop in granular beds, packed columns: packing types, Pressure drop estimation (Kozeny and Carmen equations), Fluidization Minimum fluidization velocity, Pressure, Pressure drop, Ergun equation, bed expansion and transport of particles.</p>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا
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<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	123	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	8.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	102	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	6.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>225</b>		

### Module Evaluation

#### تقييم المادة الدراسية

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

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1</b>	Introduction to Fluid Flow
<b>Week 2-3</b>	Dimensional Analysis
<b>Week 4</b>	Fluid Statics
<b>Week 5</b>	Fluid Dynamics, Newtonian's Incompressible Fluid: Fluid kinematics
<b>Week 6</b>	Continuity equation, types of flow
<b>Week 7</b>	Fluid dynamics
<b>Week 8</b>	Bernoulli's and Euler's equation
<b>Week 9</b>	flow through pipes
<b>Week 10</b>	Modified Energy and Losses, friction factor
<b>Week 11</b>	Head loss due to friction, fitting, contraction, expansion
<b>Week 12</b>	Pumps
<b>Week 13</b>	Flow Measurements



<b>Week 14</b>	Flow of Compressible Fluid
<b>Week 14</b>	Liquid Mixing
<b>Week 15</b>	Flow of Fluid through Granular Bed and Packed Columns
<b>Week 16</b>	<b>Final Exam</b>

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	<b>Material Covered</b>
<b>Week 1</b>	Density, specific gravity Measurements Viscosity Measurement using the Stocks method Viscosity Measurement using Capillary Viscometer
<b>Week 2</b>	Pressure measurement Devices ( Manometers)
<b>Week 3</b>	Calibration of Bourdon Gage Pressure
<b>Week 4</b>	Determination of center pressure
<b>Week 5</b>	Reynolds Number Determination
<b>Week 6</b>	Fluid Flow Measurements Using Traditional Method
<b>Week 7</b>	Measuring the Velocity and Pressure Distribution around the Bend in the Rectangular Duct
<b>Week 8</b>	Single-Stage Centrifugal Pump
<b>Week 9</b>	Calibration of Rotameter
<b>Week 10</b>	Fluid flow measurements using Venturi-meter
<b>Week 11</b>	Fluid flow measurements using Orifice-meter
<b>Week 12</b>	Fluid flow measurements using Nozzle-meter
<b>Week 13</b>	Airflow velocity measurements
<b>Week 14</b>	Determination of Centre of Pressure and Hydro-static Force on Plane surface
<b>Week 15</b>	Flow over the rectangular weir and V-notch
<b>Week 16</b>	<b>Final Exam</b>

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>	1) Holland, F.A. and Bragg, R., "Fluid Flow for Chemical Engineers", 2nd Ed., Edward Arnold, 1995.	<b>pdf</b>

	2) ext 1- Coulson, J.M. , Richardson, J.F., Backhurst, J.R. and Harker, J.H., “Chemical Engineering” Volume(1) 6thEd., Butterworth-Heinemann, 1999	
<b>Recommended Texts</b>	1) DARBY. R. , Dekker M. “Chemical Engineering Fluid Mechanics”, 2ndEd.Marcell Dekker, 2001 2) Wilkes J. O.,“Fluid Mechanics for Chemical Engineers”, Coulson, J.M. , Richardson, J.F., Backhurst, J.R. and Harker, J.H., “Chemical Engineering” Volume(1) 6thEd., Butterworth-Heinemann, 1999 2nd Ed. Prentice Hall PTR, 1999.	
<b>Websites</b>		

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



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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Physical Chemistry</b>		Module Delivery
Module Type	Core		Theory Lecture Lab Practical
Module Code	ETCP202		
ECTS Credits	9		
SWL (hr/sem)	225		
Module Level	2	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<b>Module Objectives</b> أهداف المادة الدراسية	<ol style="list-style-type: none"><li>1. Provide a fundamental understanding of the principles and concepts of physical chemistry.</li><li>2. Bridge the gap between theory and applications, showing how physical chemistry principles can be applied to areas such as chemical reactions, materials science, and environmental chemistry.</li><li>3. Develop critical thinking skills and problem-solving strategies that can be applied to chemical systems.</li><li>4. Introduce students to scientific inquiry, encouraging them to explore and investigate the underlying principles through laboratory work, literature reviews, and research projects.</li></ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p><b>At the end of this module students will be able to:</b></p> <ol style="list-style-type: none"><li>1. Understand the fundamental principles and concepts of physical chemistry.</li><li>2. Relate physical chemistry theories to real-world applications in various fields.</li><li>3. Develop critical thinking and problem-solving skills specific to physical chemistry.</li><li>4. Conduct scientific inquiry and research in physical chemistry.</li><li>5. Recognize interdisciplinary connections between physical chemistry and other scientific disciplines.</li><li>6. Communicate effectively about physical chemistry concepts and research findings.</li><li>7. Apply experimental techniques and data analysis methods commonly used in physical chemistry.</li><li>8. Critically evaluate scientific literature in physical chemistry.</li><li>9. Demonstrate a comprehensive understanding of the interplay between theory and experiment in physical chemistry</li></ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<ol style="list-style-type: none"><li><b>1. States of matter:</b><ul style="list-style-type: none"><li>● Gas</li><li>● liquid</li><li>● solid</li></ul></li><li><b>2. Liquid properties:</b><ul style="list-style-type: none"><li>● Vapor Pressure</li><li>● Viscosity, Surface Tension</li><li>● Refractive Index, Phases</li></ul></li><li><b>3. Phases:</b><ul style="list-style-type: none"><li>● Homogenies phase</li><li>● Hetrogenies phase</li><li>● Multi component phast</li><li>● Diagram of phasis</li></ul></li><li><b>4. Gibbs law</b><ul style="list-style-type: none"><li>● Gibbs' law - the system composed of one component</li><li>● Gibbs' law - the system consisting of more than one component</li></ul></li><li><b>5. Liquids properties :</b><ul style="list-style-type: none"><li>● kinetic theory of liquid</li></ul></li></ol>

- Solution, Property of dilute solution (colligative properties)
- Chemical equilibria

#### **6.Surface chemistry and the catalyst:**

- The Catalyst
- The General Principles Of The Work Of The Catalyst
- Type Of Catalysis

#### **7.Adsorption**

- interpretation of the phenomenon of adsorption
- adsorption of gases on the surfaces of solid materials
- factors affecting the phenomenon of adsorption
- types of adsorption (chemical, physical) , its properties.

#### **8.Electrochemistry**

- Used units
- Ohm's law electrolytic conductivity (solids, liquid)
- faraday's first and second laws
- Specific resistance
- Specific conductivity
- Equivalent conduction - equivalent conduction at final dilution (kohler's law)
- Degree and ionization constant-
- Conduction CELL
- ION MIGRATION (TRANSITION PREPARATION) METHOD TO FIND THE TRANSITION
- Cells
- Voltaic (REVERSE AND NON-REVERSE) - measurement OF ELECTROMOTIVE FORCE

#### **11.Emulsifiers :**

- Emulsifying agents
- Types of emulsions
- calculation methods

#### **12.Spectroscopy**

- Spectral methods
- Spectroscopy region
- Example on the spectroscopy
- Microwave radiation
- IR
- UV and Visible
- NMR

#### **14.Nuclear chemistry**

- Introduction to nuclear chemistry
- Radiation chemistry
- Nuclear fission

	<ul style="list-style-type: none"> <li>• Nuclear fusion</li> </ul> <p><b>15. Physical basis of some chemical analysers</b></p> <ul style="list-style-type: none"> <li>• Chromatography</li> <li>• HPLC</li> <li>• T.G Polymer</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	The course will be assessed through a combination of examinations, assignments, presentations, and projects. The assessment methods may include written tests, research papers, technical reports, oral presentations, and participation in class activities.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	138	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	9.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>200</b>		

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

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	Material Covered
Week 1	States of matter
Week 2	Liquid properties
Week 3	Phases
Week 4	Gibbs law
Week 5	Liquids properties
Week 6	Surface chemistry and the catalyst
Week 7	Adsorption
Week 8,9,10	Electrochemistry
Week 11	Emulsifiers
Week 12,13	Spectroscopy
Week 14	Nuclear chemistry
Week 15	Physical basis of some chemical analysers
Week 16	Final Exam

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

	Material Covered
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<b>Week 1</b>	Viscosity - using the Ostold Quitter method or the Hubler apparatus.
<b>Week 2</b>	Determination of liquid density and specific gravity using hydrometer, pycnometer
<b>Week 3</b>	Finding the molecular weight Measurement of the molecular weight of a volatile substance by Victor Meyer method
<b>Week 4</b>	Molecular Weight Measurement (by Boiling Height Method)
<b>Week 5</b>	Refractive index measurement
<b>Week 6</b>	Electrical conductivity (determination of conductivity for different solutions strong electrolyte and weak electrolyte) and determination of the degree of ionization and ionization constant
<b>Week 7</b>	Surface tensile strength measurement Using capillary tubes or using surface tension balance
<b>Week 8</b>	Find the common solubility curve for phenol and water
<b>Week 9</b>	distribution constant
<b>Week 10</b>	Heat of dissolution: determination of the temperature of a solution of an organic acid by dissolving it at different temperatures
<b>Week 11</b>	Measurement heat of neutralization
<b>Week 12</b>	Heat of solution
<b>Week 13</b>	Adsorption (adsorption of organic acid by activated carbon)
<b>Week 14</b>	Spectroscopy analysis by using UV spectroscopy
<b>Week 15</b>	Measure the concentration of solutions using UV spectrometer

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>"Physical Chemistry" by Peter Atkins and Julio de Paula.</li> <li>"Principles of Physical Chemistry" by Hans Kuhn, Horst-Dieter Försterling, and Peter W. Atkins.</li> </ul>	
<b>Recommended Texts</b>	"Physical Chemistry for the Chemical and Biological Sciences" by Raymond Chang and Jr. Thoman John W.	
<b>Websites</b>	<a href="https://ocw.mit.edu/index.htm">https://ocw.mit.edu/index.htm</a>	



## Grading Scheme

### مخطط الدرجات

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



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## MODULE DESCRIPTOR FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	جرائم نظام البعث في العراق		Module Delivery
Module Type	Support		Theory Lecture Seminar
Module Code	NTU201		
ECTS Credits			
SWL (hr/sem)			
Module Level	2	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. فهم التاريخ والسياق السياسي لنظام البعث في العراق.</li> <li>2. توثيق وفهم الجرائم والانتهاكات التي وقعت في هذه الفترة.</li> <li>3. تعزيز الفهم القانوني للجرائم والانتهاكات وأهمية تحقيق العدالة.</li> <li>4. فهم الآثار النفسية والاجتماعية والبيئية لتلك الجرائم.</li> <li>5. المساهمة في الحقيقة والعدالة وزيادة الوعي بقضايا حقوق الإنسان والبيئة</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>بناءً على المواضيع المذكورة، يمكن تلخيص ما يتعلمه الطالب في نهاية الكورس على النحو التالي:</p> <ul style="list-style-type: none"> <li>● فهم التاريخ والسياق القانوني لجرائم نظام البعث في العراق وتوثيقها وفقاً لقانون المحكمة الجنائية العراقية العليا لعام 2005.</li> <li>● تصنيف وفهم الجرائم من خلال فهم مفهوم الجرائم وأقسامها بما في ذلك الجرائم الدولية.</li> <li>● التعرف على الجرائم النفسية والاجتماعية وآثارها وأثارها على المجتمع.</li> <li>● فهم الجرائم البيئية والبحث في تأثير تلوث الحرب والتدمير البيئي.</li> <li>● التعرف على جرائم المقابر الجماعية وفهم أحداث مقابر الإبادة الجماعية وتصنيفها زمنياً.</li> </ul>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>الفصل الأول</p> <p>جرائم نظام البعث وفق قانون المحكمة الجنائية العراقية العليا عام ٢٠٠٥ م</p> <ol style="list-style-type: none"> <li>١,١ . مفهوم الجرائم وأقسامها.</li> <li>١,١,١ . تعريف الجريمة لغة واصطلاحاً</li> <li>١,١,٢ . أقسام الجرائم</li> <li>١,٢ . جرائم نظام البعث وفق توثيق قانون المحكمة الجنائية العراقية العليا عام ٢٠٠٥ م</li> <li>١,٢,١ . أنواع الجرائم الدولية</li> <li>١,٢,٢ . القرارات الصادرة من المحكمة الجنائية العليا</li> </ol> <p>الفصل الثاني</p> <p>الجرائم النفسية والاجتماعية وأثارها، وأبرز انتهاكات النظام البعثي في العراق</p> <ol style="list-style-type: none"> <li>٢,١ . الجرائم النفسية</li> <li>٢,١,١ . آليات الجرائم النفسية</li> <li>٢,١,٢ . آثار الجرائم النفسية</li> <li>٢,٢ . الجرائم الاجتماعية</li> <li>٢,٢,١ . عسكرة المجتمع</li> <li>٢,٢,٢ . موقف النظام البعثي من الدين</li> <li>٢,٣ . انتهاكات القوانين العراقية</li> <li>٢,٣,١ . صور انتهاكات حقوق الإنسان وجرائم السلطة</li> <li>٢,٣,٢ . بعض قرارات الانتهاكات السياسية والعسكرية لنظام البعث</li> <li>٢,٣,٣ . أماكن السجون والاحتجاز لنظام البعث</li> </ol> <p>الفصل الثالث .</p> <p>الجرائم البيئية لنظام البعث في العراق</p> <ol style="list-style-type: none"> <li>٣,١ . التلوث الحربي والإشعاعي وانفجار الألغام.</li> <li>٣,٢ . تدمير المدن والقرى (سياسة الأرض المحروقة)</li> <li>٣,٣ . تجفيف الأهوار</li> <li>٣,٤ . تجريف بساتين النخيل والأشجار والمزروعات</li> </ol> <p>الفصل الرابع</p> <p>جرائم المقابر الجماعية</p>

٤,١ أحداث مقابر الإبادة الجماعية المرتكبة من النظام البعثي في العراق.  
٤,٢ التصنيف الزمني لمقابر الإبادة الجماعية في العراق للمدة ١٩٦٣ م - ٢٠٠٣ م.

