هيئة تقويم التعليم
Education Evaluation Commission
المركز الوطني للتقويم والاعتماد الأكاديمي
National Center for Academic Accreditation and Evaluation

T6. COURSE SPECIFICATIONS (CS)

Course code:	CHEM 256
Course title:	Spectroscopic Analytical Methods
Date:	04/05/1440 H - 10/01/2019 G

Course Specifications

Institution: King Saud University	**Date:** 04/05/1440 H - 10/01/2019 G
College/Department: College of Science / Department of Chemistry	

A. Course Identification and General Information

1. Course title and code
Spectroscopic Analytical Methods (256 CHEM)

2. Credit hours
3 (2+0+2)

3. Program(s) in which the course is offered
(If general elective available in many programs indicate this rather than list programs)
B.Sc. in Chemistry

4. Name of faculty member responsible for the course
Dr. Ahmad Aqel Ifseisi

5. Level/year at which this course is offered
Fourth level, 2nd year

6. Pre-requisites for this course (if any)
250 CHEM Volumetric and Gravimetric Analysis

7. Co-requisites for this course (if any)
No requests

8. Location if not on main campus
Main campus, Chemistry Department

9. Mode of Instruction (mark all that apply)

a. traditional classroom	√	What percentage?	50%
b. blended (traditional and online)	√	What percentage?	20%
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other (laboratory)	√	What percentage?	30%

Comments:

B. Objectives

1. What is the main purpose for this course? To enable the students to have a good knowledge of various molecular and atomic spectrometric methods of analysis and to train them to operate various instruments in this field.
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field) This course is a basic (fundamental) course so it is not likely to be noticeably changes from year to year. However any new developments on the web or any other reference sources will be taking into consideration.

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: This course describes the main principles of atomic and molecular spectrometric methods of analysis (i.e. absorption and emission methods of analysis).

1. Topics to be Covered

List of Topics (Lectures)	No. of Weeks	Contact hours
Introduction to electromagnetic radiation (EMR)	1	2
The interaction of EMR with matter	1	2
General spectrophotometric instrumentation	1	2
UV-Visible molecular absorption spectrophotometry	2	4
Molecular luminescence i.e. fluorescence, phosphorescence and chemiluminescence	1	2
Scattering methods	½	1
Flame atomic emission spectrometry	1	2
ICP – AES	1	2
Arc – Spark atomic emission spectrometry	1	2
Atomic Absorption Spectrophotometry (AAS)	2	4
Atomic Fluorescence Spectrophotometry (AFA)	1	2
Mass Spectrometry	2	4
Automation in spectrometric analysis (flow-injection analysis)	1/2	1
Total	**15**	**30**

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory or Studio	Practical	Other	Total
Contact Hours	30		28			58
Credit	2		1			3

3. Additional private study/learning hours expected for students per week.	3h

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column.
First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain).

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Describe the idea, the importance and the principles of each spectrometric method (see list of topics).	-Set objectives for each topic. -Incorporate visuals, images and graphs to reinforce concepts. -Cues to help students understand fundamental issues. -Allow students to engage in conversations while I elaborate and clarify their contributions to discussions. -Summarizing each topic. -Laboratory experiments	-Homework assignments. -Mid-term, end-term and final exams. -Discussions during lectures. -Project. -Quizzes. -Lab performance and reports.
1.2	Describe the instrumentations of each spectroscopic method.		
1.3	Define and memorize various related concepts such as Beer's law and its limitations, nephelometry and turbidometry.		
1.4	Define the fundamental issues concerning the method.		
1.5	List types of chromophores and auxochromes i.e., which compounds can absorb and which cannot in UV/VIS region and what types of transitions in atoms and in molecules.		
1.6	Describe the interferences that likely to be encountered in the method and the means of eliminating them.		
1.7	Recognize various fields of applications of each spectroscopic method.		
1.8	List the advantages and disadvantages of each spectroscopic method.		
2.0	**Cognitive Skills**		
2.1	Differentiate between various types of electromagnetic radiations and to calculate their	-Solving examples. -Class discussions.	-Homework assignments.

