Jordan University of Science and Technology

Department of Chemistry

Course Syllabus

Spring 2017/2018

Course Information	
Course Number: Chem 233	**Course Name:** Analytical Chemistry
Credit Hours: 3	**Contact Hours:** 3
E-learning web address: www.Just.edu.jo/e-learning	
Prerequisites: Chem 103 or Chem 101 and Chem 102	
Required or Elective or Selected Elective	

Instructor Information	
Coordinator: Yahya R. Tahboub	**Instructor:** Yahya R. Tahboub
Office Hours: Sun. 9:30-10:30, Tue 11:30-13:30, Mon 13:30-14:30, Wed 12:30-13:30	**Office Location:** D3L3- Medicinal buildings
Instructors E-mail: tahboub@just.edu.jo	

Course Catalog

Course Description: (Give a brief description of the course as it appears in the study plan)

This course aims to teach students the basic principles of analytical chemistry. The first part of the course will cover statistical aspects of analytical chemistry including errors and validation of analytical results. The second part will deal with preparation of reagents and standards, equilibrium considerations and analyte matrix interactions. The third part will cover classical methods of analysis including gravimetric methods and volumetric (titrimetric) methods. The course will be frequently illustrated with case studies and practical examples linked to other scientific disciplines, in particular to the fields of environmental, pharmaceutical and forensic sciences.

Textbook: Textbook: (title, author, and year)

Quantitative Chemical Analysis (8th Edition), Authors: Daniel C. Harris
W. H. Freeman Company, New York U.S.A. **2010**.

References and Supplement Materials:

1. Fundamentals of Analytical Chemistry 9th edition, Skoog, West, Crouch & Hollar (2014)
2. Analytical Chemistry 7th edition, Christian, Dagupta & Chung (2017)

Evaluation		
Quizes	10	%
First Exam	25	%
Second Exam	25	%
Final Exam	40	%

Outcomes of instruction: By the end of the course, students should be able to

1- Understand preparation of solutions, expression of analytical results and statistical evaluation of analytical data.
2- Understand equilibrium considerations for analytical reactions including activity and systematic treatment of equilibrium.
3- Understand precipitation equilibrium and its applications on gravimetric and titrimetric methods and aqueous equilibrium and its applications on acid-base titrations including mono and diprotic.
4- Apply classical methods for determination of analytes on real samples including environmental and pharmaceutical.

Topics to be Covered		
Week	**Chapter**	**Topics**
1	0	**Analytical Process** a) The analytical Chemist job b) General steps in a chemical analysis

2	1	**Chemical Measurements** a) SI units b) Preparation of solutions c) Stoichiometric calculations
2	3	**Experimental Error** a) Significant figures b) Types of errors c) Manipulation of uncertainties of results
3	4	**Statistics** a) Gaussian distribution b) Confidence intervals c) Validation of analytical result d) Rejection of a replicate
4	6	**Chemical Equilibria** a) Equilibrium constant b) Precipitation equilibria
4	7	**Activity and Systematic Treatment of Equilibria** a) Ionic strength and activity coefficients b) Systematic treatment of equilibria
5	26	**Gravimetric Analysis and Precipitation Titration** a) Gravimetric analysis

		b) Analytical precipitation c) Precipitation titrations
First Exam		Date and Room will be assigned later
6	8	**Monoprotic Acid-Base Equilibria** a) pH (Chapter 6) b) Strong acids and bases c) Weak acids and bases d) Weak acid equilibria e) Weak base equilibria f) Buffers
7	9	**Polyprotic Acid-Base Equilibria** a) Diprotic acids and bases b) Diprotic buffers c) Polyprotic acids and bases d) Fractional composition equations
8	10	**Acid-Base Titrations** a) Titration of strong base with strong acid b) Titration of weak base with strong acid c) Titation of weak acid with strong base d) Titration of diprotic acid with strong base.
9	10	**Acid-Base Titrations (Continued)** e) Titration of dibasic salt with strong acid. f) Finding end point with indicators g) Applications on acid-base titrations (mixtures, Kjeldal nitrogen analysis)
Second Exam		Date and Room will be assigned later
10	11	**Complexation Titrations with EDTA**

		a) Metal chelate complexes b) EDTA c) EDTA titration curves d) Metal ion indicators e) EDTA titration techniques
11	13	**Fundamentals of Electrochemistry** a) Basic concepts b) Galvanic cells c) Standard potentials d) Nernst equation
12	15	**Redox Titrations** a) The shape of redox titrations b) Finding the end point c) Adjustment of oxidation state
13	15	**Redox Titrations (Contiued)** a) Titrations with permanganate b) Titration s with dichromate c) Iodometric and iodimetric titrations
14	Handouts	**Practical Applications** a) Titration of mixtures of acids and bases b) Titration of mixture of halides by silver nitrate c) Titration of mixtures of metal ions with EDTA
Final Exam		Date and Room will be assigned later

Relationship of the Course to the Chemistry Program Outcomes:

Program outcomes (a – k)	√	Level (L, M, H)
(a) an ability to apply knowledge of mathematics, science, and applied sciences	√	H
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	√	H
(c) an ability to formulate or design a system, process, or program to meet desired needs	√	M
(d) an ability to function on multidisciplinary teams		
(e) an ability to identify and solve applied science problems	√	M
(f) an understanding of professional and ethical responsibility		
(g) an ability to communicate effectively		
(h) the broad education necessary to understand the impact of solutions in a global and societal context		
(i) a recognition of the need for and an ability to engage in life-long learning	√	H
(j) a knowledge of contemporary issues	√	L
(k) an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice.	√	M