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

<b>Strategies</b>	سيتم تقييم المقرر الدراسي من خلال مجموعة متنوعة من الامتحانات والواجبات والعروض والمشاريع. قد تشمل أساليب التقييم اختبارات مكتوبة، أبحاث علمية، تقارير تقنية، عروض شفوية، والمشاركة في أنشطة الصف.
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### Student Workload (SWL)

#### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	32	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	2.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	68	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

### Module Evaluation

#### تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
	<b>Quizzes</b>	2	10% (10)	5 and 10	LO #1, #2 and #10, #11

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

Delivery Plan (Weekly Syllabus)		
المنهاج الاسبوعي النظري		
	Material Covered	
	الفصل الاول	الأسبوع الأول الأسبوع الثاني الأسبوع الثالث الأسبوع الرابع
	الفصل الثاني	الأسبوع الخامس الأسبوع السادس الأسبوع السابع الأسبوع الثامن الأسبوع التاسع, العاشر
	الفصل الثالث	الأسبوع الحادي عشر الأسبوع الثاني عشر
	الفصل الرابع	الأسبوع الثالث عشر, الأسبوع الرابع عشر الأسبوع الخامس عشر

### Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"> <li>• . سليم مطر ، موسوعة البيئة العراقية ، الطبعة العربية الاولى ، .٢٠١٠</li> <li>• جندي عبد الملك، الموسوعة الجنائية، الجزء الثالث، دار أحياء التراث العربي، بيروت، ١٩٩٠ م</li> </ul>	Yes
Recommended Texts	<ul style="list-style-type: none"> <li>• أرشيف المركز العراقي لتوثيق جرائم التطرف في العتبة العباسية المقدسة.</li> </ul>	Yes
Websites	<ul style="list-style-type: none"> <li>• (<a href="https://www.un.org/">https://www.un.org/</a>) الموقع الرسمي للأمم المتحدة</li> </ul>	

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



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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Computer Application</b>		Module Delivery
Module Type	<b>Support</b>		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	<b>ETCP302</b>		
ECTS Credits	<b>4</b>		
SWL (hr/sem)	<b>100</b>		
Module Level	<b>2</b>	Semester of Delivery	
Administering Department	<b>ETCP</b>	College	<b>TEMO</b>
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	<b>Professor</b>	Module Leader's Qualification	<b>Ph.D.</b>
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	<b>01/06/2023</b>	Version Number	<b>1.0</b>

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	<b>None</b>	Semester	
Co-requisites module	<b>None</b>	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> المادة أهداف الدراسية</p>	<ol style="list-style-type: none"><li>1.Introduce students to MATLAB as a programming language and development environment.</li><li>2.Teach students the basics of MATLAB programming, including variables, data types, and mathematical operations.</li><li>3.Familiarize students with control flow structures and loops for program control and iteration.</li><li>4.Provide an understanding of functions and scripts in MATLAB and their applications.</li><li>5.Teach students file input/output operations to read and write data from/to files in MATLAB.</li><li>6.Develop students' skills in data visualization using various plotting techniques in MATLAB.</li><li>7.Introduce advanced MATLAB programming techniques, such as complex numbers and symbolic math.</li><li>8.Teach students debugging and error handling strategies for MATLAB programs.</li><li>9.Apply MATLAB programming skills to real-world applications through projects and practical exercises.</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>After completing the course on computer application , students will be able to</p> <ol style="list-style-type: none"><li>1.Understand the fundamentals of MATLAB as a programming language and development environment.</li><li>2.Write and execute MATLAB commands and scripts to solve mathematical problems and perform data analysis.</li><li>3.Utilize variables, arrays, and matrices effectively for storing and manipulating data in MATLAB.</li><li>4.Apply control flow structures and loops to control program execution and implement iterative processes.</li><li>5.Create and use user-defined functions to modularize code and enhance reusability.</li><li>6.Read data from files and write data to files in various formats using MATLAB.</li><li>7.Generate and customize a wide range of plots and visualizations to present data effectively.</li><li>8.Perform advanced mathematical operations, such as symbolic mathematics and equation solving, using MATLAB.</li><li>9.Debug MATLAB programs, identify and fix errors, and handle exceptions and errors gracefully..</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"><li><b>1.Introduction to MATLAB environment and syntax:</b><ul style="list-style-type: none"><li>● Understand the basic features and capabilities of MATLAB</li><li>● Navigate the MATLAB user interface and workspace</li><li>● Write and execute simple MATLAB commands and scripts</li><li>● Learn about the syntax and structure of MATLAB programming language</li></ul></li><li><b>2. Variables, arrays, and matrices:</b><ul style="list-style-type: none"><li>● Define and manipulate variables in MATLAB</li><li>● Understand different data types and their uses in MATLAB</li><li>● Create and manipulate arrays and matrices</li><li>● Perform basic operations on arrays and matrices</li></ul></li><li><b>3. Mathematical operations and functions:</b><ul style="list-style-type: none"><li>● Perform mathematical operations in MATLAB</li><li>● Utilize built-in mathematical functions for computations</li><li>● Create user-defined functions and use them in MATLAB programs</li></ul></li><li><b>4. Scripting and writing functions</b><ul style="list-style-type: none"><li>● Write MATLAB scripts to solve complex problems</li></ul></li></ol>



	<ul style="list-style-type: none"> <li>● Understand the concept of control flow and program execution order</li> <li>● Develop and use functions to modularize code and improve reusability</li> </ul> <p>5. Conditional statements and loops</p> <ul style="list-style-type: none"> <li>● Use conditional statements (if-else, switch-case) to control program flow</li> <li>● Implement iterative processes using loops (for, while) in MATLAB</li> <li>● Understand the concept of vectorization and its benefits</li> </ul> <p>6. File input/output operations</p> <ul style="list-style-type: none"> <li>● Read data from files and write data to files in MATLAB</li> <li>● Understand different file formats and their handling in MATLAB</li> <li>● Import and export data to and from MATLAB workspace</li> </ul> <p>7. Data visualization and plotting techniques</p> <ul style="list-style-type: none"> <li>● Create 2D and 3D plots to visualize data</li> <li>● Customize plot appearance, labels, and annotations</li> <li>● Generate various types of plots, such as line plots, scatter plots, histograms, etc.</li> </ul> <p>8. Symbolic mathematics and equation solving</p> <ul style="list-style-type: none"> <li>● Perform symbolic computations using MATLAB Symbolic Math Toolbox</li> <li>● Solve algebraic and differential equations symbolically</li> <li>● Manipulate and simplify mathematical expressions in MATLAB</li> </ul> <p>9. Debugging and error handling</p> <ul style="list-style-type: none"> <li>● Identify and fix errors in MATLAB programs</li> <li>● Utilize debugging tools and techniques in MATLAB</li> <li>● Handle exceptions and errors gracefully in MATLAB programs</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<ul style="list-style-type: none"> <li>● Provide a clear and concise overview of the key concepts of computer applications .</li> <li>● Use a variety of teaching methods, including lectures, demonstrations, and hands-on activities, to engage students and help them understand the material.</li> <li>● Encourage students to participate in class discussions and activities.</li> <li>● Provide opportunities for students to apply what they have learned to solve real-world problems.</li> <li>● Assess student learning through a variety of methods, including quizzes, exams, and projects.</li> </ul>

## Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	77	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	5.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	23	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	100		

## Module Evaluation

تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1,2	Introduction to MATLAB environment and syntax
Week 4,5	Variables, arrays, and matrices
Week 6,7	Mathematical operations and functions
Week 8	Scripting and writing functions
Week 9,10	Conditional statements and loops
Week 11	File input/output operations
Week 12,13	Data visualization and plotting techniques
Week 14	Symbolic mathematics and equation solving
Week 15	Debugging and error handling

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

	Material Covered
Week 1,2	Basic MATLAB Commands and Scripting: <ul style="list-style-type: none"><li>● Execute basic MATLAB commands and scripts to perform mathematical operations.</li><li>● Write MATLAB scripts to solve simple problems, such as calculating the average of a set of numbers or finding the roots of an equation.</li></ul>
Week 3,4	Data Manipulation and Visualization: <ul style="list-style-type: none"><li>● Manipulate arrays and matrices to perform data operations, such as filtering, sorting, and indexing.</li><li>● Generate plots and visualizations for data analysis, including line plots, scatter plots, and histograms.</li></ul>
Week 5,6,7	Control Flow and Looping: <ul style="list-style-type: none"><li>● Use control flow structures like if-else statements and switch-case statements to control program flow based on conditions.</li><li>● Implement loops (for and while) for iterative processes and calculations.</li></ul>
Week 8,9	Functions and Scripting:

	<ul style="list-style-type: none"> <li>● Create and use user-defined functions to modularize code and improve reusability.</li> <li>● Write scripts that utilize functions to solve complex problems or perform repetitive tasks.</li> </ul>
<b>Week 10 ,11</b>	<p>File Input/output Operations:</p> <ul style="list-style-type: none"> <li>● Read data from external files (e.g., CSV, Excel) into MATLAB for analysis.</li> <li>● Write data from MATLAB to files in different formats for storage or sharing.</li> </ul>
<b>Week 12</b>	<p>Advanced Mathematical Operations:</p> <ul style="list-style-type: none"> <li>● Perform symbolic math operations using MATLAB's Symbolic Math Toolbox.</li> <li>● Solve algebraic equations symbolically and numerically</li> </ul>
<b>Week 13</b>	<p>Debugging and Error Handling:</p> <ul style="list-style-type: none"> <li>● Identify and fix errors in MATLAB programs using debugging tools.</li> <li>● Handle exceptions and errors gracefully through error handling techniques</li> </ul>
<b>14,15</b>	<p>Projects and Applications:</p> <ul style="list-style-type: none"> <li>● Engage students in real-world projects and applications that require MATLAB programming skills.</li> <li>● Encourage students to apply their knowledge to solve specific problems or analyze real datasets</li> </ul>

<b>Learning and Teaching Resources</b>		
مصادر التعلم والتدريس		
	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>● "MATLAB: An Introduction with Applications" by Amos Gilat</li> <li>● "MATLAB for Engineers" by Holly Moore</li> <li>● "MATLAB Programming for Engineers" by Stephen J. Chapman</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>● "Essential MATLAB for Engineers and Scientists" by Brian D. Hahn and Daniel T. Valentine</li> </ul>	Yes
<b>Websites</b>	<a href="https://www.mathworks.com/matlabcentral">https://www.mathworks.com/matlabcentral</a>	

## Grading Scheme

### مخطط الدرجات

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



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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Energy Balance		Module Delivery
Module Type	Core		Theory Lecture Tutorial
Module Code	ETCP206		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	2	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Principles of Chemical Engineering	Semester	1
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>The aims of the course are to provide the Introduction to the concepts of energy balances in chemical processes, including calculations and applications, and to provide deep knowledge, wide scope, and improved understanding of the mechanisms in heat balance for closed and open systems and for the steady and unsteady state. The students should gain knowledge to apply the energy balance in engineering problems.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>At the end of the semester, the student should be able to :</p> <ol style="list-style-type: none"> <li>1) The terminology associated with energy balances, concepts, and units.</li> <li>2) Introduction to energy balances for processes without reaction.</li> <li>3) Calculation of enthalpy changes.</li> <li>4) Energy balances how to account for chemical reactions.</li> <li>5) Energy balances for processes with reaction.</li> <li>6) Calculation of enthalpy changes.</li> <li>7) Heat of solution and Heat of mixing</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"> <li>1) <b>Energy :</b> Terminology , Concept , and units: The terminology associated with energy balances , Types of energy : Work , Heat , Kinetic energy , Potential energy , Internal energy , Enthalpy .</li> <li>2) <b>Introduction to Energy Balances for Processes without Reaction:</b> The concept of the conservation of energy , Energy balances for closed , unsteady-state systems , Energy balances for closed , steady-state systems , Energy balances for open , unsteady state systems , Energy balances for open , steady-state systems .</li> <li>3) <b>Calculation of Enthalpy Changes:</b> Phase transitions, Equation to estimate heat of vaporization , Heat capacity equations , Tables and charts to retrieve enthalpy values .</li> <li>4) <b>Energy Balances : How to Account for Chemical Reaction:</b> The standard heat of formation , The heat of reaction , Merging the heat of formation with the sensible heat or a compound in making an energy balance , The heat of combustion .</li> </ol> <ol style="list-style-type: none"> <li>1) <b>Energy Balances:</b> <ul style="list-style-type: none"> <li>● Introduction to energy balances</li> <li>● Types of energy (internal energy, enthalpy)</li> <li>● Heat capacity and specific heat</li> <li>● Calculation of heat transfer</li> <li>● Heat of reaction calculations</li> </ul> </li> <li>2) <b>Humidity (Psychrometric) Charts and Their Use</b></li> </ol>

	<ul style="list-style-type: none"> <li>● Terminology</li> <li>● The Humidity (Psychrometric) Chart</li> <li>● Applications of the Humidity Chart</li> </ul> <p>3) Analysis of the Degrees of Freedom in Steady-State Processes</p> <p>4) Heat of solutions and Mixing</p> <p>5) The Mechanical Energy Balance</p> <p>6) Liquids and Gases in Equilibrium with Solids</p> <p>7) Unsteady-State Material and Energy Balances</p>
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### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

<b>Strategies</b>	Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture.
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### Student Workload (SWL)

#### الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	78	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	122	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	8.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>200</b>		

### Module Evaluation

#### تقييم المادة الدراسية

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



Total assessment	100% (100 Marks)		
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### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Gases and Vapors Ideal gas law, Ideal gas mixtures
Week 2	Ideal gases material balance and Energy balance
Week 3	Real gases: compressibility
Week 4	Real gas : equation of state
Week 5	Energy : Terminology, Concept, and Units: The terminology associated with energy balances, Types of energy: Work, Heat, Kinetic energy, Potential energy, Internal energy, Enthalpy.
Week 6	Introduction to Energy Balances for Processes without Reaction
Week 7	Calculation of Enthalpy Changes
Week 8	Energy Balances: How to Account for Chemical Reaction:
Week 9	Applications Energy Balances for Processes without Reaction
Week 10	Applications Energy Balances for Processes with Reaction
Week 11	Humidity Charts and Their Use
Week 12	Analysis of the Degrees of Freedom in Steady-State Processes
Week 13	Heat of solutions and Mixing
Week 14	The Mechanical Energy Balance
Week 15	Liquids and Gases in Equilibrium with Solids
Week 15	Unsteady-State Material and Energy Balances
Week 16	<b>Final Exam</b>

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Himmelblau D.M., Basic Principles and Calculations in Chemical Engineering, 8 thed., Prentice Hall, India, 2012	
Recommended Texts	R.M. Felder and R.W. Rousseau , Elementary Principles of Chemical Processes ,3rd Edition ,2005.	
Websites		

