

CHEM4033: INDUSTRIAL CHEMISTRY

Effective Term

Semester A 2024/25

Part I Course Overview

Course Title

Industrial Chemistry

Subject Code

CHEM - Chemistry

Course Number

4033

Academic Unit

Chemistry (CHEM)

College/School

College of Science (SI)

Course Duration

One Semester

Credit Units

4

Level

B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

CHEM2006/BCH2006 Principles of Inorganic Chemistry

CHEM2007/BCH2007 Principles of Organic Chemistry

CHEM2008/BCH2008 Principles of Physical Chemistry

Precursors

Nil

Equivalent Courses

BCH4033 Industrial Chemistry

Exclusive Courses

Nil

Part II Course Details

Abstract

In this course, students will be introduced to the fundamentals of industrial chemistry and its role in current technologies in the chemical, petrochemical, and pharmaceutical industries. Following completion of the course students will be able to describe the role of chemical, petrochemical, and pharmaceutical industries in the world; identify the key concepts and laws of physical chemistry used in technology; comprehend the fundamentals of chemical engineering; review the production of energy and raw materials. Describe the chemical processes related to water; identify the most important inorganic and organic products and the technologies for their production; and discuss the most important challenges for sustainable development.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 app.)		DEC-A2	DEC-A3
1	Explain the role of chemical, petrochemical, and pharmaceutical industries in the world.	5	x		
2	Describe the use of the key concepts and laws of physical chemistry and chemical engineering in technology.	15	x		x
3	Analyse the role and the production of energy and raw materials including drinking water and waste water.	30	x	x	
4	Describe a technology using processes at the molecular level for the production of key inorganic and organic products.	40		x	x
5	Design a list of criteria to evaluate the feasibility of a project / plan related to sustainable developments.	10	x	x	x

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures and tutorials	Students will learn about the contribution of the chemical, petrochemical, and pharmaceutical industries to the economy based on global data.	1	

2	Lectures and tutorials	Students will develop an understanding of the key concepts of industrial chemistry and the fundamentals of chemical engineering.	2	
3	Videos	Through the use of process schemes and videos, students will review and demonstrate the production of energy and raw materials, including the treatment waste water and the production of drinking water.	3	
4	Animations	Through the use of animations, students will learn about key inorganic and organic products and some of the production process.	4	
5	Group discussion	Students will participate in group work to compose a list of criteria to be assessed by peers through online discussion.	5	

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Recollection Tests & Tutorial Assignments	1, 2, 3, 4, 5	20	
2	Group Presentations	4	15	
3	Reports & Debates	5	5	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Additional Information for ATs

Starting from Semester A, 2015-16, students must satisfy the following minimum passing requirement for courses offered by CHEM: "A minimum of 40% in both coursework and examination components."

Assessment Rubrics (AR)**Assessment Task**

Recollection Tests & Tutorial Assignments

Criterion

Ability to explain the concepts of industrial chemistry and their use in chemical processes and technologies

Excellent (A+, A, A-)

Able to demonstrate excellent understanding of industrial chemistry and their use in chemical processes and technologies

Good (B+, B, B-)

Able to demonstrate good understanding of industrial chemistry and their use in chemical processes and technologies

Fair (C+, C, C-)

Able to demonstrate satisfactory understanding of industrial chemistry and their use in chemical processes and technologies

Marginal (D)

Able to demonstrate limited understanding of industrial chemistry and their use in chemical processes and technologies

Failure (F)

Fail to demonstrate ability in understanding of industrial chemistry and their use in chemical processes and technologies

Assessment Task

Group Presentations

Criterion

Ability to explain an industrial chemical processes and the role of their products in society.

Excellent (A+, A, A-)

Able to demonstrate excellent understanding of an industrial chemical processes and the role of their products in society

Good (B+, B, B-)

Able to demonstrate good understanding of an industrial chemical processes and the role of their products in society

Fair (C+, C, C-)

Able to demonstrate satisfactory understanding of an industrial chemical processes and the role of their products in society

Marginal (D)

Able to demonstrate limited understanding of an industrial chemical processes and the role of their products in society

Failure (F)

Fail to demonstrate understanding of an industrial chemical process and the role of their products in society

Assessment Task

Reports

Criterion

- 1 Capacity for self-directed learning to understand the basics of industrial chemistry
- 2 Ability to explain industrial processes

Excellent (A+, A, A-)

Able to demonstrate excellent capability in understanding the basics of industrial chemistry and the industrial processes

Good (B+, B, B-)

Able to demonstrate good capability in understanding the basics of industrial chemistry and the industrial processes

Fair (C+, C, C-)

Able to demonstrate satisfactory capability in understanding the basics of industrial chemistry and the industrial processes

Marginal (D)

Able to demonstrate limited capability in understanding the basics of industrial chemistry and the industrial processes

Failure (F)

Fail to demonstrate capability in understanding the basics of industrial chemistry and the industrial processes

Assessment Task

Examination

Criterion

Ability to answer questions in details concerning the role of physical chemistry in industrial processes, the basics of chemical engineering, the production of energy, raw materials, inorganic and organic products and some of their production process, and discuss sustainable development.

Excellent (A+, A, A-)

Able to demonstrate excellent ability in giving correct answer to the examination questions.

Good (B+, B, B-)

Able to demonstrate good ability in giving correct answer to the examination questions.

Fair (C+, C, C-)

Able to demonstrate satisfactory ability in giving correct answer to the examination questions.

Marginal (D)

Able to demonstrate limited ability in giving correct answer to the examination questions.

Failure (F)

Fail to demonstrate ability in giving correct answer to the examination questions.

Part III Other Information

Keyword Syllabus

- The role of chemical technology in the world.
- The role of physical chemistry in chemical technology.
- The fundamentals of chemical engineering.
- Energy production.
- The raw materials of the chemical and petrochemical industry.
- Chemical processes related to water.
- The products and processes of the inorganic chemical industry.
- Synthetic fuels.
- C1 chemical processes.
- The products and processes of the organic chemical industry.
- Polymers
- Agricultural chemicals.

- The fundamentals and products of biotechnology.
- Challenges for sustainable developments.

Reading List

Compulsory Readings

Title	
1	Slides of the lectures

Additional Readings

Title	
1	Benvenuto, M. A. Industrial Chemistry, Walter de Gruyter; Berlin/Boston, 2014.