CHEM6121: ACADEMIC AND INDUSTRIAL RESEARCH, DEVELOPMENT AND INNOVATION

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Academic and Industrial Research, Development and Innovation

Subject Code
CHEM - Chemistry
Course Number
6121

Academic Unit
Chemistry (CHEM)

College/School
College of Science (SI)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
BCH6121 Academic and Industrial Research, Development and Innovation

Exclusive Courses
Nil

Part II Course Details

Abstract

In this course, students will be introduced to the academic and industrial aspects of scientific research and its role to increase the basic and applied knowledge of mankind as part of the development of a sustainable society. By completing the course students will be able to describe the brief history of knowledge and the different methods of learning, comprehend the role of serendipity in scientific discovery and differentiate between curiosity driven and problem solving research; will learn the key components of designing, performing, monitoring and evaluating experimental protocols; learn the basics of academic research as well as managing research, development and innovation (R&D&I) in industry including corporate strategy, R&D&I frameworks, core competencies and competitor assessment, strategic alliances, and R&D&I strategy development; and finally understand the importance of core values and ethics in scientific research. The course will enable the students to select a book or an article on modern science and understand the underpinning concepts.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Students will be able to describe the brief history of knowledge focusing on science and philosophy.	10	x		x
2	Students will be able to explain the methods and the role of learning in different part of the world.	5	x		
3	Students will be able to analyse the role of serendipity in scientific discoveries and contrast curiosity driven and problem-solving research.	10	x	x	
4	Students will be able to describe how to design, perform, monitor and evaluate chemical experiments.	10	x	x	x
5	Students will be able to explain the methods of management of research, development and innovation in industry, and analyse the role of ethics in scientific research.	65	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 the most important themes in science and philosophy and their role in contemporary theories and practices.	1	

2	Lectures and tutorials	Students will learn the characteristics of various learning methods in different part of the world.	2	
3	Lectures and tutorials	Students will participate in learning and discussing serendipitous scientific discoveries, curiosity driven research and problem-solving investigations.	3	
4	Lectures and tutorials	Students will be engaged in designing, performing, monitoring and evaluating of chemical experiments.	4	
5	Lectures and tutorials	Students will learn the key components of managing research, development and innovation in industry, and the role of ethics in scientific research.	5	
6	Videos	Students will watch the performing and monitoring of chemical experiments.	4	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Students will complete Tutorial Assignments	2, 4, 5	20	-	Yes
2	Students will participate in Group Presentations	3	10	-	Yes
3	Students will write Reports	1	10	Reports are required to be written and created by students themselves.	No

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

40

Assessment Rubrics (AR)

Assessment Task

1. Tutorial Assignments (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to explain the concepts and methods of learning and scientific research in academic, governmental and industrial environments.

Excellent

(A+, A, A-) Excellent abilities to discuss and explain the basic concepts and general approaches of learning and fundamental study in academic, governmental and industrial scenarios precisely and concisely with no errors

Good

(B+, B, B-) Good abilities to discuss and explain the basic concepts and general approaches of learning and fundamental study in academic, governmental and industrial scenarios precisely and concisely with a few errors

Fair

(C+, C, C-) Basic abilities to discuss and explain the basic concepts and general approaches of learning and fundamental study in academic, governmental and industrial scenarios precisely and concisely with some errors

Marginal

(D) Limited abilities to discuss and explain a few basic concepts and general approaches of learning and fundamental study in academic, governmental and industrial scenarios precisely and concisely with some errors

Failure

(F) Fail to discuss and explain the basic concepts and general approaches of learning and fundamental study in academic, governmental and industrial scenarios

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Assessment Task

2. Group Presentations (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to explain and demonstrate serendipitous scientific discoveries, curiosity driven research and problem solving investigations.

Excellent

(A+, A, A-) Excellent abilities to present the serendipitous scientific discoveries clearly, concisely and logically

Good

(B+, B, B-) Good abilities to present the serendipitous scientific discoveries concisely and logically

Fair

(C+, C, C-) Basic abilities to present the serendipitous scientific discoveries concisely

Marginal

(D) Limited abilities to present the serendipitous scientific discoveries

Failure

(F) Fail to present the serendipitous scientific discoveries

Assessment Task

3. Reports (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

· Capacity for self-directed learning to understand the basics of important themes in science and philosophy and their role in contemporary theories and practices.
· Ability to explain the role of science and philosophy in contemporary theories and practices.

Excellent

(A+, A, A-) Excellent abilities to write the report on the selected topic and make discussions clearly, concisely and logically

Good

(B+, B, B-) Good abilities to write the report on the selected topic and make discussions concisely and logically

Fair

(C+, C, C-) Basic abilities to write the report on the selected topic and make discussions concisely

Marginal

(D) Limited abilities to write the report on the selected topic and make discussions

Failure

(F) Fail to write the report on the selected topic and make discussions

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Assessment Task

4. Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to answer questions in details concerning the brief history of knowledge, the different methods of learning, comprehend the role of serendipity in scientific discovery and differentiate between curiosity driven and problem solving research, the key components of designing, performing, monitoring and evaluating experimental protocols, the basics of managing research, development and innovation in industry, and the ethics in scientific research.

Excellent

(A+, A, A-) Excellent abilities to correctly answer almost all the examination questions precisely and concisely with no errors

Good

(B+, B, B-) Good abilities to correctly answer a substantial number of the examination questions precisely and concisely with no errors

Fair

(C+, C, C-) Basic abilities to correctly answer most of the examination questions precisely and concisely with only a few errors

Marginal

(D) Limited abilities to correctly answer a few examination questions with some errors

Failure

(F) Fail to answer the examination questions

Part III Other Information

Keyword Syllabus

History
Science
Philosophy

Reading List

Compulsory Readings

	Title
1	Lecture slides

Additional Readings

	Title
1	Scaruffi P. A Brief History of Knowledge, Createspace (2004)
2	Brown, P. C.; Roediger III, H. L.; McDaniel, M. A. Make It Stick: The Science of Successful Learning, Harvard University Press, Cambridge, MA (2014)
3	Roberts, R. M. Serendipity: Accidental Discoveries in Science, Wiley, New York (1989)