



# Course Specifications

<b>Course Title:</b>	<b>Chemistry of Petroleum and Petrochemicals</b>
<b>Course Code:</b>	<b>4024572-3</b>
<b>Program:</b>	<b>Chemistry</b>
<b>Department:</b>	<b>Department of Chemistry</b>
<b>College:</b>	<b>Faculty of Applied Science</b>
<b>Institution:</b>	<b>Umm Al-Qura University</b>



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## A. Course Identification

<b>1. Credit hours:</b> 3 hrs (2 hrs. Theoretical + 1 hr. Practical)
<b>2. Course type</b> a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/> b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> 6th / 3rd semester
<b>4. Pre-requisites for this course (if any):</b> Organic Reactions and Preparations
<b>5. Co-requisites for this course (if any):</b>

## 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	2	100%
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

## 7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
<b>Contact Hours</b>		
1	Lecture	30
2	Laboratory/Studio	42
3	Tutorial	
4	Others (specify)	
	<b>Total</b>	<b>72</b>
<b>Other Learning Hours*</b>		
1	Study	51
2	Assignments	10
3	Library	
4	Projects/Research Essays/Theses	
5	Others (specify)	28
	<b>Total</b>	<b>89</b>

\* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes

<b>1. Course Description</b> Study the theories of petroleum formation, petroleum classifications and quality. Study the fractional distillation of petroleum and its products, the chemical processes. Study of petrochemical industries and their importance and uses.
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## 2. Course Main Objective

By the end of the course the student will

- 1- Petroleum formation, classifications and quality.
- 2- Petroleum distillation and its products.
- 3- Crude oil products treatment by chemical processes.
- 4- Petrochemical industries and their importance and uses.

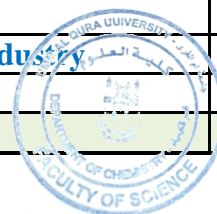
## 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge:</b>	
1.1	Are fully conversant with various theories for oil formation and oil traps	K3
1.2	Demonstrate and understanding of fundamental elements and chemical composition of crude oil	K2
1.3	Demonstrate an understanding of petroleum classifications and quality.	K6
1.4	Gain knowledge of the different ways fractional distillation of crude oil and distillate in each stage and its products (natural gas, gasoline, kerosene etc.).	K7
1.5	Gain knowledge of manufacturing processes such as chemical process of cracking, combining, rearrangement and purification process.	K7
1.6	Demonstrate a systematic understanding of mechanism of petroleum chemical process	K1
1.7	Demonstrate an understanding petrochemical industry initial and final.	K7
1.8	Learn how to get the final petrochemicals such as polymers, textiles, paints, detergents, etc.	K2
2	<b>Skills :</b>	
2.1	The student acquires the skill of thinking in trying to find the best theory for oil formation.	S3
2.2	The student acquires knowledge of chemical structures and predict its presence in petroleum distillates.	S1
2.3	Evaluate and classification of chemical petroleum quality and substances affecting it.	S4
2.4	The student acquires the skill of petroleum distillation according to the boiling point.	S4
2.5	Problem-solving skills, relating to petroleum products improvement like treatment and purification	S1
2.6	Use of reaction mechanisms and skills based on practical applications of theories for producing petrochemical and polymers.	S3
3	<b>Competence:</b>	
3.1	Student can defense and discussion about oil organic and inorganic arguments theories	C1
3.2	Numeracy and mathematical skills of finding petroleum quality.	C4
3.3	Demonstrate skills in the usage of computer, network, and software packages relevant to chemistry; e.g. Chem-draw, Microsoft ward.	C3

CLOs		Aligned PLOs
3.4	Demonstrate written of research and presenting skills.	C2

### C. Course Content

No	List of Topics	Contact Hours
1	Definition of Petroleum and it origin formation and traps	2
2	Methods of exploration and Petroleum Classification	2
3	Chemical Composition of Petroleum	2
4	Field separation of crude oil (Desalting, water treatment, gas treatment)	4
5	Refining operations and Fractional Distillation of crude oil	4
6	Crude oil Distillation products: light distillates (natural Gas, gasoline and naphtha) - Mild distillates (kerosene, heating oil and jet fuel and diesel fuel) - heavy distillates (lubricates oil and waxes, asphalt and coke oil).	4
7	Chemical conversion processes of crude oil: Cracker processes (thermal cracking and catalytic cracking and hydrocracking) - Combining processes (polymerization and alkylation) - Rearrangement processes (catalytic reforming and isomerization and improving the octane and cetane number ) - Purification by hydrogen treatment (removing hydrogen sulfide compounds mercaptans and compounds of nitrogen. Etc.).	4
8	Petrochemicals definition – History of Petrochemicals industry	4
9	Production of petrochemicals and industrial uses	4
<b>Total</b>		<b>30</b>



### D. Teaching and Assessment

#### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	<b>Knowledge</b>		
1.1	Are fully conversant with various theories for oil formation and oil traps	Lectures and Library visit and discussions and in small groups	Quiz and discussions
1.2	Demonstrate and understanding of fundamental elements and chemical composition of crude oil	Lectures	Quiz and discussions
1.3	Demonstrate an understanding of petroleum classifications and quality.	Lectures and research	Quiz and discussions
1.4	Gain knowledge of the different ways fractional distillation of crude oil and distillate in each stage and its products (natural gas, gasoline, kerosene etc.).	Lectures and Library visit	Quiz and discussions