## Grading Scheme

### مخطط الدرجات

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



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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Kinetics		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ETCP205		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<b>Module Objectives</b> أهداف المادة الدراسية	Gain a fundamental understanding of chemical kinetics, including reaction rates, rate equations, factors affecting rates, differentiation between homogeneous and heterogeneous reactions, measurement and calculation of reaction rates, analysis of reaction mechanisms and elementary steps, identification and study of reaction intermediates, analysis of reaction sequences using Semenov representation, determination of rate laws and reaction orders, study of catalytic reactions, modeling of gas phase reactions, understanding activation energy and its role in reaction rates, examination of diffusion and its impact on rates, exploration of gases adsorption onto solids in heterogeneous reactions, learning experimental techniques for studying kinetic data, and understanding chain reactions involving regenerating reactive intermediates.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	By the end of the course, the student will have a comprehensive understanding of chemical kinetics, including concepts of reaction rates, rate equations, and factors influencing rates, the differentiation between homogeneous and heterogeneous reactions, the ability to measure and calculate reaction rates, the analysis of reaction mechanisms and breakdown of complex reactions into elementary steps, the identification and study of intermediate species connecting elementary steps, the analysis of reaction sequences and utilization of Semenov representation, determination of rate laws and reaction orders based on experimental data, the study of catalytic reactions and their impact on rates, modeling gas phase reactions using collision theory, transition state theory, and the Arrhenius equation, comprehension of activation energy and its role in reaction rates and transition states, understanding diffusion and its influence on rates in gaseous systems, exploration of gases adsorption onto solid surfaces in heterogeneous reactions, learning experimental techniques for kinetic data analysis, and understanding chain reactions involving regeneration and propagation of reactive intermediates.
<b>Indicative Contents</b> المحتويات الإرشادية	<b>1.Basic concept of kinetics chemistry</b> <ul style="list-style-type: none"><li>- Chemical Reaction and Kinetic Quantities</li><li>- The reaction components</li><li>- Reaction zones</li></ul> <b>2.Homogeneous and heterogeneous reactions</b> <ul style="list-style-type: none"><li>- Single zone reaction</li><li>- Multizone reaction</li></ul> <b>3.Rate of reaction</b> <ul style="list-style-type: none"><li>- Factors affecting reaction rate</li><li>- Influence of temperature</li><li>- Influence of the concentrations (or partial pressures of gases)</li><li>- catalyst; order and molecularity of a reaction</li><li>- Other variables</li><li>- Calculation of reaction rate</li></ul>

#### **4.Reaction Mechanisms and Elementary Steps**

- Basic premise of kinetics
- Reaction mechanism
- Examples of mechanisms

#### **5.Reaction intermediates**

- Excited atoms (or molecules)
- Free radicals
- Ions
- Adsorbed species
- Point defects
- The effect of intermediates on extent and speed

#### **6.Reaction sequences and Semenov representation**

- Semenov diagram
- Linear sequences and multipoint sequences-

#### **7.rate law**

- specific rate constant,
- integrated rate equations
- - half-life (only for zero and first order reactions)

#### **8.Order of reaction**

- First order reactions
- Second order reactions
- Third order reactions
- Zero order reaction

#### **9.Catalytic reactions**

- Homogeneous catalysis
- Heterogeneous catalysis
- Important figures in reaction mechanisms-

#### **10.Modeling of a gas phase elementary step**

- Collision theory
- Bimolecular reactions
- Theory of activated complex

#### **11.Activation energy:**

- Arrhenius equation.
- Calculate activation energy-

#### **12. Particular elementary step: diffusion**

- The diffusion phenomenon

	<ul style="list-style-type: none"> <li>- Diffusion flux and Fick's first law</li> <li>- Reactivity and diffusion space function</li> <li>- Diffusion in solids</li> </ul> <p><b>13. Gases adsorption onto solids</b></p> <ul style="list-style-type: none"> <li>- Chemisorption equilibrium: Langmuir model</li> <li>- Dissociative adsorption and the Langmuir model</li> <li>- Chemisorption of gas mixtures in the Langmuir model</li> <li>- Chemisorption kinetic in the Langmuir model</li> </ul> <p><b>14. Experimental kinetic data of a reaction</b></p> <ul style="list-style-type: none"> <li>- Generalities on measuring methods</li> <li>- Chemical methods</li> <li>- Physical methods</li> </ul> <p><b>15. Chain reactions</b></p> <ul style="list-style-type: none"> <li>- Definition</li> <li>- The different categories of chain reactions</li> <li>- The steps in a chain reaction</li> <li>- Sequence of chain reactions</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	Utilize a variety of teaching methods, including lecture-based instruction with visual aids, active learning through discussions and problem-solving exercises, hands-on laboratory experiments, use of technology for simulations and modeling, case studies to demonstrate real-world applications, peer learning and group discussions, formative assessments for regular feedback, supplemental resources for further exploration, office hours for individual support, and review sessions for exam preparation

<b>Student Workload (SWL)</b> الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	108	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	7.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	42	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	2.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>150</b>		

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

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	<b>Material Covered</b>
<b>Week 1</b>	Basic concept of kinetics chemistry
<b>Week 2</b>	Homogeneous and heterogeneous reactions
<b>Week 3</b>	Rate of reaction
<b>Week 4</b>	Reaction Mechanisms and Elementary Steps
<b>Week 5</b>	Reaction intermediates
<b>Week 6</b>	Reaction sequences and Semenov representation
<b>Week 7</b>	rate law
<b>Week 8</b>	Order of reaction
<b>Week 9</b>	Catalytic reactions

<b>Week 10</b>	Modeling of a gas phase elementary step
<b>Week 11</b>	activation energy
<b>Week 12</b>	Particular elementary step: diffusion
<b>Week 13</b>	Gases adsorption onto solids
<b>Week 14</b>	Experimental kinetic data of a reaction
<b>Week 15</b>	Chain reactions
<b>Week 16</b>	<b>The preparation week before the final Exam</b>

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

	<b>Material Covered</b>
<b>Week 1</b>	Straight-line equation
<b>Week 2</b>	Calculation the constant of burette spillage
<b>Week 3</b>	Saponification of ethylacetal
<b>Week 4</b>	Study the hydrolysis rate of aspirin by ultra violet spectroscopy
<b>Week 5</b>	Catalytic decomposition of hydrogen peroxide
<b>Week 6</b>	Hydrolysis of ethyl acetate in acidic medium
<b>Week 7</b>	Hydrolysis of ethyl acetate in alkaline medium
<b>Week 8</b>	Determination the order, rate and activation energy for dyes
<b>Week 9</b>	Effect of salt as Catalyst on reaction
<b>Week 10</b>	Study the Autocatalytic reaction between potassium permanganate and oxalic acid
<b>Week 11</b>	Effect of temperature on the rate reaction
<b>Week 12</b>	Measurement of velocity constant by conductimetric methods
<b>Week 13</b>	Measurement of velocity constant by spectrophotometric methods
<b>Week 14</b>	Effect the concentration on reaction rate



<b>Week 15</b>	Determination of the rate constant and activation energy for Methyl acetate
<b>Week 16</b>	<b>Final Exam</b>

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>"Chemical Kinetics and Dynamics" by Jeffrey Steinfeld, Joseph S. Francisco, and William L. Hase</li> <li></li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>"Elements of Chemical Reaction Engineering" by H. Scott Fogler:</li> <li>"Chemical Kinetics: Fundamentals and New Developments" by Luis G. Arnaut and José A. Martinho Simões</li> </ul>	Yes
<b>Websites</b>	<a href="https://chem.libretexts.org/Courses/University_of_California_Davis/UCD_Chem_110A:_Physical_Chemistry_I">https://chem.libretexts.org/Courses/University_of_California_Davis/UCD_Chem_110A:_Physical_Chemistry_I</a>	

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



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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Petroleum Chemistry</b>		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ETCP203		
ECTS Credits	6		
SWL (hr/sem)			
Module Level	2	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	General Chemistry	Semester	2
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>1) An Introduction to Organic Compounds, preparation, and Reaction including Petroleum and Heterocyclic Compounds.</p> <p>2) An introduction to petroleum feedstock, refining processes, and its products.</p> <p>3) To know the properties of petroleum fractions</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>at the end of the semester the student should be able to:-</p> <p>1) Students will learn the basic concepts of organic chemistry</p> <p>2) understanding the concepts of organic reactions for analysis of unit processes</p> <p>3) Students will learn Petroleum chemistry and refining</p> <p>4) Learn methods of separation of main petroleum fractions</p> <p>5) Become knowledgeable in the composition, properties, and classification of crude oil or petroleum.</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>The general outline of topics typically covered in such a course:</p> <p><b>1) An Introduction to Organic Compounds:</b></p> <p>Nomenclature, Physical Properties, and Representation of Structure</p> <p><b>2) Preparation and Reactions :</b></p> <p>Alkanes, Alkenes, Dienes, Alkynes, aromatic hydrocarbon</p> <p><b>3) Preparation and Reactions:</b></p> <p>Alkanes derivative (RX, ROH, RCOOH, RCOH, RCOR,....etc. Organometallic</p> <p><b>4) Mechanisms of organic reactions:</b></p> <ul style="list-style-type: none"> <li>● Elimination</li> <li>● substitution</li> <li>● addition</li> </ul> <p><b>5) Petroleum :</b></p> <p>Origin of petroleum, Composition, Refining, Kerosene, Naphtha 4hr Heterocyclic compounds: Isolation and reactions of furan, pyrrole, pyridine 3hr Terpenes</p> <p><b>6) Petroleum Processing Overview :</b></p> <p>History of Petroleum Production, What is Petroleum, History of Petroleum Processing, Modern Petroleum Processing. Refinery Feed-stocks and Products</p> <p><b>7) Thermo-physical Properties of Petroleum Fractions and Crude Oils:</b></p> <p><b>8) Specific Gravity, Boiling Point Curves, Breakup of TBP Curve into Pseudo components, Thermo-physical Properties Calculation.</b></p> <p><b>9) Heating of Crude oil :</b></p> <p>Types of pipe still heaters , calculations of radiant absorption rates</p> <p><b>10) Crude Distillation :</b></p> <p><b>11) Desalting Crude Oils, Atmospheric distillation tower: types of refluxes. Energy balance in a topping tower and calculations involve the estimation of top, side, bottom draw tray temperatures</b></p> <p><b>12) Thermal and Catalytic Cracking :</b></p>

	<p><b>13) Coking, Visbreaking, Fluid Catalytic Cracking, Hydrotreating and Hydrocracking.</b></p> <p><b>14) Catalytic Reforming:</b></p> <p>Objectives, process, Reactions, catalysts and effect of process variables.</p> <p><b>15) Isomerization, Alkylation and Polymerization:</b></p> <p>Objectives, process, Reactions, catalysts and effect of process variables.</p> <p><b>16) Products blending :</b></p> <p>Reid Vapor Pressure, Octane Blending.</p> <p><b>17) Supporting Processes:</b></p> <p>Hydrogen Production, Gas Processing Unit, Acid Gas Removal, Sulfur Recovery Processes.</p>
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### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

<b>Strategies</b>	Power points, you tubes when necessary using board for problem solving and diagramming and any other explanations' student will be highly engaged in the activities during the lecture.
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### Student Workload (SWL)

#### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	93	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

### Module Evaluation

#### تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	<b>Assignments</b>	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	<b>Projects / Lab.</b>	1	10% (10)	Continuous	All

	<b>Report</b>	1	10% (10)	13	LO #5, #8 and #10
<b>Summative assessment</b>	<b>Midterm Exam</b>	1hr	10% (10)	7	LO #1 - #7
	<b>Final Exam</b>	2hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	<b>Material Covered</b>
<b>Week 1</b>	An Introduction to Organic Compounds
<b>Week 2</b>	Preparation and Reactions
<b>Week 3</b>	Mechanisms of organic reactions
<b>Week 4</b>	Petroleum
<b>Week 5</b>	Petroleum Processing Overview
<b>Week 6</b>	Thermophysical Properties of Petroleum Fractions and Crude Oils
<b>Week 7</b>	Heating of Crude oil
<b>Week 8</b>	Heating of Crude oil
<b>Week 9</b>	Crude Distillation
<b>Week 10</b>	Thermal and Catalytic Cracking
<b>Week 11</b>	Catalytic Reforming
<b>Week 12</b>	Isomerization, Alkylation
<b>Week 13</b>	Polymerization
<b>Week 14-15</b>	Products blending
<b>Week 16</b>	<b>Final Exam</b>

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Safety Rules and Laboratory Equipment
Week 2	Introduction to The Lab
Week 3	Standard Test Method for Dropping Point of Lubricating Grease
Week 4	Smoke Point of Kerosene
Week 5	Amount of Aromatic Hydrocarbons
Week 6	Determination of Acid Number for Lubricating Oil
Week 7	Determination of Acidity of Petroleum Products by Color Indicator Titration Method
Week 8	Exam
Week 9	Standard Test Method for Conrad Son Carbon Residue of Petroleum Products
Week 10	Standard Test Method for Pour Point and Cloud Point of Petroleum Product
Week 11	Aniline Point of Petroleum Products
Week 12	Ash Content from Petroleum Products
Week 13	Softening Point of Bitumen
Week 14	Standard Test Method for Ductility of Bituminous Materials
Week 15	Standard Test Method for Penetration of Bituminous Materials
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ol style="list-style-type: none"> <li>1) Ghatak, k.l," Textbook of organic Chemistry and problem analysis", PHL Learning.2014.</li> <li>2) W.L..Nelson" Petroleum Refining Engineering " 4th Edition. McGraw Hill, New York, 1985</li> </ol>	
Recommended Texts	<ol style="list-style-type: none"> <li>1) Morrison, Thornton R.; Boyd, Neilson, R. "Organic Chemistry" 6th edition, J. Chem. Educ. 1992</li> </ol>	

	<p>2) Bruice, P.Y., J.M "Organic chemistry", 7th edition, Books a la Carte Edition, 2014</p> <p>3) Characterization and Properties of Petroleum Fractions. M.R.Raiz-1<sup>st</sup> ed.</p>	
<b>Websites</b>	<a href="https://scholar.google.com/scholar?q=petroleum+fluid+properties+pdf&amp;hl=en&amp;as_sdt=0&amp;as_vis=1&amp;oi=scholart">https://scholar.google.com/scholar?q=petroleum+fluid+properties+pdf&amp;hl=en&amp;as_sdt=0&amp;as_vis=1&amp;oi=scholart</a>	

