Course Specification

(Postgraduate Programs)

Course Title:	**Spectroscopic Methods**
Course Code:	**CHM 6132**
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.*

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A. General information about the course:

1. Course Identification:

1. Credit hours: 3 (3 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 cover aspects of common spectroscopic techniques used in analytical chemistry. It will cover Introduction to Spectrochemical Methods and optimization of analytical processors. It will give an extensive knowledge of Instrumentation and theoretical aspects of Molecular Absorption Spectrometry, and Molecular Fluorescence Spectroscopy. It will extend to Atomic Spectroscopy.

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

Advanced Analytical Chemistry - CHM 6131

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

7. Course Main Objective(s):

- **Optimize spectroscopic method for a particular type of a sample.**
- **Recognize the optimization of analytical processors.**
- **Develop awareness with all analytical spectrometry instruments and techniques.**
- **Interpret the analytical spectrometry results.**

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**45**	**100 %**
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**	**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 memorize the principles of a wide range of Modern Analytical Atomic Spectroscopy Methods of Analysis.**	**K1. Anal.; K2. Anal.; K4. Anal.**	**Five hours/week lectures. Self-study Home-exam.**	**Regular Exams Assignments Short Quizzes Oral Discussion Participation.**
1.2	**To list the Spectrometric Instrumentation, and its application.**	**K2. Anal.; K4. Anal.**	**Five hours/week lectures. Think and justify The Spectrometric Instrumentation, using available references (SDL) online. Open discussion.**	**Oral Discussion marks Literatures Survey Mini-seminar. Participation.**
1.3	**To outline a suitable Analytical Spectroscopic Method to analyse specific samples.**	**K2. Anal.; K4. Anal.**	**Five hours/week lectures Open Discussion with mini-reports to justify suitable analytical spectroscopic method using available references (SDL) online.**	**Midterm. Assignments. Group Discussions. Literatures Survey Mini-seminar. Participation.**
1.4	**To state Applications of Spectroscopic**	**K2. Anal.; K3. Anal.**	**Five hours/week lectures.**	**Assignments Open Discussions.**

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	Methods in Analytical Chemistry.		Group Discussion using available references (SDL)	Literatures Survey Mini-seminar. Participation.
2.0	Skills			
2.1	To analyze data and interpret results for complex samples with different matrix constituents.	S1. Anal.; S2. Anal.; S3. Anal.	Lectures activity Self-study. Think, and discuss analyzing the obtained results for complex samples	Questions in Lectures. Short Quizzes and Exams. Open Discussions. Participation Mini -seminar.
2.2	To explain experimental setup for Spectrometric Instrumentation	S2. Anal.; S3. Anal.	Practice some examples for experimental setup of different instruments. Brainstorming. Self-study.	Questions in Lectures. Participation Oral Discussion Short Quizzes.
2.3	To justify the selection of proper spectroscopic techniques to analyze various samples	S1. Anal.; S2. Anal.; S3. Anal.	Lectures Oral Discussions. Brainstorming. Self-study	Questions in Lectures. Short Quizzes and Exams. Oral Discussion. Participation.
2.4	To demonstrate Oral Communication to different isolated results from different Spectroscopic techniques used, accompanying writing of mini-Reports, operating electronic mail, and Network in communicating with others.	S1. Anal.; S4. Anal.	Group Discussion and Assignments Practice on several examples of isolated results from different spectroscopic techniques used to study, which will require reading, writing, and oral presentation in groups. Encourage students to use electronic mail to submit Home Exams and Assignments.	▪ Oral Discussion. ▪ Quizzes, and Exams. ▪ Giving marks for Oral Discussion in Lectures. Marks given for Assignments
3.0	Values, autonomy, and responsibility			

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.1	To perform a scientific presentation, research, and work independently and integrate with a collaborated group, Using IT to acquire, analyze, and communicate information.	V1. Anal.	Brainstorming. Exercises. Group Discussion. Team work.	Oral Discussion. Group Discussion Assignments.
3.2	To appraise effectively the collaboration and inter-professionalism in class discussions or team works, as well as independently.	V1. Anal.; V2. Anal.	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.	**Introduction to Spectrochemical Methods:** Electromagnetic Radiation, Interaction of Electromagnetic Radiation with Matter, Electronic Spectra and Molecular Structure, Infrared Absorption, and Beer's Law.	15
2.	**Spectrometric Instrumentation:** Sources, Monochromators, Sample cells, Detectors, Types of Instruments (Single beam spectrometer, and Double beam spectrometers), and Fourier Transform Infrared Spectrometers	7
3.	**Molecular Absorption Spectrometry:** Absorption by Organic Compounds, Absorption by Inorganic Species, Charge-Transfer Absorption, Ultraviolet and Visible Molecular Absorption Spectroscopy, Infrared Absorption Spectroscopy.	13
4.	**Molecular Fluorescence Spectroscopy:** Principles, Relationship between concentration and fluorescence intensity, Fluorescence Instrumentation and Molecular Phosphorescence Spectroscopy.	13
5.	**Atomic Spectroscopy:** Principles, Atomic Absorption Spectrometry, and Atomic Emission Spectrometry: The Induction Coupled Plasma (ICP).	7
6.		
7.		
8.		
Total		45

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 Exams	9th and week	30 %
3.	Final Exam	Around 12th–17th 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	***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	• Spectrochimica Acta - Part B: Atomic Spectroscopy • Journal of Analytical Atomic Spectrometry • Spectroscopy Letters • 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
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.
	Course Responsible	**Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	Course Responsible	**Direct:** Exams - Course e-Portfolio. **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