Course Specification

(Postgraduate Programs)

Course Title:	**Research Methods in Chemistry**
Course Code:	**CHM 6190**
Program:	**Master of science in chemistry**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	*Course Specification Version Number*
Last Revision Date:	*Pick Revision Date.*

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: 2 (2 Lectures, 0 Lab, 0 Tutorials)				
2. Course type				
A.	☐University	☐College	☐Department	☐Track
B.	☒ Required		☐ Elective	
3. Level/year at which this course is offered: Level 2/Year 1				

4. Course General Description:

This course is designed to develop and improve the capability of graduate students to carry out search and interpret as well summarize the literature survey relevant for research topics. Students will practice through a series of exercises in a proposal of a simple project, logic thinking in building up methodology and justify the applied techniques, and finally writing a report. A presentation of the proposed project will improve students understanding of how scientific questions are developed and posed through proposals and dissemination of research results.

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

None

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

CHM 6111, CHM 6121, CHM 6131, CHM 6141

7. Course Main Objective(s):

- Understand the scientific research, and its methods.
- Recognize various designs and methodologies of scientific research.
- Provide suggestions for treatment of research challenges in a scientific way.
- Make bibliography about the current state of the art of specific scientific subjects
- Read, comment and summarize scientific papers
- Make a critical assessment of scientific work conducted by others.
- Select suitable literature databases for a given topic.
- Offer scientific oral presentation and writing scientific article or report.

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	100 %

No	Mode of Instruction	Contact Hours	Percentage
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**30**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)……**	**0**
	Total	30

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**			
1.1	**To state Ethics in Chemistry.**	**Inorganic Chemistry Track: K1. Inorg.; K2. Inorg.** **Organic Chemistry Track: K1. Org.; K2. Org.** **Analytical Chemistry Track: K1. Anal.; K2. Anal.** **Physical Chemistry Track: K1. Phy.; K2. Phy.**	• Two hours/week lectures. • Students are encouraged to make regular visits during office hours where they can ask any question about the course.	• Regular Exams. • Assignments • Short Quizzes • Oral Discussion • Participation .

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			• Self-study •	
1.2	**To outline the appropriate methods and routes in formulating a research problem or topic.**	**Inorganic Chemistry Track: K1. Inorg.; K2. Inorg. K3. Inorg.; K4. Inorg.;** **Organic Chemistry Track: K1. Org.; K2. Org.; K3. Org.; K4. Org.;** **Analytical Chemistry Track: K1. Anal.; K2. Anal.; K3. Anal.; K4. Anal.** **Physical Chemistry Track: K1. Phy.; K2. Phy.; K3. Phy.; K4 Phy.**	• 2 hours are weekly containing guidance to gather and formulate the research problem. • Think and talk to conceptualize the research design with optimization. • Open discussion. •	• Oral Discussion • Participation. • Written mini-reports for evaluation. •
1.3	**To list in-depth the chemical literatures survey analysis with comparing the scientific approach**	**Inorganic Chemistry Track: K3. Inorg.; K4. Inorg.** **Organic Chemistry Track: K3. Org.; K4. Org.** **Analytical Chemistry Track: K3. Anal.; K4. Anal.;** **Physical Chemistry Track: K3. Phy.; K4. Phy.**	• Evaluate and discuss on chemical literatures survey analysis. • Group discussion •	• Oral Discussion • Participation. • Mini-reports for evaluation
1.4	**To recognize a critical assessment of scientific work conducted by others.**	**Inorganic Chemistry Track: K3. Inorg.; K4. Inorg.** **Organic Chemistry Track: K3. Org.; K4. Org.** **Analytical Chemistry Track: K3. Anal.; K4. Anal.**	• 2 hours /week lectures. • Group Discussion on critical assessment of scientific work	• Oral Discussion • Participation. • Mini-reports for evaluation

