Kingdom of Saudi Arabia

The National Commission for

Academic Accreditation & Assessment

Course Specifications

Spectrophotometric and Electrochemical Techniques

402311-3

Institution: **Umm Al-qura University**	Date of Report: **2017**
College/Department : **Faculty of Applied Science/ department of chemistry**	

A. Course Identification and General Information

1. Course title and code: **Spectrophotometric and Electrochemical Techniques / 402311-3**			
2. Credit hours: **3 (2+1)**			
3. Program(s) in which the course is offered. **Chemistry program**			
4. Name of faculty member responsible for the course: **Dr. Amr Lotfy Saber**			
5. Level/year at which this course is offered: **5th level/3rd year**			
6. Pre-requisites for this course (if any):**Volumetric analysis/402112**			
7. Co-requisites for this course (if any)---			
8. Location if not on main campus: **both on El-Abedyah, and El-Zaher**			
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	■	What percentage?	**30%**

Comments:

B Objectives

1. What is the main purpose for this course? **By the end of this course the student** **1- Have all information about the instrumental analysis** **2- Able to determine the trace amounts of different compounds and metals.** **3- Familiar with spectrophotometric and electroanalytical methods**
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) **The students will be mentioned to prepare an essay or a report from literature using the library, data base services, and/or websites to follow up and update the new topics of the subject of the course**

C. Course Description (Note: General description in the form to be used for the Bulletin or handbook should be attached)

1. Topics to be Covered

List of Topics	No. of Weeks	Contact Hours
a. Principles and applications of spectrophotometric and colormetric analysis	1	2
b. Electromagnetic spectrum and its interaction with matter	1	2
c. Absorption and emission of light by atoms and molecules-types of analysis and devices	1	2
d. Spectrophotometric measurements theory and Beer's law deviation	1	2
e. Spectrophotometric instrumentation – spectra measurements using UV-vis and IR f. Beer's law applications	1	2
g. Turbidity analysis and flame photometry (devices-principles-applications)	1	2
h. Atomic absorption by electrothermal oven- X ray analysis – Applications	1	2
i. Atomic emission spectroscopy and the interference study	1	2
j. Inductively coupled plasma (ICP)– principles and applications	1	2
k. Electrochemical methods in quantitative analysis – Introduction to the principles l. Potentiometric methods and Potentiometric titrations	1	2
m. Electrogravimetric analysis-columetry	1	2
n. Voltammetry and polarography techniques,Conductmetric methods and their titrations	1	2

Practical Part:

- Determine copper in copper sulphate solution using spectrophotometric methods
- Determine iron in its salt solution using spectrophotometric methods
- Study reduction oxidation reactions by spectrophotometric methods
- Analysis of $KMnO_4$ and $K_2Cr_2O_7$ in mixture using UV-Vis. spectrophotometer
- Determination of copper using potentiometric titration

- Potentiometric methods for EDTA titrations
- Determination of ascorbic acid in fruit juice using Polarographic method
- Determination of amino acids in their solutions
- Polarographic study for zinc ion reduction in its solution
- Determination of some drugs using ion selective electrode method
- Revision
- Exam

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory	Practical	Other:	Total
Contact Hours	24	-	36	-	-	60
Credit	2	-	1	-	-	3

3. Additional private study/learning hours expected for students per week. 2 h

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

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Describe the principles and applications of spectrophotometric and colormetric analysis	• Lectures • Scientific discussion • Library visits • Web-based study	• Exams • web-based student performance systems • portfolios • long and short essays • posters lab manuals
1.2	Identify electromagnetic spectrum and its interaction with matter		
1.3	Define absorption and emission of light by atoms and molecules-types of analysis and devices		
1.4	Recognize spectrophotometric measurements theory and Beer's law deviation		
1.5	Familiar with spectrophotometric instrumentation – spectra measurements using UV-vis and IR		
1.6	Name atomic absorption by electrothermal oven- X ray analysis – Applications		
1.7	Write about atomic emission spectroscopy and the interference study		
1.8	Determine the electrochemical methods in quantitative analysis		
1.9	Recognize the potentiometric methods and Potentiometric titrations		
1.10	Memorize voltammetry and polarography techniques		
1.11	Outline conductmetric methods and their titrations		
2.0	**Cognitive Skills**		