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.5	Gain knowledge of manufacturing processes such as chemical process of cracking, combining, rearrangement and purification process.	Lectures and Library visit	Quiz and discussions
1.6	Demonstrate a systematic understanding of mechanism of petroleum chemical process	Lectures and Library visit	Quiz and discussions
1.7	Demonstrate an understanding petrochemical industry initial and final.	Lectures and Library visit	Quiz and discussions
1.8	Learn how to get the final petrochemicals such as polymers, textiles, paints, detergents, etc.	Long and short essays	Quiz and discussions
<b>2.0</b>	<b>Skills</b>		
2.1	The student acquires the skill of thinking in trying to find the best theory for oil formation.	Discussions	Quiz
2.2	The student acquires knowledge of chemical structures and predict its presence in petroleum distillates.	Discussions	Quiz
2.3	evaluate and classification of chemical petroleum quality and substances affecting it.	Through assignments and homework	Quiz
2.4	The student acquires the skill of petroleum distillation according to the boiling point.	Discussions	Quiz
2.5	Problem-solving skills, relating to petroleum products improvement like treatment and purification	Through assignments and homework	Quiz
2.6	Use of reaction mechanisms and skills based on practical applications of theories for producing petrochemical and polymers.	Through assignments and homework	Quiz
<b>3.0</b>	<b>Competence</b>		
3.1	Student can defense and discussion about oil organic and inorganic arguments theories	Discussions	Quiz
3.2	Numeracy and mathematical skills of finding petroleum quality.	Through assignments and homework	Quiz
3.3	Demonstrate skills in the usage of computer, network, and software packages relevant to chemistry; e.g. Chem-draw, Microsoft ward.	Through assignments and homework	Quiz
3.4	Demonstrate written of research and presenting skills.	Long and short essays	Long and short essays

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework or research activities	--	10 %
2	Midterm Exam	8	20 %
3	Practical Exam.	14	30 %
4	Final Exam.(2 hours exam)	16	40 %
5	Total		100%

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- Presence of faculty members to provide counseling and means.
- Office Hours: weekly during working hours, and to create appropriate means
- Academic Advising for students to those who need it.

## F. Learning Resources and Facilities

### 1.Learning Resources

Required Textbooks	Petroleum and petrochemical course presented by the lecturer.
Essential References Materials	<ul style="list-style-type: none"> <li>• J. G. Speight, The Chemistry and Technology of Petroleum, 5th ed. CRC Press, 2014, P. 953, ISBN: 9781439873892.</li> <li>• R. Curley, Fossil Fuels. Britannica, 2012, P. 160, ISBN 9781615305407.</li> <li>• M. A. Fahim, T. A. Alsahhaf, A. Elkilani, Fundamentals of Petroleum Refining, Elsevier, 2010, P. 496, ISBN 9780444527851.</li> <li>• D. S. J. Jones, Peter R. Pujadó, Handbook of petroleum processing, Springer Dordrecht Netherlands, 2006.</li> <li>• S. Matar, L. F. Hatch, Chemistry of Petrochemical Processes, 2nd ed. 2001, P. 392, ISBN 9780884153153.</li> <li>• Uttam Ray Chaudhuri. Fundamentals of Petroleum and Petrochemical Engineering. December 13, 2010 by CRC Press.</li> <li>• Uttam Ray Chaudhuri. Fundamentals of Petroleum and Petrochemical Engineering (Chemical Industries) Hardcover – Import, 28 Jan 2011. CRC Press; 1 edition (28 January 2011).</li> <li>• International petroleum encyclopedia, Tulsa, Oklahoma: Pennwell, Corporation, 2007.</li> </ul>
Electronic Materials	<ul style="list-style-type: none"> <li>• <a href="http://www.chemhelper.com/">http://www.chemhelper.com/</a></li> <li>• <a href="http://www.chemweb.com/">http://www.chemweb.com/</a></li> <li>• <a href="http://www.sciencedirect.com/">http://www.sciencedirect.com/</a></li> </ul>

<b>Other Learning Materials</b>	<ul style="list-style-type: none"> <li>• Microsoft Power Point, Microsoft Word.</li> <li>• Video show on thermodynamics.</li> <li>• Learning CD on thermodynamics.</li> </ul>
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## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> <li>- Classroom capacity (30) students.</li> <li>- Processing of the classroom with appropriate educational means, including computers</li> </ul>
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Classroom is equipped with a computer, Data Show and TV.
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	No other requirements.

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course learning outcomes	Observations and the assistance of colleagues.	Direct
Quality of learning resources	Students	A questionnaire
Effectiveness of teaching and assessment	Peer Reviewer and Program Leaders	Direct

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

Council / Committee	
Reference No.	
Date	2019 - 2020

Received by: Dr. Ismail Althagafi

Department Head

Signature:



Date: 20/12/2019