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
		Physical Chemistry Track: K3. Phy.; K4. Phy.	conducted by others using available references (SDL) online.	
2.0	**Skills**			
2.1	**To develop experience in searching and assessing current literature.**	**Inorganic Chemistry Track: S1. Inorg.; S4. Inorg.** **Organic Chemistry Track: S1. Org.; S4. Org.** **Analytical Chemistry Track: S1. Anal.; S4. Anal.** **Physical Chemistry Track: S1. Phy.; S4. Phy.**	• Two hours/week lectures. • Students are encouraged to make regular visits during office hours where they can ask any question about the course. • Self-study •	• Regular Exams. • Assignments • Short Quizzes • Oral Discussion • Participation .
2.2	**To summarize the literature survey the applied methods and techniques used**	**Inorganic Chemistry Track: S1. Inorg. ; S2. Inorg.; S4. Inorg.** **Organic Chemistry Track: S1. Org. ; S2. Org.; S4. Org.** **Analytical Chemistry Track: S1. Anal.; S2. Anal.; S4. Anal.** **Physical Chemistry Track: S1. Phy.; S2. Phy. S4. Phy.;**	• 2 hours are weekly containing guidance to gather and formulate the research problem. • Think and talk to conceptualize the research design with optimization. • Open discussion. •	• Oral Discussion • Participation . • Written mini-reports for evaluation. •
2.3	**To analyze and contrast the literature survey with instructor guidance.**	**Inorganic Chemistry Track:** **S1. Inorg.; S2. Inorg.**	• Evaluate and discuss on chemical literatures	• Oral Discussion • Participation .

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			survey analysis. • Group discussion •	• Mini-reports for evaluation
		Organic Chemistry Track: S1. Org.; S2. Org.		
		Analytical Chemistry Track: S1. Anal.; S2. Anal.		
		Physical Chemistry Track: S1. Phy.; S2. Phy.		
2.4	**To demonstrate Oral Communication on selected problem, accompanying writing of mini- Reports, operating electronic mail, and Network in communicating with others.**	**Inorganic Chemistry Track: S1. Inorg.; S3. Inorg.; S4. Inorg.**	• 2 hours /week lectures. Group Discussion on critical assessment of scientific work conducted by others using available references (SDL) online.	• Oral Discussion • Participation . Mini-reports for evaluation
		Organic Chemistry Track: S1. Org.; S3. Org.; S4. Org.		
		Analytical Chemistry Track: S1. Anal.; S3. Anal.; S4. Anal.		
		Physical Chemistry Track: S1. Phy.; S3. Phy. S4. Phy.		
3.0	To develop experience in searching and assessing current literature.			
3.1	**To perform a scientific presentation, research, and work**	**Inorganic Chemistry Track: V1. Inorg.; V2. Inorg.**	• Brainstorming	• Continuous evaluation via Oral

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	independently and integrate with a collaborated group, Using IT to acquire, analyze, and communicate information.	**Organic Chemistry Track: V1. Org.; V2. Org.** **Analytical Chemistry Track: V1. Anal.; V2. Anal.** **Physical Chemistry Track: V1. Phy.; V2. Phy.**	• Group Discussion.	Presentation with marks. • Written report.
3.2	**To appraise effectively the collaboration and inter-professionalism in class discussions or team works, as well independently.**	**Inorganic Chemistry Track: V1. Inorg.; V2. Inorg.** **Organic Chemistry Track: V1. Org.; V2. Org.** **Analytical Chemistry Track: V1. Anal.; V2. Anal.** **Physical Chemistry Track: V1 Phy.; V2. Phy.**	• Small Group tasks • Open discussion at classroom. • Office hour guiding. • Group Presentation of mini-projects. • Reading IMSIU ethical standards and Scanning any product for plagiarism.	• Continuous evaluation • Written report • Oral discussion • Presentation .

C. Course Content:

No	List of Topics	Contact Hours
1.	**Ethics in Chemistry: Professional discussion of chemistry, Identifying "hot topics" in chemistry research, sharpening the awareness of chemists for ethical, social and legal implications of their professional practice.**	**2**