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



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## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Petroleum Fluid Properties</b>		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	ETCP207		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<b>Module Objectives</b> أهداف المادة الدراسية	The objective of this course is to understand the physical and chemical properties of petroleum specialty products which are invisible fuels, and explain in detail all the properties of these products.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	at the end of the semester the student should be able to:- <ol style="list-style-type: none"> <li>1) A comprehensive understanding of petroleum product that appears in less visible .form over the entire spectrum of industry such as automobile lubricants, greases, and carbon black for truck tires.</li> <li>2) Ability to think that a refinery may produce specialty manufactures a large number of the products from the basic refinery products such as (LPG, naphtha, kerosene, diesel, and fuel oils).</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	The general outline of topics typically covered in such a course <ol style="list-style-type: none"> <li>1) <b>Bitumen:</b>                      Introduction, Bitumen composition{ Asphaltine, resin aromatic oil, saturated oil}, Bitumen for pavement, Bitumen evaluation for pavement</li> <li>2) <b>Types of Bitumen:</b>                      Cut back bitumen, bitumen emulsion, polymer modified bitumen, oxidized bitumen, Industrial uses of bitumen, storage and handling of bitumen.</li> <li>3) <b>Petroleum Coke:</b>                      Introduction, manufacturing process, petroleum coke type, properties of calcined coke, uses of petroleum coke</li> <li>4) <b>Carbon black:</b>                      Introduction, manufacturing processes, channel black process, carbon black process, carbon black properties, secondary properties.</li> <li>5) <b>Carbon black test methods:</b>                      Application and uses</li> <li>6) <b>Lube base stocks :</b>                      Introduction conventional process, catalytic dewaxing, API classification of base oil</li> <li>7) <b>Lubricating oil blending :</b>                      Introduction, classification of lubricating oils, effect of viscosity on fuel economy , automotive oil additives, viscosity index improvers, detergent inhibitors .</li> <li>8) Engine oil formulation: effect of base stock quality, gear oil, automotive lubricants test methods</li> </ol>

	<p>9) Synthetic lubricants</p> <p><b>10) Turbine oil :</b></p> <p>Introduction, base oil, formulation, life of turbine oil, tests method{ acid number, copper corrosion , rust test, foam test, turbine oil test}</p> <p><b>11) Lubricating greases:</b></p> <p>Introduction, grease composition, base oil, grease thickeners, additives</p> <p><b>12) Grease manufacture:</b></p> <p>Lubricating grease quality, automotive greases, aircraft greases, marine greases, and high-temperature grease.</p> <p><b>13) Waxes</b></p> <p>Introduction, nonpetroleum waxes, other plant waxes, properties, test method (melting point, hardness, color, oil content, viscosity, acid number)</p> <p><b>14) Microcrystalline waxes</b></p> <p>Petroleum wax manufacture</p>
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### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

<b>Strategies</b>	Power points, you tubes when necessary using board for problem solving and diagramming and any other explanations' student will be highly engaged in the activities during the lecture.
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### Student Workload (SWL)

#### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	93	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

### Module Evaluation

#### تقييم المادة الدراسية

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

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Bitumen
Week 2	Types of Bitumen
Week 3	Petroleum Coke
Week 4	Carbon black
Week 5	Carbon black test methods
Week 6	Carbon black test methods
Week 7	Lube base stocks
Week 8	Lubricating oil blending
Week 9	Turbine oil
Week 10	Lubricating greases:
Week 11-12	Grease manufacture
Week 13	Waxes
Week 14-15	Microcrystalline waxes
Week 16	Final Exam

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Safety Rules and Laboratory Equipment
<b>Week 2</b>	Standard Test Method for Dropping Point of Lubricating Grease
<b>Week 3</b>	Smoke Point of Kerosene
<b>Week 4</b>	Amount of Aromatic Hydrocarbons
<b>Week 5</b>	Determination of Acid Number for Lubricating Oil
<b>Week 6</b>	Determination of Acidity of Petroleum Products by Colour Indicator Titration Method
<b>Week 7</b>	Exam
<b>Week 8</b>	Standard Test Method for Conrad Son Carbon Residue of Petroleum Products
<b>Week 9</b>	Standard Test Method for Pour Point and Cloud Point of Petroleum Product
<b>Week 10</b>	Aniline Point of Petroleum Products
<b>Week 11</b>	Ash Content from Petroleum Products
<b>Week 12</b>	Softening Point of Bitumen
<b>Week 13</b>	Standard Test Method for Ductility of Bituminous Materials
<b>Week 14-15</b>	Standard Test Method for Penetration of Bituminous Materials
<b>Week 16</b>	<b>Final exam</b>

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ol style="list-style-type: none"> <li>1) Speight, J.G, Handbook of petroleum product analysis, John Willey &amp; Sons,2002.</li> <li>2) W.L..Nelson" Petroleum Refining Engineering " 4th Edition. McGraw Hill, New York, 1985</li> </ol>	
<b>Recommended Texts</b>	<ol style="list-style-type: none"> <li>3) Speight J.G. and Ozum,B; Petroleum Refinery processes, Macel Dekker, New York, 2002.</li> <li>4) Speight J.G., The chemistry and Technology of petroleum, 3rd Edition. Marcel Dekker, New York 1999.</li> </ol>	

	5) Petroleum Fuels Manufacturing hand book; SurinderParkash, McGraw-Hill companies, 2010.	
<b>Websites</b>	<a href="https://scholar.google.com/scholar?q=petroleum+fluid+properties+pdf&amp;hl=en&amp;as_sdt=0&amp;as_vis=1&amp;oi=scholart">https://scholar.google.com/scholar?q=petroleum+fluid+properties+pdf&amp;hl=en&amp;as_sdt=0&amp;as_vis=1&amp;oi=scholart</a>	

<b>Grading Scheme</b> مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A</b> - Excellent	امتياز	90 - 100	Outstanding Performance
	<b>B</b> - Very Good	جيد جدا	80 - 89	Above average with some errors
	<b>C</b> - Good	جيد	70 - 79	Sound work with notable errors
	<b>D</b> - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	<b>E</b> - Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 – 49)</b>	<b>FX</b> – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F</b> – Fail	راسب	(0-44)	Considerable amount of work required
<b>Note:</b> 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  
Northern Technical University  
Technical Engineering College-Mosul  
Engineering Technological for Chemical and  
Petroleum Industries



## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Professional Ethics</b>		Module Delivery
Module Type	<b>Support</b>		Theory Lecture Seminar
Module Code	<b>NTU300</b>		
ECTS Credits	<b>3</b>		
SWL (hr/sem)	<b>75</b>		
Module Level	2	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>مع التطورات المتلاحقة في شتى مناحي الحياة ، تظهر مشكلات لم يواجهها خريجي الكليات التقنية من قبل ، بعض من هذه المشكلات له بعد اخلاقي يصعب على الخريج التعامل معه. يهدف هذا المقرر الدراسي الى تعريف طلبة الجامعة التقنية الوسطى بأخلاقيات المهنة حسب تخصصهم التقني ، واكسابهم القواعد الاخلاقية لمهنية التي تعزز التزامهم بها ، كي تمكنهم من حل المشكلات الاخلاقية ، التي سوف تواجههم في مجال عملهم المتوقع بعد التخرج.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>سيمكن هذا المقرر الدراسي جميع الطلبة ، من التعرف على مبادئ التحليل الاخلاقي والتفكير في مختلف المواقف المهنية ، التي سوف يتعرضون لها والتصرف الاخلاقي الامثل اتجاه هذه المواقف المهنية بعد تخرجهم . كما سيساعد هذا المقرر الكليات والمعاهد التقنية في الحصول على الاعتماد الاكاديمي من قبل هيئات الاعتماد الاكاديمي العالمية المتخصصة ، بعد تضمين مقرراتها الدراسية مادة اخلاقيات المهنة.</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>الوحدة (1) – الأخلاق</p> <ul style="list-style-type: none"> <li>● مفهوم الأخلاق و منشأها.</li> <li>● القواعد العامة للأخلاقيات.</li> <li>● مصادر الاخلاقيات.</li> <li>● القيم الاخلاقية.</li> <li>● أهمية الأخلاق للفرد والمجتمع</li> </ul> <p>الوحدة (2) – العمل والمهنة</p> <ul style="list-style-type: none"> <li>● العمل واهميته.</li> <li>● سلوكيات العمل.</li> <li>● مفهوم المهنة.</li> <li>● تعريف المهنة.</li> <li>● الفرق بين مفهوم العمل و المهنة والحرفة.</li> <li>● المعايير التي يجب ان تقوم عليها المهنة</li> </ul> <p>الوحدة (3) – اخلاقيات المهنة</p> <ul style="list-style-type: none"> <li>● ماهية أخلاقيات المهنة.</li> <li>● المردودات الايجابية للالتزام بأخلاقيات المهنة.</li> <li>● خصائص أخلاقيات العمل.</li> <li>● صفات اخلاقيات المهنة.</li> <li>● خطوات المستوى المقبول من اخلاقيات المهنة.</li> </ul> <p>الوحدة (4) – القيم و اخلاقيات المهنة</p> <ul style="list-style-type: none"> <li>● الأمانة.</li> <li>● الصدق.</li> <li>● النصح.</li> <li>● العدل.</li> <li>● حسن التعامل.</li> </ul>

• الإلتقان العمل.

الوحدة (5) – أنماط السلوك الغير أخلاقي في المهنة

• الفساد الاداري.

o السلوك الاداري الغير أخلاقي.

o تعريف الفساد الاداري .

o أنواع الفساد الاداري.

• الرشوة.

o مفهوم الرشوة.

o انواع الرشوة.

o الفرق بين الهدية والرشوة.

o الاسباب والدوافع التي تقف وراء الرشوة.

• الغش.

o مفهوم الغش.

o طبيعة الغش في العمل.

o مظاهر الغش في أداء الوظيفة.

الوحدة (6) – وسائل واساليب ترسيخ قيم اخلاقيات المهنة

• اسلوب ترسيخ اخلاقيات المهنة.

• مستويات بناء وترسيخ أخلاقيات المهنة.

• وسائل واساليب ترسيخ أخلاقيات المهنة.

• الامور التي يجب مراعاتها في صياغة الميثاق الاخلاقي للمهنة .

• الكيفية التي يتم بها تعزيز السلوك الاخلاقي في العمل وفق ل(كريتير وكينيكي)

اخلاقيات ممارسة المهن الهندسية ( خاصة بالكليات التقنية الهندسية)

الوحدة (7) – اخلاقيات مهنة الهندسة

• اهمية المهندسين في المجتمع.

• تعريف الاخلاق الهندسية .

• شروط المهندس المحترف.

• سمات المهندس المحترف.

• مثال لبعض بنود لائحة مزاوله المهنة لنقابة المهندسين.

• النظرة الاسلامية للأخلاقيات المهنة ، مقارنة بالنظرة الغربية والامريكية.

الوحدة (8) – ميثاق اخلاق مهنة الهندسة لاتحاد المهندسين العرب

(نموذج اخلاقيات مهنة الهندسة)

• اهمية المرتكزات الأساسية لميثاق أخلاق مهنة الهندسة.

• علاقة المهندس مع ذاته وزملائه .

• علاقة المهندس مع مؤسسته وعمله الهندسي.

• علاقة المهندس مع صاحب العمل.

• علاقة المهندس مع عمله الهندسي والهيئة الهندسية المنتسب اليها.

• دور المهندس وعلاقته بالمجتمع.

• علاقة المهندس مع البيئة والتنمية المستدامة والصحة والسلامة العامة.

• علاقة المهندس مع القوانين والتشريعات والانظمة، وقوانين العمل والعمال.

• علاقة المهندس مع قضايا الوطن والأمة والقضايا الانسانية

الوحدة (9) - اخلاقيات المهندس في التعليم و التدريب المستمر

• اهمية المشاركة في التعليم والتدريب المستمر اخلاقياً.

• قواعد السلوك الواجب ان يلتزم بها المهندس نحو ذاته في التعليم والتدريب المستمر.

• قواعد سلوك المهندس نحو مرؤوسيه في مجال التعليم والتدريب المستمر.



	<ul style="list-style-type: none"> <li>• قواعد سلوك المهندس نحو النقابات الهندسية في مجال التعليم والتدريب المستمر.</li> <li>• قواعد سلوك المهندس نحو مراكز التدريب في مجال التعليم والتدريب المستمر</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<p>وان اسلوب تدريس هذا المقرر الدراسي ( اخلاقيات المهنة ) يجب ان يتبع الآتي:</p> <ul style="list-style-type: none"> <li>• طريقة المحاضرة الفاعلة لتأصيل المفاهيم والقواعد الاخلاقية الأساسية.</li> <li>• طرائق التدريس الفعالة كالحوار والمناقشة و العصف الذهني وتمثيل الادوار.</li> <li>• تضمين المحاضرات أنشطة تعليمية كحل التمارين والتجارب المستمدة من واقع الحياة المهنية.</li> <li>• تحقيق الهدف الاسمي هو ( إجراء البحث الفعلي لإعداد ميثاق أخلاقي لكل تخصص علمي).</li> </ul>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	32	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	2.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.9
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>75</b>		

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1,2	الوحدة (1) – الأخلاق
Week 3,4	الوحدة (2) – العمل والمهنة
Week 5,6	الوحدة (3) – اخلاقيات المهنة
Week 7	الوحدة (4) – القيم واخلاقيات المهنة
Week 8	الوحدة (5) – أنماط السلوك الغير أخلاقي في المهنة
Week 9	الوحدة (6) – وسائل واساليب ترسيخ قيم اخلاقيات المهنة
Week 10	الوحدة (7) – اخلاقيات مهنة الهندسة
Week 11,12	الوحدة (8) – ميثاق اخلاق مهنة الهندسة لاتحاد المهندسين العرب
Week 13,14,15	الوحدة (9) - اخلاقيات المهندس في التعليم و التدريب المستمر
Week 16	Preparatory week before the Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	عنوان الكتاب المنهجي : أخلاقيات المهنة Professional Ethics للتخصصات التقنية (الهندسية، الطبية، الادارية، الفنون التطبيقية) •	Yes
Websites	<a href="https://ncee.org.sa/">https://ncee.org.sa/</a>	

