CHEM8013: POLYMER CHEMISTRY

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Polymer Chemistry

Subject Code
CHEM - Chemistry
Course Number
8013

Academic Unit
Chemistry (CHEM)

College/School
College of Science (SI)

Course Duration
One Semester

Credit Units
3

Level
R8 - Research Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
BCH8013 Polymer Chemistry

Exclusive Courses
Nil

Part II Course Details

Abstract
Polymer chemistry is a multidisciplinary science that deals with the chemical synthesis and chemical/physical properties of polymers. This course of polymer chemistry is a postgraduate taught course tailored for postgraduate students only.

The aim of this course is to:

- Introduce students to core concepts of polymer synthesis and characterization;

- Prepare students to undertake a PhD in the research of polymer science and functional materials;

- Prepare students to take on consulting and/or R&D professionals in industry related to the application of polymers in nanotechnology, renewable energy, information technology and healthcare.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Demonstrate the attitude and ability to discover and describe the fundamental characteristics of synthetic polymers.	20	x	x	
2	Explain the fundamental principles, polymerization and characterization of polymers.	20	x	x	
3	Evaluate the properties of polymeric materials that are related to atomic, molecular, and crystalline structures, molecular weight, phase transition and morphologies.	20		x	
4	Analyze the critical role of polymer application in nanotechnology, renewable energy, information technology and healthcare.	20	x	x	
5	Manipulate the polymer structure, processing and properties in materials engineering designs; discover examples encountered in our daily lives that involve the applications of polymers.	20	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	Group activities	Students will learn through large group activities exploring problems and applications of polymer chemistry.	1	

2	Lectures, videos and web-based teaching methods	Students will develop experience in recognizing and explaining polymer synthesis, processing, characterization and application through lectures, videos and web-based teaching methods.	2	
3	Group activities	Teaching and learning will be in the form of large and small group activities; students will develop an understanding on the structural and functional properties of polymers.	3	
4	Group critical evaluation tasks	In large and small group critical evaluation tasks students will discuss and rationalise the various factors affecting application landscape of polymers.	4	
5	Group activities	In large and small group activities, students will discuss and examine the critical role of polymer application in nanotechnology, renewable energy, information technology and healthcare.	5	
6	Literature search and presentation	Students, in small groups, will take part in the literature search on identification of their daily life encounters related polymer chemistry. They will then present, evaluate and discuss their findings in the light of modern day living in the form of written reports and oral presentations.	5	

Additional Information for LTAs

Seminar: 39 hours

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Short Quizzes and Tutorial Questions	1, 2, 3, 4, 5	10	-	Yes

2	Assignments	1, 2, 3, 4, 5	10	-	Yes
3	Tests	1, 2, 3, 4, 5	10	-	Yes
4	Written Reports and Group Presentations	5	10	-	Yes
5	AT3. Final Examination The purpose of the examination is to assess students' overall competence level in the domain areas.	1, 2, 3, 4, 5	0	-	No

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

3

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

40

Assessment Rubrics (AR)

Assessment Task

Short Quizzes and Tutorial Questions (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

ABILITY to develop a fundamental understanding on the concepts of polymer chemistry, and good comprehension of polymer processing, polymer engineering, and polymer physics

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task
Assignments (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
ABILITY to analyse and solve problems relevant to polymer chemistry

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Tests (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
ABILITY to describe and explain the aforementioned concepts to solve problems

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Written Reports and Group Presentations (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
ABILITY to conduct literature search and give written and oral presentations on different topics on polymer chemistry at the advanced level

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Short Quizzes and Tutorial Questions (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
ABILITY to develop a fundamental understanding on the concepts of polymer chemistry, and good comprehension of polymer processing, polymer engineering, and polymer physics

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
ABILITY to analyse and solve problems relevant to polymer chemistry

Excellent
(A+, A, A-) High

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Part III Other Information

Keyword Syllabus

Polymer Chemistry, Polymer Synthesis, Polymer Reactions, Solid-State Structures and Properties of Polymers, Functional Polymers, Polymer Processing, Polymers for Advanced Technologies

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Koltzenburg, Sebastian, Maskos, Michael, Nuyken, Oskar, Polymer Chemistry Springer, 2017.
2	Joel R. Fried, Polymer Science and Technology Third Edition, Prentice Hall, 2014.
3	Abe Ravve, Principles of Polymer Chemistry Springer-Verlag New York, 2012.
4	Paul C. Hiemenz, and Timothy P. Lodge, Polymer Chemistry 2nd edition, Taylor & Francis Inc, 2007.
5	J.M.G. Cowie, Valeria Arrighi, Polymers: Chemistry and Physics of Modern Materials, Third Edition, CRC Press, 2007.