2.1	Analyze electromagnetic spectrum and its interaction with matter	• Lectures • Scientific discussion • Library visits • Web-based study	• Exams • web-based student performance systems • portfolios • posters • demonstrations
2.2	Summarize the principles and applications of spectrophotometric and colormetric analysis		
2.3	Explain the turbidity analysis and flame photometry		
2.4	Apply Beer's law in many analytical applications		
2.5	Predict the inductively coupled plasma (ICP)– principles and applications		
2.6	Compare between voltammetry and polarography techniques		
2.7	Account for conductmetric methods and their titrations		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Use absorption and emission of light by atoms and molecules to determine the concentration	• Lectures • Scientific discussion • Web-based study	• Exams • web-based student performance systems
3.2	Show spectrophotometric measurements theory and Beer's law deviation		
4.0	**Communication, Information Technology, Numerical**		
4.1	Evaluate atomic absorption by electrothermal oven- X ray analysis – Applications	• Lectures • Scientific discussion • Library visits • Web-based study	• web-based student performance systems • individual and group presentations
4.2	Demonstrate potentiometric methods and Potentiometric titrations		
5.0	**Psychomotor**		
5.1	NOT APPLICABLE		
5.2			

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	Exam	5-14	20%
2	Assignments		10%
3	Practical Exam	15	30%
4	Final Exam	16	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) • **We havefaculty membersto providecounseling andadvice.** • **Office hours: During the working hoursweekly.** • **Academic Advisingforstudents.**

E. Learning Resources

1. List Required Textbooks • K. Danzer, *Analytical Chemistry, Theoretical and Metrological Fundamentals*, Springer(2014)
2. List Essential References Materials (Journals, Reports, etc.) • Lecture Hand outs available on the coordinator website
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) • Gary D. Christian, Purnendu K. Dasgupta and Kevin A. Schug, *Analytical Chemistry*, 7th edition, WILEY (2014) • Douglas A. Skoog, Donald M. West, James F. Holler and Stanley R. Crouch, *Analytical Chemistry*, 7th edition, Springer (2014)
4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.) • **http://www.chemweb.com** • **http://www.sciencedirect.com** • **http://www.rsc.org**
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

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.) • **Classroomscapacity(30) students.** • **Providinghallof teaching aids includingcomputers andprojector.**

2. Computing resources (AV, data show, Smart Board, software, etc.) ▪ **Roomequippedwithcomputer andprojectorandTV.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) • **Noother requirements.**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Complete thequestionnaireevaluation of the coursein particular.
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor • **Observationsandthe assistance ofcolleagues.** • **Independent evaluation forextent toachieve students the standards.** • **Iindependent adviceofthe dutiesandtasks.**
3 Processes for Improvement of Teaching • **Workshopsforteaching methods.** • **Continuous trainingof member staff.** • **Review of strategies proposed.** • **Providing new tools for learning.** • **The application ofe-learning.** • **Eexchangeof experiencesinternal andexternal.**
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) ▪ **Check markingof a sampleofexam papers, orstudent work.** ▪ **Exchange corrected sample of assignments or exam basis with another staff member for the same course in other faculty.**

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • **Periodic Reviewof thecontents ofthe syllabusandmodify thenegatives.** • **Consultotherstaff ofthe course.** • **Hostinga visiting staffto evaluate of thecourse.** • **Workshopsfor teachers ofthe course.**

Faculty or Teaching Staff: **Dr.AmrLotfy Saber**

Signature: **Date Report Completed: 2017**

Received by: Dr HatemAltass **Department Head**

Signature: _____ **Date: _____**

2016