## Grading Scheme

### مخطط الدرجات

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

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



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Engineering Technological for Chemical and  
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MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Chemical Industries</b>		Module Delivery
Module Type	CORE		Theory Lecture Lab Tutorial Practical Seminar
Module Code	<b>ETCP403</b>		
ECTS Credits	<b>8</b>		
SWL (hr/sem)	<b>200</b>		
Module Level	4	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> <li>1.Acquire knowledge and skills related to various industrial processes and applications.</li> <li>2. learn about the production and manufacturing techniques used in the chemical industry to produce important substances such as sulfuric acid, nitric acid, phosphoric acid, sodium compounds, oil, fats, detergents, surface coatings, sugar, and starch.</li> <li>3.Students studying industrial chemistry gain an understanding of the chemical reactions, catalysts, and conditions necessary for the production of these substances.</li> <li>4. learn about the principles of water treatment and its importance in various industrial processes.</li> <li>5.study the properties and applications of different materials used in industries, such as polymers for plastics, cement for construction, glass and ceramics for manufacturing, and surfactants for detergents.</li> <li>6.Equip students with the knowledge and skills required to work in the chemical industry, where they can contribute to the production, development, and optimization of various industrial processes and products.</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p><b>At the end of the semester the student should be able to:</b></p> <ol style="list-style-type: none"> <li>1.Understand the principles and concepts of industrial chemistry.</li> <li>2.Comprehend the different industrial processes involved in the production of various chemicals and substances.</li> <li>3.Explain the role and significance of catalysts in industrial reactions.</li> <li>4.Demonstrate knowledge of the production processes for sulfuric acid, nitric acid, phosphoric acid, ammonia, and other important chemicals.</li> <li>5.Understand the principles and techniques used in water treatment for industrial applications.</li> <li>6.Describe the properties, uses, and manufacturing processes of polymers.</li> <li>7.Explain the production techniques and applications of cement in the construction industry.</li> <li>8.Understand the manufacturing processes and properties of glass and ceramic materials.</li> <li>9.Comprehend the production and applications of salt and sodium compounds in various industries.</li> <li>10.Describe the extraction, refining, and applications of oil and fats.</li> <li>11.Understand the formulation and manufacturing processes of detergents.</li> <li>12.Explain the principles and techniques used in the surface coating industry.</li> <li>13.Understand the production processes and applications of sugar and starch in the food industry.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"> <li><b>1.Introduction to the industrial chemistry:</b> <ul style="list-style-type: none"> <li>● History of industrial chemistry</li> <li>● Classification of chemical industries</li> <li>● The basic Concepts</li> <li>● Batch method and continuous method</li> </ul> </li> <li><b>2.The industrial processes:</b> <ul style="list-style-type: none"> <li>● physical and chemical processes</li> <li>● Chemical reactors types and forms</li> </ul> </li> <li><b>3.Catalytic Industry:</b></li> </ol>

- Types of catalysts
- Example on the catalysts

**4.Sulfuric acid production:**

- Sulfur and sulfuric acid
- Extraction of sulfur from natural gas
- Manufacture of sulfuric acid by contact method

**5.Nitric acid production**

- Preparation of nitric acid
- Oxygen and Nitrogen Production
- Nitrogen fertilizers

**6.Phosphoric acid production, Ammonia production:**

- Fertilizer production
- complex fertilizers
- other compounds

**7.Water Treatment:**

- Methods of conditioning water for domestic uses,
- Methods of conditioning water for industrial uses
- Treating sewage and industrial waste water

**8.Polymers:**

- Type of polymers
- Preparation of polymers
- Application of polymers

**9.Cement industry:**

- Types and specifications
- Raw materials
- Methods and stages of manufacturing and types

**10.Glass industry and ceramic industry:**

- Raw materials, manufacture of all kinds of glassware
- Ceramics
- Fire and thermal bricks and bricks

**11.Salt and Sodium compounds:**

- table salt and sodium compounds industry,
- Purify table salt from salt water
- sodium sulfate industry, sodium silicate industry,
- sodium carbonate industry, Caustic soda industry

**12.Oil and Fats:**

- Vegetable oil industry
- Oil extraction

	<ul style="list-style-type: none"> <li>purified and hydrogenated</li> </ul> <p><b>13.Detergents:</b></p> <ul style="list-style-type: none"> <li>soap production</li> <li>industrial detergents</li> </ul> <p><b>14.Surface Coating Industry:</b></p> <ul style="list-style-type: none"> <li>Oily and water-based dyes</li> <li>Thermo-chromic dyes</li> <li>plastic dyes</li> </ul> <p><b>15.Sugar and starch industry:</b></p> <ul style="list-style-type: none"> <li>Manufacture of sugar from beets and sugar cane</li> <li>Brewing industry, pure alcohol, vinegar and acetic acid</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<p>In the chemical industry, learning and teaching strategies encompass practical laboratory work, problem-solving approaches, industry visits and guest speakers, interactive discussions and group work, multimedia and visual aids, project-based learning, industry internships and work placements, continuous assessment and feedback, use of technology, and professional development and training for teachers. These strategies aim to create an engaging and effective learning environment, enabling students to develop a strong foundation in chemical industry concepts, critical thinking skills, and practical competencies.</p>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	123	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	8.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>200</b>		

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to the industrial chemistry
Week 2	The industrial processes
Week 3	Catalytic Industry
Week 4	Sulfuric acid production
Week 5	Nitric acid production
Week 6	Phosphoric acid production, Ammonia production
Week 7	Water Treatment



<b>Week 8</b>	Polymers
<b>Week 9</b>	Cement industry
<b>Week 10</b>	Glass industry and ceramic industry
<b>Week 11</b>	Salt and Sodium compounds
<b>Week 12</b>	Oil and Fats
<b>Week 13</b>	Detergents
<b>Week 14</b>	Surface Coating Industry
<b>Week 15</b>	Sugar and starch industry
<b>Week 16</b>	FINAL EXAM

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Purification and conditioning of water used for drinking, industry and steam boilers.
<b>Week 2</b>	A study of the physical properties of clays (thermal endurance, plasticity and the amount of water absorption for the types of clays used in the manufacture of glass and ceramics).
<b>Week 3</b>	Standard methods for the analysis of Portland cement, estimation of loss by burning, estimation of insoluble matter and estimation of SO <sub>3</sub> in cement and in sand.
<b>Week 4</b>	Determination of SiO <sub>2</sub> percentage in cement and the percentage of R <sub>2</sub> O <sub>3</sub> and Fe <sub>2</sub> O <sub>3</sub> in cement.
<b>Week 5</b>	Determination of CaO and MgO in cement and conducting calculations to find LSF, C <sub>2</sub> S, C <sub>3</sub> S, C <sub>3</sub> A, C <sub>4</sub> AF, CaSO <sub>4</sub> .
<b>Week 6</b>	Extraction of vegetable oils
<b>Week 7</b>	Soap making (soaping process) and Determine the soap number and the soap equivalent.
<b>Week 8</b>	Purification of table salt.
<b>Week 9</b>	Caustic soda industry.
<b>Week 10</b>	Alkylbenzene sulfonation for the production of industrial detergents.
<b>Week 11</b>	Determine the acidity of vinegar.
<b>Week 12</b>	Paper pulp manufacturing.

<b>Week 13</b>	Preparation and purification of some diazo dyes.
<b>Week 14</b>	aspirin industry.
<b>Week 15</b>	Standard methods for testing and analyzing sugar.

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>"Introduction to Industrial Chemistry" by Cynthia A. Challener.</li> <li>"Chemical Engineering: An Introduction" by Morton Denn.</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>"Introduction to Chemical Engineering: Tools for Today and Tomorrow" by Kenneth A. Solen and John N. Harb.</li> </ul>	Yes
<b>Websites</b>	<a href="https://www.open.edu/openlearn/">https://www.open.edu/openlearn/</a>	

### Grading Scheme

#### مخطط الدرجات

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



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Technical Engineering College-Mosul  
Engineering Technological for Chemical  
and Petroleum Industries



## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Equipment Design</b>		Module Delivery
Module Type	Core		Theory Lecture Tutorial Seminar
Module Code	ETCP401		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	4	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<b>Module Objectives</b> أهداف المادة الدراسية	The course content process planning, piping and pumps network , gas-gad separation ,solid handling, hear and mass transfer equipment's.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	at the end of the semester the student should be able to :- 1) apply the design equation and equipments specifications as practical 2) read and understand chemical engineering plants drawing
<b>Indicative Contents</b> المحتويات الإرشادية	The general outline of topics typically covered in such a course: 1) <b>Process planning:</b> Introduction, Nature of design ,the organization of a chemical engineering projects Scheduling .Standards and codes. Flow sheet design, flow sheet types and designation .Block diagram .Process flow sheet .Piping and instrumentation diagram .Utilities, Computer aided drafting ,process simulation programs .Layout and plot plan .Project evaluation and cost estimation 2) <b>Piping network and Pumps:</b> Valves selection . Piping design standards and codes . Pipe size selection .Mechanical design of piping system. Pump type, pump specifications, and pump data sheet 3) <b>Mass Transfer Equipments:</b> Columns types . Plate Types. Packing types . Pressure drops in columns . Column data sheets 4) <b>Solid Handling:</b> Screening Classification with Streams of Air or Water Air Classifiers . Size Reduction. Equipment for Size Reduction Particle Size Enlargement Extrusion Processes 5) <b>Heat Transfer Equipments:</b> Heat exchanger types and applications. Basic design procedure and theory. Overall heat transfer coefficient. Heat exchanger data sheet. Furnaces convection and radiation zone. Steam boilers 6) <b>Vessels and tanks: Types of vessels.</b> Criteria in vessel design ,stress considerations . Materials of construction commonly used in vessels tanks. Design of tall vertical vessels . Pressure vessels Design. Vessels supports and foundations

## Learning and Teaching Strategies

## استراتيجيات التعلم والتعليم

<b>Strategies</b>	Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture.
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## Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

## Module Evaluation

تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1</b>	Introduction & course objectives
<b>Week 2</b>	Nature of design & the anatomy of chemical manufacturing process
<b>Week 3</b>	The organization of chemical engineering projects – project documentation
<b>Week 4</b>	Codes and standards, Degree of freedom, Optimization & flow sheeting and Material of construction
<b>Week 5</b>	Separation column design: packed bed absorber, distillation column
<b>Week 6</b>	Separation column design: packed bed absorber, distillation column
<b>Week 7</b>	Separation column design: packed bed absorber, distillation column
<b>Week 8</b>	Separation column design: packed bed absorber, distillation column
<b>Week 9</b>	Separation column design: packed bed absorber, distillation column
<b>Week 10</b>	Equipment design: gas –solid cyclones, solid – liquid cyclones, decanter design
<b>Week 11</b>	Equipment design: gas –solid cyclones, solid – liquid cyclones, decanter design
<b>Week 12</b>	Heat transfer equipment design
<b>Week 13</b>	Heat transfer equipment design
<b>Week 14</b>	Pressure Vessels and mechanical design
<b>Week 15</b>	General site considerations
<b>Week 16</b>	<b>Final Exam</b>

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	1) Chemical Engineering Design, Vol.6, Colson and Richardson	
<b>Recommended Texts</b>	1) Sinnott R. and Towler C; 2013 " chemical Engineering Design" 5th edition Butterworth Heinemann	

	2) Coke, A.K ;2007"Ludwig s Applied Process Design of Chemical and petrochemical Plant" vol. 1 4th edition Gulf professional Publisher	
<b>Websites</b>		

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



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Engineering Technological for Chemical  
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## MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Petroleum Refinery		Module Delivery
Module Type	Core		Lecture Reports Practical Seminar
Module Code	ETCP400		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	4	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

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



## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>The aim of this module is to:</p> <ol style="list-style-type: none"> <li>1) An introduction to petroleum feedstock, refining processes, and its products.</li> <li>2) To know the properties of petroleum fractions</li> <li>3) To understand the methods of separation and purification methods of different fractions produced</li> <li>4) Design of atmospheric and vacuum columns for petroleum fractionation will be going to explain.</li> <li>5) Refinery processes will be explained in terms of their objectives, feedstock, products, and catalysts.</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>At the end of this module students will be able to:</p> <ol style="list-style-type: none"> <li>1) Learn methods of separation of main petroleum fractions</li> <li>2) Become knowledgeable in the composition, properties, and classification of crude oil or petroleum.</li> <li>3) Become familiar with the overall refinery processes including physical separation operations and chemical conversion processes.</li> <li>4) Become knowledgeable about impurities in crude oil and how to remove them from products.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>The general outline of topics typically covered in such a course:</p> <p><b>1) Petroleum Processing Overview and Revision :</b></p> <p>History of Petroleum Production, What is Petroleum, History of Petroleum Processing, Modern Petroleum Processing. Refinery Feed-stocks and Products</p> <ul style="list-style-type: none"> <li>● <b>Thermo-physical Properties of Petroleum Fractions and Crude Oils:</b></li> <li>● Specific Gravity, Boiling Point Curves, Breakup of TBP Curve into Pseudocomponents, Thermo-physical Properties Calculation.</li> <li>● <b>Heating of Crude oil :</b></li> <li>● Types of pipe still heaters , calculations of radiant absorption rates</li> <li>● <b>Crude Distillation :</b></li> <li>● Desalting Crude Oils, Atmospheric distillation tower: types of refluxes. Energy balance in a topping tower and calculations involve estimation of top, side, bottom draw tray temperatures</li> <li>● <b>Thermal and Catalytic Cracking :</b></li> <li>● Coking, Visbreaking, Fluid Catalytic Cracking, Hydrotreating and Hydrocracking.</li> <li>● <b>Catalytic Reforming:</b></li> <li>● Objectives, process, Reactions, catalysts and effect of process variables.</li> <li>● <b>Isomerization, Alkylation and Polymerization:</b></li> <li>● Objectives, process, Reactions, catalysts and effect of process variables.</li> <li>● <b>Products blending :</b></li> <li>● Reid Vapor Pressure, Octane Blending.</li> <li>● <b>Supporting Processes:</b></li> <li>● Hydrogen Production, Gas Processing Unit, Acid Gas Removal, Sulfur Recovery Processes.</li> </ul>

## **2) Thermal Cracking: introduction, Coking:**

Delayed Coking, Feed Types, Background, Typical Product Yields and Characteristics, Description of the Delayed Information, Typical Yields, Process Description, Uses for Low Btu Gas, Use of Purge Coke

## **3) Visbreaking of Residues:**

Background Information, Feed Composition, Cracking Reactions, Reaction Kinetics and Mechanism, Process Data, Operating Variables, Product Properties and Yields, Process Flow Schemes, Specific Equipment, Environment.

## **4) Catalytic Cracking :**

Overview, The FCC Process, Introduction, Feeds and Products, Description, Thermal Balance, Fluidization and Pressure Balance, Operating Variables, Conversion, and Cracking Severity, Changing Technology, Residue Cracking, Reactions, Reactivity, and Mechanisms, Reactions, Modern FCC Catalyst.

## **5) Hydrocracking:**

Importance, Background, Typical Feeds, Reaction Thermodynamics, Kinetic, Catalysts, Effects of Feed Impurities and Components,, Typical Flow Schemes, Operating Conditions, Product Yields and Quality, Hydrogen Consumption, ,

## **6) Catalytic Reforming:**

Importance, Process Background, Reactions, Catalysts ,Operating Variables, Influence of Feeds, Technology, Fixed Bed, Moving Bed, Industrial Performance , Operating Conditions, Typical Yields, Reformate Characteristics, , Capacity

## **7) Isomerization of C5-C6 Paraffins:**

Aim, Thermodynamics, The Catalyst, Reaction Mechanism, Kinetics, The Isomerization Process, , Isomerization of n-Butane, Aim, Thermodynamics, Catalysts, Reaction Mechanism, Kinetics, Process

## **8) Aliphatic Alkylation:**

Importance, Reaction Thermodynamics, Alkylate Compositions, Catalysts, Production Mechanisms, Red Oil Production Mechanisms, Structure and Function of Red Oils, Process Data, Feed Composition, Feed Pretreatment, Operating Conditions, Sulfuric Acid Alkylation Processes, HF Alkylation

## **9) Olefin Etherification :**

Importance, Properties of Ethers, Feedstocks, Etherification Process, Reaction Mechanism, Kinetics and Thermodynamics, Catalysts, Side Reactions, Process Data, Feed Treatment, Raffinate Treatment, Operating Conditions, Process Flow Schemes, Reactor Design, Product Yield and Quality.