	IMSIU Ethical Standards rule https://units.imamu.edu.sa/deanships/SR/Documents/%الأخلاقيات العلمية/لائحة-الحماية20.pdf .	
2.	Research: a way of thinking: A way to gather evidence for your practice, Applications of research, Type of research, application perspective, objectives perspective, Paradigms of research.	4
3.	The research process: Deciding what to research, formulating a research problem, Reviewing the literature, Summarizing the literature reviews, constructing hypotheses, conceptualizing a research design, exchanging reading, discussing, and organizing ideas, Steps in conducting research, designing a scientific experiment, experimental optimization, performing, collecting, and organizing data, Draw the conclusions, justify the research objective.	6
4.	Elements of a primary research article, Reference Types, Bibliographies: Select a problem and reviewing the literature, open discussions about obtained chemical literature survey, how to search and how to justify keywords in the search library database and develop effective techniques.	4
5	Analyze, set a contrast, compare, and review scientific literature: provide the available literature, open discussion how to analyze, how to compare the scientific approaches to solve the problem, how to review the chemical literature to build up your approach	4
6	Group Discussion of a research proposal, applied methodology to build up experimental part, writing summaries, peer review: Review the literature survey for a selected problem, open discussion about the framework concept to solve the problem, build up experimental part, Guide for critiquing a research article or report, differences between summarizing and critiquing	3
7	Introduction tontific Presentations and how to design an effective and potential presentation, informative outlines: Preparation the scientific presentation, write the clear abstract, organize all obtained information in the Scientific presentation, how to organize the introduction and how to present the concept of the research article, how to use the appropriate scientific details and information in appropriate scientific language. How to organize and present the materials	4
8	Elements of Scientific writing Grant Proposals: What are reviewers looking for? how to choose appropriate literatures relevant for selected research topics; how to attract the reviewers for your proposal; checklist for research proposal.	3
Total		30

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Class Activities (Open Discussion, Mini-reports, Oral Presentation, solving questions)	weekly	30 %
2.	Midterm Exam	9th week	30 %
3.	Final Exam	17 th week	40 %
4.	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	Research Methodolgy: a step-by-step guide for beginners , Kumar, R.; SAGE Publications Ltd-London, 3 rd edition, 2011, ISBN 978-1-84920-300-5 A Short Guide to Writing About Chemistry Davis, H.B.; Tyson, J.F.; Pechenik, J.A. Addison-Wesley, Boston, MA. 2010, ISBN 9780205550609 The ACS Style Guide (2006), (Coghill, A.M., Garson, L.R., Eds.), American Chemical Society, Washington, DC. ISBN 9780841239999 (Available free of charge • Write Like a Chemist, , M.S., Stoller, F.L., Costanza-Robinson, M.S., Jones, J.K , Robinson,., Oxford University Press, Oxford, 2008.ISBN: 9780195305074.
Supportive References	• None
Electronic Materials	IMSIU Ethical Standards rule https://units.imamu.edu.sa/deanships/SR/Documents/الأخلاقيات العلمية/لائحة-الحماية20%.pdf . • Saudi Digital Library. • Available database.
Other Learning Materials	• Blackboard • Multimedia associated with the text book and the relevant websites.

3. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Each of the classroom should be equipped with a whiteboard and a projector, with a maximum of 20 students.
Technology equipment (projector, smart board, software)	• The rooms are equipped with data show, Smart Board, • WI-FI access.
Other equipment (depending on the nature of the specialty)	• None

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct: Questionnaire.
	Course Responsible	Direct: Course e-Portfolio. Indirect: Second examiner checklist-Course report.
	Peer Reviewer	Direct: Questionnaire. Indirect: External assessor report.
Effectiveness of students assessment	Program Leaders	Direct: Course e-Portfolio. Indirect: Course report.
Quality of learning resources	Students	Indirect: Second examiner checklist-Course report.
	Faculty (Academic Advisory-GCC)	Direct: course Entrance/Exit. Indirect: Observations - Accreditation review.
	Program Leaders	Direct: Course e-Portfolio. Indirect: Course evaluation survey- Observations- Syllabus review- Accreditation review.
	Course Responsible	
The extent to which CLOs have been achieved	Course Responsible	Direct: Exams - Course e-Portfolio.

Assessment Areas/Issues	Assessor	Assessment Methods
		Indirect: Second examiner checklist-Course report.
	Program Leaders	Indirect: Exams.
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	Council of Chemistry Department
REFERENCE NO.	10 (No. 2/10)
DATE	21/04/1444- 15/11/2022