هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	Chemistry of Petroleum and Petrochemicals
Course Code:	CHEM 492-3
Program:	Bachelor of Science in Chemistry
Department:	Department of Physical Sciences
College:	College of Science
Institution:	Jazan University
Version:	TP-153 (2024)
Last Revision Date:	1 March 2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3h)

2. Course type

A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		

3. Level/year at which this course is offered: ((8th Level/ 4th year)

4. Course general Description:

Course title	Course code	Contact Hours			Credit Hours	Year	Level	Prerequisite	Corequisite
		Lec	Tut	Lab					
Chemistry of Petroleum and Petrochemicals	CHEM 492-3	2	0	2	3	4th	8th	CHEM234-3	---

This course covers the basic knowledge about the petroleum and different methods of manufacturing of petrochemicals from natural gas, ethylene, propylene, benzene, and industrial gas.

5. Pre-requirements for this course (if any)**:**

CHEM234-3

6. Co-requisites for this course (if any)**:**

None

7. Course Main Objective(s):

This course has been designed to give students the following concepts:

1- **Identify the origin of petroleum, theories of its formation, properties, and refining processes.**
2- **Study of thermal cracking, octane number, and methods of preparing petroleum.**
3- **Study and classification of petrochemicals.**
4- **Understand and assimilate the many organic and inorganic petrochemicals that can be obtained from natural gas and reformed naphtha.**

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		

No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	$2 \times 15 = 30$
2.	**Laboratory/Studio**	$2 \times 15 = 30$
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify) Field trip to Aramco**	0
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding;** *Upon completion of the course, students are able to:*			
1.1	**Demonstrate knowledge and an understanding of Petroleum and petrochemicals sources, components, properties, and refining processes. (P)**	**K1**	**lecture/ discussion Seminars/presentation**	**Objective question**
1.2	**Explain the Distillation, thermal cracking, alkylation processes, isomerism, and polymerization and the petrochemicals classification. (P)**	**K2**	**lecture / Interactive discussion / Seminars /Individual presentation**	**Essay question**
2.0	**Skills;** *Upon completion of the course, students are able to:*			
2.1	**Solve problems in petroleum and differentiate between different petrochemical products from organic and inorganic sources. (P)**	**S1**	**lecture / Interactive discussion / Seminars /Individual presentation**	**Solving Problems & Essay question**
2.2	**Design, carry out, and record the results of petroleum and petrochemical experiments using classical techniques and modern instruments, then**	**S2**	**Lab work, group work**	**Objective question, Essay question,**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	analyze those results to draw reasonable, correct conclusions and write reports. (P)			lab report rubric
2.3	Use a variety of instruments to efficiently analyze different materials.	S3	lab demonstrations / hands-on student learning activities	lab report
2.4	Knows the proper procedures for safe handling and use of chemicals. (P)	S4	lab demonstrations / hands-on student learning activities	Safety exam
2.5	Communicate scientific information and research findings effectively in writing research papers, or orally, using clear and concise scientific language. (M)	S5	Research /Seminars /Individual presentation	Interactive Discussions/Rubric
3.0	**Values, autonomy, and responsibility;** *Upon completion of the course, students are able to:*			
3.1	Working as a group leader in cooperation with other colleagues. (P)	V1	*lab demonstrations / whole group and small group discussion*	*Practical group work Rubric*
3.2	*Recognize a chemist's ethical and scientific responsibilities.*	V2	*Research project or presentation*	*group work Rubric*

C. Course Content

1- Theoretical Part

No	List of Topics	Contact Hours
1.	Introduction to Petroleum	1
2.	Theories of formation, components and properties of petroleum	3
3.	refining processes	2
4.	Distillation, and thermal cracking of petroleum	2
5.	Alkylation processes, isomerism, and polymerization of petroleum	2
6.	Octane number, and preparation of petroleum	2
7.	Introduction to petrochemicals and classification	2
8.	petrochemicals from methane	2
9.	petrochemicals from synthetic gas	2
10.	Petrochemicals from propylene	2

11.	Petrochemicals from benzene	2
12.	Petrochemicals from xylene	2
13.	Inorganic petrochemicals	2
14.	Renewable energy sources as an alternative to fossil fuel	2
15.	Review	2
Total		$2 \times 15 = 30$

2- Lab work

No	List of Topics	Contact Hours
1.	Introduction and Safety	2
2.	Standard method for determining the specific density of crude petroleum	2
3.	Standard method for determining aniline point.	2
4.	Diesel coefficient and cetane number	2
5.	Standard method for determining spill point	2
6.	Standard method for fractional distillation of crude petroleum under normal atmospheric pressure	2
7.	Determination of pH number	4
8.	Synthesis of Biodiesel	2
9.	Aniline point & mixed aniline point	2
10.	Cloud & pour point	2
11.	Flash & fire point	2
12.	Standard method for fractional distillation of crude petroleum under normal atmospheric pressure	2
13.	Synthesis of polyethylene	2
14.	Synthesis of styrene	2
Total		$2 \times 15 = 30$

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	*Periodic Exams*	*During Semester*	*15%*
2.	*Assignments & Classroom Activities*	*During Semester*	*5%*
3.	*Lab Work*	*During Semester*	*30%*
4.	*Final Exam*	*16-17*	*50%*
		Total	*100%*

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	1. **Handbook of Petrochemicals and Processes, Wells, G. Margaret, Routledge; CRC, 2018.** 2. **Industrial petroleum and Petrochemicals, Salim El-Zeab. 1997, King Saud University.**
Supportive References	
Electronic Materials	**Some course contents and materials are posted on Black board sites**
Other Learning Materials	• **https://en.wikipedia.org/wiki/Chemical_industry** • **http://www.rsc.org/learn-chemistry** • **https://www.khanacademy.org/science/organic-chemistry** • **https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/intro1.htm** • **https://chem.libretexts.org/**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture room(s) for groups of 50 students
Technology equipment (projector, smart board, software)	Smart board, Data show, Black board, internet
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect
Effectiveness of Students' assessment	Instructor & Course coordinator	Classroom evaluation (direct & indirect
Quality of learning resources	Program coordinator	Indirect
The extent to which CLOs have been achieved	Assessment committee	Indirect
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physical Sciences Department Council
REFERENCE NO.	Meeting (3)
DATE	12/03/2024 -02/09/1445