## **10) Residue Hydroconversion:**

Introduction, Background, Reactions, Catalysts, Kinetics and Operating Conditions, Technologies and Process Data, Fixed Bed Processes, Moving Bed Processes, Product Yields and Characteristics, Associating the Hydrotreating Process with Deasphalting

## **11) Hydrogen Production:**

	<p>Hydrogen in the Refinery, Requirements, Sources, Hydrogen Balance, Hydrogen Production by Steam Reforming, Production of Synthesis Gas, Carbon Monoxide to Hydrogen Conversion, Carbon Dioxide Removal, Machination of Residual CO and CO<sub>2</sub>, Purification by Adsorption, Comparison of Conventional Machination and Adsorption (PSA) Methods, Ongoing Developments, Hydrogen Production by Partial Oxidation, Synthesis Gas Production, Hydrogen Production Sequencing, Hydrogen and Electricity Coproduction, Other Technologies, Hytex Process, Catalytic Auto- thermal Process.</p> <p><b>12) White Products Refining by Sweetening:</b></p> <p>Mercaptan Distribution in Petroleum Cuts, Background Data, Recapitulation of Process History, Current Technologies, Industrial Processes, Liquid/Liquid Contact Technologies, Fixed Bed Catalyst Processes, Economic</p> <p><b>13) Hydrotreating:</b></p> <p>Objectives, Impurities and their Origins, Heteroatoms and Metals, Unsaturated Products, Hydrotreating Processes, Background Information, Hydrotreating Reactions, Catalysts, Process Information, Catalyst Reaction Kinetics, Operating Variables, Catalysts, Process Technology, Reactors, Process Flow Schemes, Selecting Construction Materials, Industrial Performance, Feed Pretreatment for Gasoline Catalytic Reforming Units, Hydrotreating Kerosene and Gas Oil, Hydrotreating Vacuum Distillates</p> <p><b>14) Desulfurization of Stack Gases:</b></p> <p>Principle of Stack Gas Desulfurization Processes, Choice of Sulfur Oxide Chemical , Operating Conditions, Regenerative Processes and Throwaway Processes, Characteristics of Stack Gas Desulfurization Processes, Stack Gas/Reactant Contactor, Heating the Stack Gases, Corrosive Nature of the Stack Gases, The Main Processes, Processes Using Lime or Limestone, Semiwet Processes, Dry Processes with Discharges, Regenerative Processes with Production of Concentrated SO<sub>2</sub></p>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<p>In addition to the PowerPoint slides presented using data projectors:</p> <ul style="list-style-type: none"> <li>• The lecture will include continuous discussion about the presented processes in the course book.</li> <li>• Practical comparison with daily available applications and examples to simplify the complicated concepts of refinery technology.</li> </ul>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا
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<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	77	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	5.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	73	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	4.9
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>150</b>		

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

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	<b>Material Covered</b>
<b>Week 1</b>	Petroleum Processing Overview and Revision
<b>Week 2</b>	Thermal Cracking: introduction, Coking:
<b>Week 3</b>	Visbreaking of Residues
<b>Week 4</b>	Catalytic Cracking
<b>Week 5</b>	Hydrocracking
<b>Week 6</b>	Catalytic Reforming
<b>Week 7</b>	Isomerization of C5-C6 Paraffins:
<b>Week 8</b>	Aliphatic Alkylation
<b>Week 9</b>	Olefin Etherification

<b>Week 10</b>	Residue Hydroconversion:
<b>Week 11</b>	Hydrogen Production:
<b>Week 12</b>	White Products Refining by Sweetening
<b>Week 13</b>	Hydrotreating:
<b>Week 14-15</b>	Desulfurization of Stack Gases
<b>Week 16</b>	Final Exam

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	Text	Available in the Library?
<b>Required Texts</b>	1) W.L.Nelson" Petroleum Refining Engineering " 4th Edition. McGraw Hill, New York, 1985	
<b>Recommended Texts</b>	2) 2. M.A. Fahim, T.A. Al-Sahhaf, and A.S. Elkilani," Fundamentals of Petroleum Refining", Elsevier, 2010. 3. J.H. Gary and G. E. Handwerk and M.J. Kaiser, "Petroleum Refining Technology and Economics", 5th Ed. CRC Press, 2007.	No
<b>Websites</b>	<a href="https://www.google.com/search?q=petroleum+refining+process+ppt&amp;oq=PETROLEUM+REFINING+&amp;aqs=chrome.1.69i57j0l7.19304j0j7&amp;sourceid=chrome&amp;ie=UTF-8">https://www.google.com/search?q=petroleum+refining+process+ppt&amp;oq=PETROLEUM+REFINING+&amp;aqs=chrome.1.69i57j0l7.19304j0j7&amp;sourceid=chrome&amp;ie=UTF-8</a>	

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

	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 – 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	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  
Northern Technical University  
Technical Engineering College-Mosul  
Engineering Technological for Chemical  
and Petroleum Industries



## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Process Control</b>		Module Delivery
Module Type	Core		Theory Lecture Lab Tutorial Practical Seminar
Module Code	<b>ETCP402</b>		
ECTS Credits	<b>6</b>		
SWL (hr/sem)	<b>150</b>		
Module Level	4	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> <li>1) Study of dynamic characteristics of open-loop Chemical and Petroleum Refinery engineering processes to formulate transfer function and analysis response of the system to design and select closed-loop control scheme.</li> <li>2) Analysis of closed-loop Petroleum Refinery Engineering processes system to design and select a closed-loop control scheme that will operate the plant with stable conditions.</li> </ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>at the end of the semester, the student should be able to :</p> <ol style="list-style-type: none"> <li>1) Study of dynamic analysis of chemical processes to allow students to identify the system under different operating conditions.</li> <li>2) Understanding of formulated transfer function of the system.</li> <li>3) Testing and selecting critical process variables.</li> <li>4) Developing skills, solving open-ended problems, and working in teams.</li> <li>5) To enhance the ability of students the analysis closed-loop systems and the response of the controlled system under different operating conditions.</li> <li>6) Construction of transfer function of the closed system for different schemes.</li> <li>7) Provide practice in tuning controller parameters and limiting stable operating conditions.</li> <li>8) Motivation and encourage the students for solving open-ended problems.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"> <li>1) <b>Linear Open-Loop Systems</b> Transfer function, Transient Response, Forcing Functions: Step Response ,Impulse Response Ramp Response Sinusoidal Response.</li> <li>2) <b>Applications of First Order Systems</b> Liquid –level system, heating system, Mass transfer system, Reactors, absorber, pressure vessel, Linearization.</li> <li>3) <b>Response of First-Order Systems in Series</b> Non-interacting System, Interacting System.</li> <li>4) <b>Higher-Order Systems</b> Second-Order: Under-damped, Critical and over-damped, Transportation Lag</li> <li>5) <b>Instrumentation:</b> Sensors: pressure, temperature, level, flow and concentration. Control valve. Dynamics characteristics of Instruments.</li> <li>6) <b>Linear Closed-Loop Systems:</b></li> </ol>



	<p>The Control System, Controllers and Final Control Elements, Block Diagram of Controlled System, Overall Closed-Loop Transfer Functions.</p> <p><b>7) Characteristics of the Closed Loop</b></p> <p>System Transient Response of Simple Control Systems, Stability</p> <p><b>8) Frequency Response Methods:</b></p> <p>Introduction to Frequency Response Bode Diagrams, Control System Design by Frequency Response, Ziegler-Nichols Controller Settings.</p> <p><b>9) Computer Control of Chemical process:</b></p> <p>Analog Computer, Digital Computer, Computer Control Loops. 5 3hr Control of Complex Processes: Distillation Column, Heat Exchanger, Catalytic Reactor.</p>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<ol style="list-style-type: none"> <li>1) Active learning: Engage students through problem-solving exercises, hands-on experiments, and group discussions.</li> <li>2) Visual aids: Utilize diagrams and visual representations to enhance understanding of complex concepts.</li> <li>3) Interactive demonstrations: Use demonstrations and simulations to illustrate control system behavior.</li> <li>4) Problem-based learning: Present real-world problems for students to solve using their theoretical knowledge.</li> <li>5) Collaborative learning: Encourage group work and peer-to-peer teaching to foster engagement and knowledge exchange.</li> </ol>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	108	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	7.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1-2</b>	Linear Open-Loop Systems
<b>Week 3-4</b>	Applications of First-Order Systems
<b>Week 5-6</b>	Response of First-Order Systems in Series
<b>Week 7-8</b>	Higher-Order Systems
<b>Week 9-10</b>	Linear Closed-Loop Systems
<b>Week 11-12</b>	Characteristics of the Closed Loop
<b>Week 13-15</b>	Frequency Response Methods:
<b>Week 8</b>	Computer Control of Chemical process
<b>Week 16</b>	Final Exam

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Feedback Control
<b>Week 2</b>	Dynamic Behavior of Second Order under Damped System (Orifice)
<b>Week 3</b>	Flow rate Control
<b>Week 4-5</b>	Level Control in the Tank
<b>Week 6-7</b>	Pressure Control
<b>Week 8-10</b>	Dynamic Behavior of Second-order over Damped System (Stirred Tanks)
<b>Week 11-12</b>	Dynamic Behavior of Second-order over Damped System (Stirred Tanks Heater)
<b>Week 13</b>	Temperature Control
<b>Week 14</b>	PH Control
<b>Week 15</b>	Control of the Water Treatment Unit
<b>Week 16</b>	<b>Final Exam</b>

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ol style="list-style-type: none"> <li>1) D.R. Coughanowr and S. LeBlanc, Process Systems Analysis and Control, McGraw-Hill, 3rd edition, 2008.</li> <li>2) Stephanopoulos G., "Chemical Process Control-An Introduction to Theory and Practice," Prentice-Hall, New Jersey, 1984.</li> </ol>	Yes
<b>Recommended Texts</b>	<ol style="list-style-type: none"> <li>1) Luyben W. L., "Process Modeling, Simulation and Control for Chemical Engineers," McGraw-Hill, New York, 2nd Ed., 1990 .</li> </ol>	No

	2) Process Dynamics: Modeling, Analysis, and Simulation, by Wayne Bequette.	
Websites		

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

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



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Engineering Technological for Chemical  
and Petroleum Industries



## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Research Methodology		Module Delivery
Module Type	Support		Theory Lecture Tutorial Seminar
Module Code	NTU400		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	4	Semester of Delivery	7
Administering Department	TECO	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

## Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

<b>Prerequisite module</b>		<b>Semester</b>	
<b>Co-requisites module</b>	None	<b>Semester</b>	

## Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Aims</b> أهداف المادة الدراسية	<p>Studying research methodology is essential for individuals who plan to conduct research in any field or discipline. Here are some key aims of studying research methodology:</p> <ol style="list-style-type: none"><li>1. <b>Understanding the Research Process:</b> The study of research methodology teaches the systematic approach to research, including the various stages involved such as problem identification, hypothesis formulation, data collection, data analysis, and inference drawing. This understanding allows researchers to properly plan and conduct their own research studies.</li><li>2. <b>Developing Critical Thinking Skills:</b> It helps to develop analytical and critical thinking skills. By understanding different research methodologies, one can critically evaluate research conducted by others and make informed decisions about the quality and reliability of the results.</li><li>3. <b>Understanding Different Research Methods:</b> There are many different ways to approach a research question, and studying research methodology provides an overview of these different methods. This includes qualitative and quantitative methods, experimental and observational studies, and various data collection techniques.</li><li>4. <b>Ethical Considerations:</b> Ethical considerations are crucial in research. Studying research methodology educates about ethical issues in conducting research, such as informed consent, confidentiality, avoiding harm to participants, and responsible reporting of results.</li><li>5. <b>Improving Data Interpretation:</b> It enhances one's ability to interpret and understand data. A sound understanding of research methods can help interpret results correctly, recognizing the implications of the findings as well as the limitations.</li><li>6. <b>Designing Effective Studies:</b> The study of research methodology provides the knowledge necessary to design effective and meaningful studies, increasing the likelihood of producing valid and reliable results.</li><li>7. <b>Writing and Presenting Research:</b> Understanding research methodology is also important for writing research papers or</li></ol>
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	<p>proposals, as well as presenting your research to others. This includes structuring the research report, interpreting the data, discussing the implications, and writing a conclusion.</p> <p>8. Applying for Research Funding: A clear understanding of research methodology is often required when applying for research funding, as it demonstrates to potential funders that you know how to conduct robust and reliable research.</p> <p>9. In short, studying research methodology equips you with the tools to conduct high-quality, ethical research and critically evaluate the research of others.</p>
<p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p>	<p>1. Improved Research Skills: One of the most significant outcomes is the development of strong research skills, including formulating research questions, designing research studies, collecting and analyzing data, and interpreting and presenting results.</p> <p>2. Critical Thinking Abilities: Through studying research methodology, you can enhance your ability to critically evaluate and understand other studies, allowing you to discern reliable findings from those that are flawed or misleading.</p> <p>3. Understanding of Different Research Approaches: You can gain knowledge about various research methods, including both qualitative and quantitative approaches. This understanding can help you to select the most appropriate methodology for your own research projects.</p> <p>4. Ethical Awareness: You'll be equipped with an understanding of the ethical considerations involved in conducting research, which is crucial to ensure that your studies are carried out responsibly and respectfully.</p> <p>5. Effective Communication of Research: Another important outcome is the ability to communicate your research effectively, both in written and verbal forms. This includes writing research papers, grant proposals, and presenting your findings to various audiences.</p> <p>6. Improved Decision-Making: An understanding of research methodology can also help in decision-making processes, as it provides the tools necessary to critically evaluate and make sense of the abundance of information we encounter daily.</p> <p>7. Increased Opportunities: With a solid grasp of research methodology, you will be more attractive to potential employers or academic institutions, as research skills are highly sought after in many fields.</p> <p>8. Knowledge Application: Finally, you will be able to apply your knowledge of research methods to various contexts, not just</p>

