Course Specification

(Postgraduate Programs)

Course Title:	**Advanced Analytical Chemistry**
Course Code:	**CHM 6231**
Program:	**Executive Master of Forensic Science**
Department:	**Biology and Chemistry**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**1**
Last Revision Date:	**2 October 2024**

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A. General information about the course:

1. Course Identification:

1. Credit hours:					
3 (3 Lectures, 0 Lab, 0 Tutorial)					
2. Course type					
A.	☐University	☐College	☒ Progam	☐Track	
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (4/2)					
4. Course General Description:					
This course is designed to provide comprehensive topics of sampling and modern sample preparation techniques. The course will cover the classical methods of analysis (gravimetric methods and volumetric methods). The topics include advanced aspects of Spectroscopic methods of analysis, Electro-chemical methods of analysis, and Chromatographic techniques.					
5. Pre-requirements for this course (if any):					
None					
6. Pre-requirements for this course (if any):					
None					
7. Course Main Objective(s):					
• Recognize the required techniques for a variety of sampling types. • Develop awareness of handling sample preparation in an appropriate way. • Be familiar with volumetric and gravimetric analysis and their application in different fields. • Develop awareness of spectral, electrochemical, and chromatographic methods and choose the appropriate technique.					

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning	0	0%
3	Hybrid • Traditional classroom • E-learning	0	0%
4	Distance learning	0	0%

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

No	Activity	Contact Hours
1.	**Lectures**	**45**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)……**	**0**
	Total	**45**

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**To recall the principles of a wide range of modern analytical methods of sampling types.**	**K1; K3; K4**	▪Three hours/week lectures. ▪Self-study. ▪ Home-exam.	▪ Regular Exams ▪ Assignments ▪ Short Quizzes ▪ Oral Discussion ▪ Participation.
1.2	**To list principles in Analytical Chemistry.**	**K1; K2**	▪Three hours/week lectures. ▪Think, to justify the principles of analytical chemistry, available references (SDL) online. Open discussion.	▪ Oral Discussion marks ▪ Literatures Survey ▪ Mini-seminar. ▪ Participation.
1.3	**To describe the applications of spectral methods in analytical chemistry.**	**K1; K4**	▪ Three hours/week lectures. ▪Group Discussion using available references (SDL) online.	▪ Midterm. ▪ Assignments. ▪ Group Discussions. ▪ Literatures Survey ▪ Mini-seminar. ▪ Participation.
1.4	**To memorize the**	**K1; K4**	▪ Three	▪ Assignments

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	Chromatographic and Electrochemical Methods.		hours/week lectures. ▪Group Discussion Analytical methods for separation using available references online.	▪ Open Discussions. ▪ Literatures Survey ▪ Mini-seminars. Participation.
2.0	**Skills**			
2.1	**To analyze problems and explore strategies for Volumetric and Gravimetric Methods applications.**	**S1 ; S2**	▪ Lectures activity ▪ Self-study. ▪Deep discussions on the Volumetric and Gravimetric Methods applications.	▪ Questions in Lectures. ▪ Short Quizzes and Exams. ▪ Open Discussions. ▪ Participation ▪ Mini - seminar.
2.2	**To interpret the obtained data from different Spectral Methods.**	**S2 ; S3**	▪Practice examples Spectral Methods interpretation. ▪Brainstorming. ▪ Self-study	▪ Questions in Lectures. ▪ Participation ▪ Oral Discussion ▪ Short Quizzes.
2.3	**To choose the appropriate techniques in Electrochemical analytical methods for a specific sample.**	**S2 ; S4**	▪Lectures and Oral Discussions. ▪Brainstorming. ▪ Self-study.	▪Questions in Lectures. ▪Short Quizzes and Exams. ▪Oral Discussion. ▪ Participation.
2.4	**To demonstrate Oral Communication on applying analytical chemistry techniques in the industry and their impact in KSA, accompanying mini-Reports, operating electronic mail, and**	**S1; S4; V1**	▪ Group Discussion and Assignments. ▪ Suggest applying analytical chemistry techniques in the industry and its impact on KSA, which will	▪ Oral Discussion. ▪ Quizzes, and Exams. ▪ Giving marks for Oral Discussion in Lectures. ▪ Marks given for

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	Network in communicating with others.		require reading, writing, and oral presentation. ▪ Encourage students to use electronic mail to submit Home Exams and Assignments.	Assignments.
3.0	**Values, autonomy, and responsibility**			
3.1	**Perform communications to integrity, academic ethical practices to find solutions for scientific and social issues, and a commitment to responsible citizenship and using IT.**	**V1**	▪ Brain Storms Exercises Group Discussion	▪ Oral Discussion. ▪ Group Discussion ▪ Assignments.
3.2	**Appraise effectively in research or professional groups and make decisions, develop knowledge, enhance society's quality, and contribute to its advancement.**	**V1 ; V2**	▪ Small Group tasks ▪ Open discussion at classroom. ▪ Office hour guiding. ▪ Group Presentation of mini-projects	▪ Participation ▪ Homework's ▪ Mini-project(s).

C. Course Content:

No	List of Topics	Contact Hours
1.	**Various sampling techniques of organic and inorganic analytes.**	**6**
2.	**Scientific principles in analytical chemistry**	**9**
3	**Volumetric and Gravimetric Methods:** Principle, Stoichiometric calculations in Volumetric and Gravimetric Analysis and their application	**9**
4	**Spectral Methods:** Recent techniques in spectroscopic methods of analysis, Infrared spectroscopy (Definition - Theory – Infrared	**12**

	instruments), Ultraviolet/Visible spectroscopy (Principle – Instrumentation – Applications), and Atomic spectroscopy (Principle – Instrumentation – Applications).	
	Electrochemical Methods: Simple introduction, Potentiometry, conductometry, coulometry, polarography, amperometry, voltammetry.	**6**
	Chromatographic Methods: Principles, Theory and different types.	**3**
Total		**45**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Activities (Oral Discussion, Mini-projects, Miniseminar, Quizzes, Mid-term, Oral Presentation, Participation, Assignments, Lab. reports)**	**During the semester**	**30 %**
2.	**Midterm Exam**	**8th week**	**30 %**
3.	**Final Exam**	**16th week**	**40 %**
	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	**Fundamentals of analytical chemistry,** Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch. 9th Edition. ISBN-13: 978-0-495-55828-6. **Analytical Chemistry,** Gary D. Christian, Purnendu K. (Sandy) Dasgupta, Kevin A. Schug., 7th Edition. ISBN: 978-0-470-88757-8
Supportive References	None
Electronic Materials	• The Journal of Analytical Chemistry • Saudi Digital Library
Other Learning Materials	• Blackboard • Multimedia associated with the text book and the relevant websites

2. Educational and Research Facilities and Equipment Required:

Items	Resources

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Each classroom should be equipped with a whiteboard and a projector, with a maximum of 20 students.**
Technology equipment (Projector, smart board, software)	**The rooms have a data show, Smart Board, and 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 - **FEGC**)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
	Students	**Indirect:** Second examiner checklist-Course report.
The extent to which CLOs have been achieved	Course Responsible	**Direct:** Exams - Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.

Assessment Areas/Issues	Assessor	Assessment Methods
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	Department of Chemistry Council
REFERENCE NO.	7 (NO. 2/3)
DATE	29/3/1446 - 2/10/2024