	energies, frequencies and wavelengths particularly in UV/VIS region.	-Using modern methods of teaching with smart boards.	-Mid-term, end-term and final exams. -Lectures. -Discussion. -Project. -Quizzes. -Lab reports.
2.2	Explain the role and the requirements of each component of each instrument and how to operate each.		
2.3	Recognize the absorption and emission and differentiate between atomic spectrum and molecular spectrum.		
2.4	Construct the calibration curve and predict what are and when to use standard addition method and internal standard method.		
2.5	Differentiate between fluorescence, phosphorescence and chemiluminescence.		
2.6	Compare between atomization and excitation means i.e., flame, electrothermal and radiation in AAS, AFS, FAES, ICP- AES and spark - arc emission.		
2.7	Evaluate the interferences in each method and justify how to eliminate them.		
2.8	Summarize the main application fields of each spectroscopic method.		
2.9	Recognize the principles and instrumentations of mass spectrometry.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Work as a part of a team during Lab session.	Safety instructions.	Lab reports and performance.
3.2	Use standard laboratory equipment to carry out experiments and handle chemicals with safety.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use of computer and internet to search for required information.	-Encourage students to contact other fellow students and discuss points of general interest. -Encourage students to collect information through university provided Wi-Fi.	-Observation. -Demonstration. -Quizzes. -Lab performance and reports.
4.2	Use computer programs to statistically evaluate the results of analysis.		
5.0	**Psychomotor**		
5.1	Demonstrate safe handling of laboratory chemicals and glass ware during experiments.	Perform laboratory experiments in groups	Laboratory reports and practical exams

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Midterm exam	7–8	15%
2	Discussion and assessment	During lectures	5%
3	Lab reports and performance	2–14	30%
4	Project – Presentation	End term	10%
5	Final Exam	16–17	40%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week) - Office hours: 6 h/week

E. Learning Resources

1. List Required Textbooks -Douglas A. Skoog, F. James Holler, Stanley R. Crouch, Principles of Instrumental Analysis, 7th ed., 2018, Cengage Learning, USA. -الكيمياء التحليلية – التحليل الآلي: تأليف الدكتور ابراهيم زامل الزامل؛ الناشر دار الخريجي للنشر والتوزيع، الطبعة الخامسة؛ الرياض 2015.
2. List Essential References Materials (Journals, Reports, etc.) 1- Analytical Chemistry journal. 2- Analytica Chimica Acta journal. 3- The Analyst journal. 4- Spectrochimica Acta - Part B: Atomic Spectroscopy journal. 5- Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy journal. 6- Journal of Analytical Atomic Spectrometry journal.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. -https://plus.google.com/+ProfIbrahimZamilALZamillojo#+ProfIbrahimZamilALZamillojo/posts -https://www.youtube.com/channel/UCTT9iAzSzzc-NVMwCwShFpg -https://plus.google.com/u/0/+ProfIbrahimZamilALZamillojo#+ProfIbrahimZamilALZamillojo/posts
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Non

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Medium size classroom for 30 students equipped with smart board and internet connection through the university network. Laboratories should be supplied with basic chemicals, glass ware, and basic equipment. Body protection safety accessories should be available to all students.
2. Technology resources (AV, data show, Smart Board, software, etc.) -Smart board and internet access in the lecture room. -E-podium & data show available in all lecture rooms.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) -The presence of chemicals and standards used in analytical experiments -The presence of related analytical equipment and instruments such AAS, FAES, ICP – AES, ICP, MS, UV/VIS Molecular absorption spectrophotometer and accessories, pH meter, analytical balance, …etc.

G. Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching Course evaluation by students through Student - actually meetings and Student questionnaires.
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department Revision by the analytical chemistry regular committee meetings.
3. Processes for Improvement of Teaching -Attending workshops and conferences given by experts on the teaching and learning methodologies -Attending workshops given by experts on the teaching and learning methodologies. -Applying modern technology methods in teaching such as learning management system.
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) Checking a sample of the student's work, exams and assignments by other staff member in the Department.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement -The course material and learning outcomes are periodically reviewed and the changes needed are approved during department council meetings. -The head of department and faculty take the responsibility of implementing the proposed changes.

Name of Instructor: Dr. Ahmad Aqel

Signature:

Date Report Completed: 04/05/1440 H - 10/01/2019 G

Name of Field Experience Teaching Staff: Analytical Chemistry

Program Coordinator: Prof. Abdullah Alqahtani

Signature:

Date Received: 04/05/1440 H - 10/01/2019 G