	<p>academic research, but also in business, policy-making, and everyday problem-solving.</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <ol style="list-style-type: none"> <li>1. Introduction to research methodology <ul style="list-style-type: none"> <li>● Meaning of Research</li> <li>● Objectives of Research</li> <li>● Motivation in Research</li> <li>● Types of Research</li> <li>● Research Approaches</li> <li>● Significance of Research</li> </ul> </li> <li>2. Defining the Research Problem <ul style="list-style-type: none"> <li>● What is a Research Problem?</li> <li>● Selecting the Problem</li> <li>● Necessity of Defining the Problem</li> </ul> </li> <li>3. Technique Involved in Defining a Problem Research Design <ul style="list-style-type: none"> <li>● Meaning of Research Design</li> <li>● Need for Research Design</li> <li>● Features of a Good Design</li> <li>● Important Concepts Relating to Research Design</li> <li>● Different Research Designs</li> <li>● Basic Principles of Experimental Designs</li> </ul> </li> <li>4. Qualitative and Quantitative Research <ul style="list-style-type: none"> <li>● Qualitative research</li> <li>● Quantitative research</li> <li>● Concept of measurement, causality, generalization, replication</li> <li>● Merging the two approaches.</li> </ul> </li> <li>5. Literature Review <ul style="list-style-type: none"> <li>● Meaning of Literature Review</li> <li>● Necessity of Literature Review</li> <li>● Objectives of Literature Review</li> <li>● Sources of Literature</li> <li>● How to Conduct the Review of Literature</li> </ul> </li> <li>6. Research Hypotheses <ul style="list-style-type: none"> <li>● Meaning of Hypothesis</li> <li>● Definitions of Hypothesis</li> <li>● Nature of Hypothesis</li> </ul> </li> </ol>



	<ul style="list-style-type: none"> <li>● Functions of Hypothesis</li> <li>● Importance of Hypothesis</li> <li>● Types of Hypothesis</li> </ul> <p>7. Measurement and Scaling Techniques</p> <ul style="list-style-type: none"> <li>● Measurement in Research</li> <li>● Measurement Scales</li> <li>● Sources of Error in Measurement</li> <li>● Tests of Sound Measurement</li> <li>● Technique of Developing Measurement Tools</li> <li>● Scaling</li> </ul> <p>8. Sampling</p> <ul style="list-style-type: none"> <li>● Concepts of Statistical Population</li> <li>● Sample, Sampling Frame, Sampling Error, Sample Size</li> <li>● Characteristics of a good sample</li> <li>● Probability Sample - Simple Random Sample</li> <li>● Practical considerations in sampling and sample size.</li> </ul> <p>9. Data Analysis</p> <ul style="list-style-type: none"> <li>● Introducing statistical concepts used in research</li> <li>● Data Preparation - Univariate analysis (frequency tables, bar charts, pie charts, percentages)</li> </ul> <p>10. Data Analysis</p> <ul style="list-style-type: none"> <li>● Bivariate analysis- Cross tabulations and Chi-square test</li> </ul> <p>11. Interpretation of Data and Paper Writing</p> <ul style="list-style-type: none"> <li>● Layout of a Research Paper</li> <li>● Selecting quality journals</li> <li>● Impact factor of Journals</li> <li>● When and where to publish</li> <li>● Ethical issues related to publishing, Plagiarism and Self-Plagiarism.</li> </ul> <p>12. Project presentation and evaluation</p> <ul style="list-style-type: none"> <li>● Finishing the necessary documentation and presenting the project results</li> <li>●</li> </ul>
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<p><b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم</p>
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<b>Strategies</b>	1. Learning research methodology often involves enrollment in structured
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	<p>courses. These could be in traditional classrooms, online classes. The chosen course should ideally align with one's field of study and research interests.</p> <ol style="list-style-type: none"> <li>2. Reading academic texts on research methodology serves as a beneficial resource. These texts typically offer a detailed understanding of different research methods and their applications.</li> <li>3. Getting practical experience by conducting research could be a valuable learning experience. Working under the supervision of an experienced researcher might enhance the learning process. This experience can provide insights into formulating research questions, designing studies, collecting and analyzing data, and interpreting results.</li> <li>4. Workshops and seminars may offer hands-on experience and a chance to learn from experienced researchers. These events often provide practical advice and real-world examples that can be applied to one's research.</li> <li>5. Various online resources exist, including YouTube videos and tutorials. These can help in explaining complex concepts in an understandable way.</li> <li>6. Engaging in discussions with peers could offer different perspectives, challenge one's understanding, and provide learning opportunities from others' experiences.</li> <li>7. Analyzing research articles actively in one's field can be a good practice. This could involve understanding the methodology used, why it was chosen, and how it was implemented.</li> </ol>
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<b>Student Workload (SWL)</b>			
الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	45	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	3
<b>Unstructured SWL (h/sem)</b>	55	<b>Unstructured SWL (h/w)</b>	3.7

الحمل الدراسي غير المنتظم للطالب خلال الفصل	الحمل الدراسي غير المنتظم للطالب أسبوعيا	
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	100	

## Module Evaluation

### تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	5	10% (10)	2,4,6,9,12	LO #1,2,3,4, and 8
	Assignments	4	10% (10)	3, 7,10,13	LO # 5,6, and 8
	Projects	1	10% (10)	Continuous	
	Reports	2	10% (10)	13	LO # 5,6, and 8
Summative assessment	Midterm Exam	1hr	10% (10)	7	LO #1,2,3,4
	Final Exam	2hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1</b>	<p>Introduction to research methodology</p> <ul style="list-style-type: none"> <li>• Meaning of Research</li> <li>• Objectives of Research</li> <li>• Motivation in Research</li> <li>• Types of Research</li> <li>• Research Approaches</li> <li>• Significance of Research</li> <li>• Research Methods versus Methodology</li> <li>• Research and Scientific Method</li> <li>• Importance of Knowing How Research is Done</li> <li>• Research Process</li> <li>• Criteria of Good Research</li> </ul>
<b>Week 2</b>	<p>Defining the Research Problem</p> <ul style="list-style-type: none"> <li>• What is a Research Problem?</li> <li>• Selecting the Problem</li> <li>• Necessity of Defining the Problem</li> <li>• Technique Involved in Defining a Problem</li> </ul>
<b>Week 3</b>	<p>Research Design</p> <ul style="list-style-type: none"> <li>• Meaning of Research Design</li> <li>• Need for Research Design</li> </ul>

	<ul style="list-style-type: none"> <li>• Features of a Good Design</li> <li>• Important Concepts Relating to Research Design</li> <li>• Different Research Designs</li> <li>• Basic Principles of Experimental Designs</li> </ul>
<b>Week 4</b>	<p>Qualitative and Quantitative Research</p> <ul style="list-style-type: none"> <li>• Qualitative research</li> <li>• Quantitative research</li> <li>• Concept of measurement, causality, generalization, replication</li> <li>• Merging the two approaches.</li> </ul>
<b>Week 5</b>	<p>Literature Review</p> <ul style="list-style-type: none"> <li>• Meaning of Literature Review</li> <li>• Necessity of Literature Review</li> <li>• Objectives of Literature Review</li> <li>• Sources of Literature</li> <li>• How to Conduct the Review of Literature</li> </ul>
<b>Week 6</b>	<p><b>Research Hypotheses</b></p> <ul style="list-style-type: none"> <li>• Meaning of Hypothesis</li> <li>• Definitions of Hypothesis</li> <li>• Nature of Hypothesis</li> <li>• Functions of Hypothesis</li> <li>• Importance of Hypothesis</li> <li>• Types of Hypothesis</li> </ul>
<b>Week 7</b>	Mid-term Exam
<b>Week 8</b>	<p>Measurement and Scaling Techniques</p> <ul style="list-style-type: none"> <li>• Measurement in Research</li> <li>• Measurement Scales</li> <li>• Sources of Error in Measurement</li> <li>• Tests of Sound Measurement</li> <li>• Technique of Developing Measurement Tools</li> <li>• Scaling</li> </ul>
<b>Week 9</b>	<p>Sampling</p> <ul style="list-style-type: none"> <li>• Concepts of Statistical Population</li> <li>• Sample, Sampling Frame, Sampling Error, Sample Size</li> <li>• Characteristics of a good sample</li> <li>• Probability Sample - Simple Random Sample</li> <li>• Practical considerations in sampling and sample size.</li> </ul>
<b>Week 10</b>	<p>Data Analysis</p> <ul style="list-style-type: none"> <li>• Introducing statistical concepts used in research</li> <li>• Data Preparation - Univariate analysis (frequency tables, bar charts, pie charts, percentages)</li> </ul>

<b>Week 11</b>	Data Analysis <ul style="list-style-type: none"> <li>• Bivariate analysis- Cross tabulations and Chi-square test</li> </ul>
<b>Week 12</b>	Interpretation of Data and Paper Writing <ul style="list-style-type: none"> <li>• Layout of a Research Paper</li> <li>• Selecting quality journals</li> <li>• Impact factor of Journals</li> <li>• When and where to publish</li> <li>• Ethical issues related to publishing, Plagiarism and Self-Plagiarism.</li> </ul>
<b>Week 13</b>	Project presentation and evaluation <ul style="list-style-type: none"> <li>• Finishing the necessary documentation and presenting the project results</li> </ul>
<b>Week 14</b>	Project presentation and evaluation <ul style="list-style-type: none"> <li>• Finishing the necessary documentation and presenting the project results</li> </ul>
<b>Week 15</b>	<b>Preparatory Week</b>
<b>Week 16</b>	<b>Final Exam</b>

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Kothari, C.R. (2004) Research Methodology: Methods and Techniques. 2nd Edition	Yes
<b>Recommended Texts</b>	Ranjit Kumar (2019) Research Methodology: A Step-by-Step Guide for Beginners 5th Edition	No
<b>Websites</b>		

### GRADING SCHEME

مخطط الدرجات

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

<b>(0 – 49)</b>	<b>F – Fail</b>	راسب	<b>(0-44)</b>	<b>Considerable amount of work required</b>

**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  
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Technical Engineering College-Mosul  
Engineering Technological for Chemical  
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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Corrosion Engineering</b>		Module Delivery
Module Type	Core		Theory Lecture Seminar
Module Code	ETCP405		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	4	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>This course is designed to achieve the following objectives:</p> <ol style="list-style-type: none"><li>1) Defining corrosion and recognize each form of corrosion, corrosion resistance of materials. Describe the economic, environmental, and safety significance of corrosion.</li><li>2) Recognize terms and definitions of basic electrochemistry. Understand electrochemical processes and concepts</li><li>3) Establishing corrosion rate. Understand principal corrosion control methods f Control corrosion by design, materials selection, and modification of environment, protective coatings, and cathodic and anodic protection. Effects of different types of polarization.</li><li>4) Understanding mechanisms of corrosion reaction including reduction and oxidation reactions, galvanic series, polarization and passivation.</li><li>5) Developing corrosion protection processes.</li></ol>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>At the end of this course, the students will be able to recognize each form of corrosion.</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<ol style="list-style-type: none"><li>1. Introduction to Corrosion: Basic concepts, definitions, and types of corrosion.</li><li>2. Electrochemical Principles: Redox reactions, electrochemical cells, and polarization.</li><li>3. Thermodynamics and Kinetics of Corrosion: Corrosion potential, corrosion rate, and activation energy.</li><li>4. Corrosion Electrochemistry: Anodic and cathodic reactions, Pourbaix diagrams, and corrosion cell components.</li><li>5. Corrosion Testing and Monitoring: Techniques for measuring corrosion rates, weight loss analysis, electrochemical methods, and non-destructive testing.</li><li>6. Environmental Factors: The influence of temperature, humidity, pH, and impurities on corrosion.</li><li>7. Forms of Corrosion: Uniform corrosion, galvanic corrosion, pitting corrosion, crevice corrosion, and stress corrosion cracking.</li><li>8. Corrosion Prevention and Control: Selection and design of corrosion-resistant materials, coatings, inhibitors, and cathodic protection.</li><li>9. Corrosion Mechanisms in Specific Environments: Corrosion in aqueous solutions, atmospheric corrosion, high-temperature corrosion, and corrosion in different industrial environments.</li><li>10. Corrosion Management and Failure Analysis: Inspection, corrosion modeling, risk assessment, and failure investigation.</li></ol>



## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture.
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## Student Workload (SWL)

### الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	66	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	4.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	88	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	5.87
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>150</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	<b>Material Covered</b>
<b>Week 1</b>	Introduction & Basic Terminology
<b>Week 2</b>	Corrosion principles
<b>Week 3</b>	Electrochemical aspects
<b>Week 4</b>	Environmental effects
<b>Week 5</b>	Corrosion rate Expression
<b>Week 6</b>	Forms of corrosion
<b>Week 7</b>	Pourbaix diagram
<b>Week 8</b>	Polarization
<b>Week 9</b>	Passivity
<b>Week 10</b>	Corrosion testing
<b>Week 11</b>	Corrosion Protection
<b>Week 12</b>	Inhibitors
<b>Week 13</b>	Coatings
<b>Week 14</b>	Anodic protection, Cathodic Protection design of cathodic protection system
<b>Week 15</b>	Corrosion monitoring
<b>Week 16</b>	Final Exam

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>	R. W. Revie and H. H. Uhlig, Corrosion and Corrosion Control An Introduction to Corrosion Science and Engineering, Fourth. Canada: A JOHN WILEY & SONS, INC., 2008.	
<b>Recommended Texts</b>	<ol style="list-style-type: none"> <li>1) Mars J. Fontana (1987) CORROSION ENGINEERING. 3rd edition, McGraw-Hill Inc.</li> <li>2) Zaki Ahmad (2006) Principles of Corrosion Engineering and Corrosion Control. Elsevier: Oxford.</li> </ol>	
<b>Websites</b>		

## Grading Scheme

### مخطط الدرجات

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



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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Engineering Economics		Module Delivery
Module Type	Support		Theory Lecture Tutorial
Module Code	ETCP407		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	4	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>Chemical plants are built to make a profit, and an estimate of the investment required and the cost of production are needed before the profitability of a project can be assessed. Thus, what to produce is more important in developing economies, as a result of scarcity of skilled manpower. How to produce is another problem, due to differences in availability of resources in differing economy. For whom to produce is another problem of economics and it depends on the socioeconomic ideology while how much to produce is a problem which depends on the production, Potential and size of the market.</p> <p>The problem of by whom to produce is also very big. Most important task is to deal with decision for production processes that have goods manufacturing products according to the standard specifications, and at minimum cost</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>The objective of course is to provide students with a clear understanding of the basic Economic concepts and tools and to enable them to use these tools as Necessary Avenue for engineering professions and scientific knowledge as follows:</p> <ol style="list-style-type: none"><li>1) The market study.</li><li>2) Total investment costs.</li><li>3) Production costs.</li><li>4) Total revenue and profit.</li><li>5) Break-even point and Cash income balance</li><li>6) Identify the advantages that designed experiments have in comparison to the other methods of collecting engineering data.</li></ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"><li>1) Introduction to Engineering Economics</li><li>2) Market study principles</li><li>3) Estimation rate of demands</li><li>4) Definition of fixed cost and currently cost. Details of investment cost item</li><li>5) Estimation total investment cost for simple factory (Recycling of waste plastics)</li><li>6) Definition of production cost and its' items.</li><li>7) Estimation of Production cost for a simple factory (Recycling of waste plastics)</li><li>8) Determination of revenue, profit, cash flow, taxes. , Determination of Breakeven point and its' estimation procedure by graph paper.</li><li>9) Practical examples to determine the feasibility of two factory samples from Break-even points location on graph estimation</li><li>10) Determination the meaning of "Optimum Equipment Design".</li><li>11) Application to determine the optimum pipe insulation thickness to reduce heat loses.</li></ol>

	<p><b>12)</b> Application to determine the optimum pipe diameter for lowest power consumption.</p> <p><b>13)</b> Practical example to prepare project report feasibility study</p>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	33	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Engineering Economics
Week 2	Market study principles
Week 3	Estimation rate of demands
Week 4	Definition of fixed cost and currently cost. Details of investment cost item
Week 5	Estimation total investment cost for simple factory (Recycling of waste plastics)
Week 6	Definition of production cost and its' items.
Week 7	Estimation of Production cost for a simple factory (Recycling of waste plastics)
Week 8	Mid Exam
Week 9	Determination of revenue, profit, cash flow, taxes. , Determination of Breakeven point and its' estimation procedure by graph paper.
Week 10	Practical examples to determine the feasibility of two factory samples from Break-even points location on graph estimation
Week 11	Determination the meaning of "Optimum Equipment Design".
Week 12	Application to determine the optimum pipe insulation thickness to reduce heat loses.
Week 13	Application to determine the optimum pipe diameter for lowest power consumption.
Week 14	Practical example to prepare project report feasibility study
Week 15	Practical example to prepare project report feasibility study
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1) R. K. Sinnott, (1999) "Coulson & Richardson Chemical Engineering Design", Volume 6, 3rd edition	
Recommended Texts	1) Perry's Handbook for Chemical Engineering by Robert H. Perry Encyclopaedia of Science and Technology. McGraw-Hill.	

