



Course Specifications

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

Table of Contents

A. Course Identification	3
6. Mode of Instruction (mark all that apply)	3
B. Course Objectives and Learning Outcomes	3
1. Course Description	3
2. Course Main Objective.....	3
3. Course Learning Outcomes	3
C. Course Content.....	4
D. Teaching and Assessment	5
1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods	5
2. Assessment Tasks for Students	6
E. Student Academic Counseling and Support.....	6
F. Learning Resources and Facilities.....	6
1. Learning Resources	6
2. Facilities Required.....	7
G. Course Quality Evaluation	7
H. Specification Approval Data	8

A. Course Identification

1. Credit hours: 3 hrs (2 hrs. Theoretical + 1 hr. Practical)
2. Course type
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"/>
3. Level/year at which this course is offered: 6 th Level / 3 rd Year
4. Pre-requisites for this course (if any): Organic Reactions and Preparations
5. Co-requisites for this course (if any): None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	√	73%
2	Blended		
3	E-learning	√	27%
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22
2	Laboratory/Studio	30
3	Tutorial	--
4	Others (specify)	15
	Total	67

B. Course Objectives and Learning Outcomes

1. Course Description

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.

2. Course Main Objective

By the end of the course the student will be familiar by the basis of petroleum chemistry and petrochemicals industries, classifications, and quality.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Familiar with various theories for oil formation and oil traps	K1
1.2	Describe different processes carried out on crude oil and the chemical background of these processes	K2
1.3	Write the chemical methods for manufacture of petrochemicals	K2

CLOs		Aligned PLOs
1.4	Relate the chemical properties of the different types of petrochemicals with their properties and applications in the research developments and environment	K2
2	Skills :	
2.1	Demonstrate an understanding of petroleum classifications and quality.	S1
2.2	the different ways fractional distillation of crude oil and distillate in each stage and its products (natural gas, gasoline, kerosene etc.).	S1, S3
2.3	Evaluate petroleum quality and substances affecting it.	S3
2.4	Predict the expected product and mechanism of different reactions of heterocyclic compounds	S2
2.5	Summarize the different methods used to synthesis of different types of petrochemicals	S1
2.6	Adapt and practice chemical processes for evaluation of some of the petroleum products	S3
2.7	Collect a data using computers and internet to find all information related to petroleum and petrochemicals and their applications in industries	S5
2.8	Communicate effectively using theoretical basis of evaluation and processing of the petroleum and petrochemicals to a variety of audiences	S4
3	Values:	
3.1	Write and present a chemical report related to petroleum chemistry.	V2

C. Course Content

No	List of Topics	Contact Hours
1	Definition of Petroleum and its 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).	2+2E
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	2+2E

	compounds mercaptans and compounds of nitrogen. Etc.).	
8	Petrochemicals definition – History of Petrochemicals industry	2+2E
9	Production of petrochemicals and industrial uses	2+2E
Total		30

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	Knowledge and Understanding		
1.1	Familiar with various theories for oil formation and oil traps	Lectures	Mid-term and final Exams
1.2	Describe different processes carried out on crude oil and the chemical background of these processes	Lectures. Mind Mapping	Mid-term and final Exams Assignments and activities on blackboard
1.3	Write the chemical methods for manufacture of petrochemicals	Lectures. Lab work.	Mid-term and final Exams Practical Lab exam.
1.4	Relate the chemical properties of the different types of petrochemicals with their properties and applications in the research developments and environment	Lectures. Lab work E-Learning	Mid-term and final Exams Practical Lab exam Assignments and activities on blackboard
2.0	Skills		
2.1	Demonstrate an understanding of petroleum classifications and quality.	Lab work	Practical Lab report and Exam
2.2	the different ways fractional distillation of crude oil and distillate in each stage and its products (natural gas, gasoline, kerosene etc.).	Lab work	Practical Lab report and Exam
2.3	Evaluate petroleum quality and substances affecting it.	Cooperative learning and Group Presentations	Report and research on Project production
2.4	Predict the expected product and mechanism of different reactions of heterocyclic compounds	Lectures	Mid-term and final Exams
2.5	Summarize the different methods used to synthesis of different types of petrochemicals	Lectures. Lab work.	Final exam. Practical Lab exam.
2.6	Adapt and practice chemical processes for evaluation of some of the petroleum products	Lectures. Lab work.	Final exam. Practical Lab exam.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.7	Collect a data using computers and internet to find all information related to petroleum and petrochemicals and their applications in industries	Web based study.	Web-based student performance systems
2.8	Communicate effectively using theoretical basis of evaluation and processing of the petroleum and petrochemicals to a variety of audiences	Web based study. Research activity.	Class discussion.
3.0	Values		
3.1	Write and present a chemical report related to petroleum chemistry.	Research activity. Web based study.	Portfolios Assignments and activities

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	E-learning	All weeks	5%
2	Assignments and activities	All weeks	5%
3	Mid-term Exam	6	20%
4	Practical Lab Work (Reports and Exams)	11	30%
5	Final Exam.(2 hours exam)	12	40%

*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 :

A faculty member was assigned to provide counseling and advice (about 20-25 student/ one faculty member).

Office hours of the instructor: during the working hours weekly.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	-
Essential References Materials	<ul style="list-style-type: none"> • J. G. Speight, The Chemistry and Technology of Petroleum, 5th ed. CRC Press, 2014, P. 953, ISBN: 9781439873892. • R. Curley, Fossil Fuels. Britannica, 2012, P. 160, ISBN 9781615305407.

	<ul style="list-style-type: none"> • M. A. Fahim, T. A. Alsahhaf, A. Elkilani, Fundamentals of Petroleum Refining, Elsevier, 2010, P. 496, ISBN 9780444527851. • D. S. J. Jones, Peter R. Pujadó, Handbook of petroleum processing, Springer Dordrecht Netherlands, 2006. • S. Matar, L. F. Hatch, Chemistry of Petrochemical Processes, 2nd ed. 2001, P. 392, ISBN 9780884153153. • Uttam Ray Chaudhuri. Fundamentals of Petroleum and Petrochemical Engineering. December 13, 2010 by CRC Press. • Uttam Ray Chaudhuri. Fundamentals of Petroleum and Petrochemical Engineering (Chemical Industries) Hardcover – Import, 28 Jan 2011. CRC Press; 1 edition (28 January 2011). • International petroleum encyclopedia, Tulsa, Oklahoma: Pennwell, Corporation, 2007.
Electronic Materials	Course handouts PPT
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom with capacity of (30) students. A laboratory with capacity of (15) students Including all practical facilities
Technology Resources (AV, data show, Smart Board, software, etc.)	Teaching halls and laboratories are equipped with data show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	See attached list

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Program leader, curriculum committee; external reviewers	Direct
Extent of achievement of CLO's	Peer Reviewer	Direct
Quality of learning resources	Students, faculty members and External reviewers	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	Quality committee and department counsel
Reference No.	
Date	2022

Head of Chemistry Department



Dr Moataz Morad

