

Petra University		جامعة البترا
Faculty of arts and sciences		كلية الآداب والعلوم
Department of Chemistry		قسم الكيمياء

## Course Syllabus

Year: 2019/2020

Semester: Second

Course No.	Course Title	Prerequisite	Co-requisite	Credit Hours Lectures / ECTS
101345	Electroanalytical method	101241	-	3/5 ECTS: European Credit Transfer System

Instructor Name	e-mail	Office No.	Office ext.	Office Hours
DR. ABDEL MNIM ALTWEIQ	aaltweiq@uop.edu.jo	7214	7214	Sun., Tues., Thurs.: 10 <sup>00</sup> -11 <sup>00</sup> and 13 <sup>00</sup> – 14 <sup>00</sup> (Sun.) Mon., Wed.: 8 <sup>00</sup> - 09 <sup>00</sup>

<b>Course Description</b>	This course will discuss the theory and instrumental techniques that encompass static and dynamic electroanalytical measurements. Topics will include potentiometry, voltammetry, polarography, coulometry, gas sensing probes and electro-gravimetry. Focus will be on analytical applications and utilizing the correct techniques for solving specific analysis problems.
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### Course Objectives

- To provide in-depth theoretical and practical insights into commonly occurring modern electroanalytical techniques, both potentiometric and amperometric.
- To develop the students' ability to independently select and optimize appropriate electroanalytical methods.

### Course Intended Learning Outcomes (ILOs) and their Alignment with Program

#### ILOs:

Upon successful completion of this course, students are expected to achieve the following learning outcomes:

Course ILOs	Program ILOs	Teaching and Learning Method	Assessment Method
<b>Knowledge (K)</b>			
1. Demonstrate knowledge of the main principle, concepts and phenomena of electrochemistry like redox reaction and titration, cell potential, electrochemical cell, salt bridge, electrolysis, corrosion, electrical conductance, polarization, resistance.	<b>K (1)</b>	Lectures and discussion	First, second and final exams
2. Describe the principle, structure, function and application of the different instrument methods, which include potentiometry, voltammetry, coulometry, conductivity gas sensing probes and electrogravimetry.	<b>K (3)</b>		
<b>Intellectual Skills (I)</b>			
1. Estimate chemical data by performing calculations related to Faraday law, Nernst equation, Ohm law, and calculate the concentration by applying the electrochemical methods mentioned above by the calibration and the normal chemical calculations.	<b>I (2)</b>	Lectures and discussion	First, second and final exams
<b>Practical skills (P)</b>			
1. Develop the students' ability to independently select and optimize appropriate electro-analytical methods and to provide a coherent overview of the subject.	<b>P(1)</b>		
<b>Transferable Skills (T)</b>			
achieved through goals mentioned in ILOs	<b>T (1)</b>		

**Course Schedule:**

Week	Topics	Topic Details
1	An introduction to electrochemistry	Reduction, oxidation, redox reaction, applications
2	Electrochemical	Types, electrodes, types of reference electrode

	cells	
3, 4	Electrochemical measurements	Potential, charge, current, Nernst equation, Faraday's Law
5	Conductivity	Background, instrumentation, applications
6-8	Potentiometry	Background, Types, pH-meter, ion selective electrode, instrumentation, applications
9, 10	Coulometry and electrogravimetry	Background, 3 electrodes system, Types, instrumentation, applications
11, 12	Voltammetry	Background, Types, instrumentation, applications
13	Scanning probe techniques	Background, Types, instrumentation, applications
14	Other applications of electrochemistry	Corrosion, electroplating, fuel cell, batteries, solar energy

**Assessment Methods:**

Assessment method	Grade
First exam	30
Second exam	30
Final exam	40
Total	100

**Alignment of Teaching and Learning Methods, Assessment and Course ILOs:**

Teaching method	Contact Hours	Assessed through	ILOs numbers
Lectures and Discussions	3	In-class problems, Exams	K1, K3, I2, P1

### Learning References:

<b>1- Textbook (s):</b>
Electrochemical methods, fundamental and application, 2 <sup>ed</sup> edition, A. J. Brad & L. R. Faulkner, John Wiley & sons, New York, 2000.
<b>2- References:</b>
Principles of Instrumental analysis, 7 <sup>th</sup> Edition, D. A, Skoog, J. Holler & S. R. Crouch, Thomas Brook/Cole, 2014
Laboratory Techniques in Electroanalytical Chemistry, P. T. Kissinger & W. R. Heineman, 2 <sup>nd</sup> edition, Marcel Dekker, New York, 1996.
<b>3- Other Resources:</b>
Course notes, data show facilities and Internet

### Course Policies

- Attendance Policy: University regulations apply to attendance.
- Academic Honesty: Academic dishonesty is an unacceptable mode of conduct, and will not be tolerated in any form at University of Petra. All persons involved in academic dishonesty and plagiarism in any form will be disciplined in accordance with University rules and regulations.

Approved by	Name	Date	Signature
Head of Department	Dr. Abdel mnim Altwaiq	18.2.2020	
Faculty Dean	Prof. Rami Abdel-Rahem	24.2.2020	

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