	<p>2) Paul Newton, What is cash flow analysis Bookboon.com.1st edition, 2014.</p> <p>3) Max S. Peters Klaus D. Timmerhaus. PLANT DESIGN AND ECONOMICS FOR CHEMICAL ENGINEERS. Fourth edition, McGraw-Hill, Inc.1991.</p>	
<b>Websites</b>		

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





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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Environment Pollution		Module Delivery
Module Type	Support		Theory Lecture Seminar
Module Code	ETCP406		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	4	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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	
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<b>Module Aims, Learning Outcomes and Indicative Contents</b>	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
<b>Module Objectives</b> أهداف المادة الدراسية	Definitions of pollutants emission from petroleum refinery. Classification of air pollutants, Sources and type of air pollution, Particulate and air born particulate. Air pollution control equipment: types of equipment, Design of settling chamber and cyclones. Source of water, Utilization, and classification. Type of water pollutants and its effect, Wastewater treatment. Oxygen demanding wastewater: Dissolved Oxygen DO, BOD, Oxygen sage curve and the related equations. Classification of solid waste, the methods of disposal of the solid waste.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1) Understand the concept of the environment and environmental pollution and global problems resulting from environmental pollution.</li> <li>2) Provide solutions to environmental problems.</li> <li>3) Concerned with local and worldwide environmental issues.</li> <li>4) Design devices that are used in the control of air pollution.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>The general outline of topics typically covered in such a course:</p> <ol style="list-style-type: none"> <li>1) <b>Types of pollution</b> Air, Water, Soil, Marine, Noise pollution and Nuclear Hazards. Petroleum pollution allowable limits in the environment.</li> <li>2) <b>Water pollution, Inorganic</b></li> <li>3) <b>water quality parameters</b></li> <li>4) <b>Organic water quality parameters</b></li> <li>5) <b>Organic materials in water</b></li> <li>6) <b>Naturally occurring organic contaminants</b></li> <li>7) <b>Synthetic organic contaminants</b></li> <li>8) <b>Determination of organic content of water, BOD, COD, TOC, TOD.</b></li> <li>9) <b>Five-day BOD Test, Modeling BOD as a first-order reaction</b></li> <li>10) <b>The BOD reaction rate constant</b></li> <li>11) <b>Nitrification</b></li> <li>12) <b>Drinking water standards, water Treatment processes, waste water characteristics and effluent standards, Eutrophication, Industrial waste water.</b></li> <li>13) <b>Waste water Treatment processes, The effect of oxygen- demanding waste on rivers.</b></li> <li>14) <b>Air pollution, Criteria pollutants, Properties and pollution, Significance of criteria pollutants.</b></li> </ol> <p>Air pollutants (Hydrocarbons, Particulates, Gases), Characterization, Meteorological factor influencing, Characteristics of Stack Plume. Control of Particulates. Control of Gases (CO, SOX, NOX). Chimney Design.</p> <ol style="list-style-type: none"> <li>15) <b>Air pollution control, Particulate control, Settling chamber, Cyclone, Separator, Electrostatic precipitator, Fabric Filter, Scrubber and their efficiencies</b></li> </ol>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	Power points, YouTube when necessary using the board for problem-solving and diagramming, and any other explanations' Students will be highly engaged in the activities during the lecture.
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## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	47	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	3.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	53	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

## Module Evaluation

### تقييم المادة الدراسية

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

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Types of pollution
Week 2	Water pollution, Inorganic
Week 3	water quality parameters
Week 4	Organic water quality parameters
Week 5	Organic materials in water
Week 6	Naturally occurring organic contaminants
Week 7	Synthetic organic contaminants
Week 8	Determination of organic content of water, BOD, COD, TOC, TOD.
Week 9	Five-day BOD Test, Modeling BOD as a first-order reaction
Week 10	The BOD reaction rate constant
Week 11	Nitrification
Week 12	Drinking water standards, water Treatment processes, waste water characteristics and effluent standards, Eutrophication, Industrial waste water.
Week 13	Waste water Treatment processes, The effect of oxygen- demanding waste on rivers,
Week 14	Air pollution, Criteria pollutants, Properties and pollution, Significance of criteria pollutants.
Week 15	Air pollution control, Particulate control, Settling chamber, Cyclone, Separator, Electrostatic precipitator, Fabric Filter, Scrubber and their efficiencies
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1) C.S.Rao, "Environmental Pollution Control Engineering", 2nd Edition, New Age International (P) Limited, Published, 2006, Reprint 2007.	
Recommended Texts	2) R. K. Sinnott, Chemical Engineering Design, Vol. 6. 4th edition, Chemical Engineering Design, 2005, pp. 450-457. 3) Noel de Never, "Air Pollution Control Engineering", McGraw-Hill, Inc 1987	

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



Ministry of Higher Education and  
Scientific Research - Iraq  
Northern Technical University  
Technical Engineering College-Mosul  
Engineering Technological for Chemical and  
Petroleum Industries



MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Petrochemical</b>		Module Delivery
Module Type	CORE		Theory Lecture Lab Tutorial Practical Seminar
Module Code	<b>ETCP404</b>		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	4	Semester of Delivery	
Administering Department	ETCP	College	TEMO
Module Leader	Name	e-mail	E-mail
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	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

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>In the study of petrochemical and oil chemistry, the aim is to develop a comprehensive understanding of crude oil and its properties, the classification of petrochemicals, the processes and reactors used in the industry, the utilization of primary raw materials such as natural gas, the production and applications of synthesis gas, olefinic hydrocarbons, and aromatic hydrocarbons, as well as the exploration of petrochemicals derived from methane, ethylene, propylene, n-paraffin, and high molecular weight paraffin, along with their respective applications in various industries.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p><b>At the end of the semester the student should be able to:</b></p> <ol style="list-style-type: none"> <li>1. Describe the composition of crude oil and analyse its physical and chemical properties.</li> <li>2. Differentiate between light, medium, and heavy petrochemicals and understand their characteristics and applications.</li> <li>3. Explain the role of reactors and separation techniques in the petrochemical industry, considering their dependence on reaction pathways and the complexity involved.</li> <li>4. Recognize natural gas as a primary raw material for petrochemicals and understand its treatment process through physical and chemical adsorption.</li> <li>5. Describe the steps involved in the treatment of natural gas, including water removal, hydrocarbon recovery, and liquefied natural gas (LNG) production.</li> <li>6. Identify the sources of synthesis gas and examine its utilization, particularly in hydrogen production and partial oxidation processes.</li> <li>7. Examine the properties and applications of olefinic hydrocarbons such as ethylene, propylene, and butadiene in the petrochemical industry.</li> <li>8. Investigate the reactions and chemical properties of aromatic hydrocarbons, including benzene, toluene, and BTX, as well as their derivatives.</li> <li>9. Analyse the production and applications of petrochemicals derived from methane, such as CS<sub>2</sub>, chloromethane, and acetylene.</li> <li>10. Examine the uses of ethylene in the production of polyethylene, PVC, polystyrene, ethylene oxide, acetaldehyde, and acrylic compounds.</li> <li>11. Study the properties and applications of polypropylene, PMMA, polyacrylonitrile, isopropanol, cumene, phenol, acetone, epichlorohydrin, and propylene oxide.</li> <li>12. Evaluate the production and uses of petrochemicals derived from n-paraffin, including butadiene, rubber, and maleic anhydride.</li> <li>13. Understand the properties and applications of fatty acids and fatty alcohols derived from high molecular weight paraffin.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p><b>1. Petrochemical and oil chemistry</b></p> <ul style="list-style-type: none"> <li>● Crude oil</li> <li>● Composition of crude oil</li> <li>● Physical and chemical properties</li> </ul> <p><b>2. Classification: Petrochemicals</b></p> <ul style="list-style-type: none"> <li>● Light Petrochemicals</li> <li>● Medium Petrochemicals</li> <li>● Heavy Petrochemicals</li> </ul>

### **3.Process Topology**

- Reactors
- Separation
- Dependence on Reaction pathway
- Complexity in pathway

### **4.Primary Raw Materials for Petrochemicals**

- Natural gas
- Natural gas treatment process
- Physical adsorption
- Chemical adsorption

### **5.Natural gas treatment process:**

- Water removal
- Hydrocarbon recovery
- Liquefied natural gas ( LNG)

### **6.Synthesis gas:**

- Source of synthesis gas
- Used of synthesis gas
- Hydrogen production
- Partial oxidation

### **7.Olefinic hydrocarbons:**

- Ethylene
- Propylene
- butadiene

### **8.Aromatic hydrocarbon:**

- BTX
- Reaction and chemical of benzene
- Alkylation , chlorination, nitration and acylation

### **9.Aromatic hydrocarbon:**

- Oxidation of benzene
- Hydrogenation of benzene
- Reaction and chemical of toluene

### **10.Aromatic hydrocarbon:**

- Phenol and benzoic acid
- Chemicals from xylene

### **11.Petrochemicals based methane:**

- CS<sub>2</sub>
- Chloromethane
- Acetylene

### **12.Petrochemicals based ethylene**

- Polyethylene



	<ul style="list-style-type: none"> <li>● PVC, polystyrene</li> <li>● Ethylene oxide, acetaldehyde, acrylic</li> </ul> <p><b>13.Petrochemicals based propylene:</b></p> <ul style="list-style-type: none"> <li>● Polypropylene</li> <li>● PMMA, Poly acrylonitrile</li> <li>● Isopropanol, cumene</li> <li>● Phenol ,acetone , Epichlorohydrin , Propylene Oxide</li> </ul> <p><b>14.Petochemicals based n paraffine</b></p> <ul style="list-style-type: none"> <li>● Butadiene</li> <li>● Rubber</li> <li>● Maleic anhydride</li> </ul> <p><b>15.petrochemicals based high molecular weight paraffine</b></p> <ul style="list-style-type: none"> <li>● Fatty acids</li> <li>● Fatty alcohols</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<p>In the chemical industry, learning and teaching strategies encompass practical laboratory work, problem-solving approaches, industry visits and guest speakers, interactive discussions and group work, multimedia and visual aids, project-based learning, industry internships and work placements, continuous assessment and feedback, use of technology, and professional development and training for teachers. These strategies aim to create an engaging and effective learning environment, enabling students to develop a strong foundation in chemical industry concepts, critical thinking skills, and practical competencies.</p>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	123	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	8.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>200</b>		

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Petrochemical and oil chemistry
Week 2	Classification: Petrochemicals
Week 3	Process Topology
Week 4	Primary Raw Materials for Petrochemicals
Week 5	Natural gas treatment process
Week 6	Synthesis gas
Week 7	Olefinic hydrocarbons
Week 8	Aromatic hydrocarbon
Week 9	Aromatic hydrocarbon

<b>Week 10</b>	Aromatic hydrocarbon
<b>Week 11</b>	petrochemicals based methane
<b>Week 12</b>	petrochemicals based ethylene
<b>Week 13</b>	petrochemicals based propylene
<b>Week 14</b>	petrochemicals based n paraffine
<b>Week 15</b>	petrochemicals based high molecular weight paraffine
<b>Week 16</b>	Preparatory week before the Final Exam

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Separation of normal paraffin from branched paraffin
<b>Week 2</b>	Qualitative detection of sulfur and its compounds in the petrochemicals compounds
<b>Week 3</b>	Alkylation of aromatic compound
<b>Week 4</b>	Detection of polymer type by using solvent
<b>Week 5</b>	rubber vulcanization
<b>Week 6</b>	Reaction and identification of alcohols and phenols
<b>Week 7</b>	Preparation of nylon6 polymers
<b>Week 8</b>	The radical polymerization of methyl acrylate
<b>Week 9</b>	Preparation of polyesters
<b>Week 10</b>	Preparation of urea-formaldehyde
<b>Week 11</b>	Preparation of phenol-formaldehyde resin (resols, novolac )
<b>Week 12</b>	Preparation of styrene monomer and polystyrene
<b>Week 13</b>	Preparation of grease from sodium hydroxide
<b>Week 14</b>	Preparation of grease from Lithium hydroxide
<b>Week 15</b>	Preparing liquid detergents from petrochemical materials
<b>Week 16</b>	Preparatory week before the Final Exam

### Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"> <li>"Petrochemicals: The Rise of an Industry" by Gregory P. Arnold and Robert A. Meyers</li> <li>"Introduction to Petrochemicals" by James G. Speight</li> <li>"Petrochemical Processes" by Alain Chauvel and Gilles Lefebvre</li> </ul>	Yes
Recommended Texts	<ul style="list-style-type: none"> <li>"Petrochemicals: Chemistry, Technology, and Commercial Applications" by Himadri B. Bohida</li> </ul>	Yes
Websites	<a href="https://www.afpm.org/about-petrochemicals">https://www.afpm.org/about-petrochemicals</a>	

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