



**The Hashemite University**  
**Faculty of Science**  
**Course Outline**

<b>Department:</b> Chemistry.	
<b>Year :</b> 2017/2018	<b>Semester :</b> <i>Second Semester</i>

Course Information	
Course Title	<b>ADVANCED ANALYTICAL CHEMISTRY</b>
Course Number	110103711.
Course Credits	3.
Designation	Compulsory.
Course Time	Mon, Wed: 11-12.30.
Instructor	<b><i>Dr. Ayman A. Issa.</i></b>
Office Location	Chem. 208.
Office Hours	Sun, Tue: 11-12.
E-mail	<a href="mailto:aymani@hu.edu.jo">aymani@hu.edu.jo</a>

**Course Description (Catalog):**

This Course deals with advanced instrumental analysis. Topics include emission spectroscopy, atomic spectroscopy and its advanced techniques and instrumentation, plasma techniques, atomic and molecular infrared spectroscopy and their applications, Raman spectroscopy, molecular luminescence techniques and advanced surface characterization techniques are also covered in details. The course includes advances in separation methods like HPLC and GC, as well as other separation techniques.

Text Book and References	
Text Book	Skoog, Holler, and Nieman, Principles of Instrumental Analysis. Saunders College Publishing, 1998, 5 <sup>th</sup> Edition.
Reference(s)	Any library book related to instrumental analysis in general, or dealing with a specified topic in the course contents.

Grading Plan		
Assessment Type	Expected Date	Weight
Mid-term Exam	March 19, 2018	30%
Report*	Submitted before April 12, 2018	20%
Seminar**	April 16 - April 25, 2018	10%
Final Exam	May 5 - 17, 2018	40%

\* Reports include RECENT additions/research in the studied fields OR a detailed description of instrumental methods that were not discussed.

\*\* Start in weeks 13 and 14. They may be started in week 12 (April 9) according to available time.

Teaching and Learning Methods
Lectures, using an LCD projector (data show). Each student will write a report about NEW additions/research in the studied fields OR a detailed description of instrumental methods, and its analytical applications, that were not discussed earlier. Each student will present a full lecture of his report.
All material and references will be available on my web page <a href="http://staff.hu.edu.jo/aymani">http://staff.hu.edu.jo/aymani</a>

**❖ Course Objectives:**

The course aims at studying advanced instrumental methods of analysis, including those concerned with atomic and molecular spectroscopy as well as surface techniques and separation methods.



### Course Contents

Week	Topics	Chapter
1	<b>Atomic Spectroscopy:</b> An introduction to optical atomic spectrometry.	8
2, 3	<b>Atomic Spectroscopy:</b> Atomic emission spectrometry based on plasma sources, and atomic emission spectrometry based upon arc and spark sources. Also, an introduction to atomic mass spectrometry.	10, 11
4, 5	<b>Molecular Spectroscopy:</b> Molecular luminescence spectrometric techniques; fluorescence, phosphorescence, and chemiluminescence.	15
6, 7	<b>Molecular Spectroscopy:</b> An introduction to infrared spectrometry and its applications.	16, 17
8	<b>Molecular Spectroscopy:</b> Raman spectroscopy.	18
9	<b>Mid-Term exam</b>	
10	<b>Surface Characterization:</b> Surface characterization by spectroscopic and microscopic techniques.	21
11, 12	<b>Separation Methods:</b> An introduction to chromatographic separations, gas chromatography, and high-performance liquid chromatography.	26-28
13, 14	Seminars.	

#### ❖ Specific Outcomes of Instruction (Course Learning Outcomes):

After completing this course, the students will be able to:

	Course Learning Outcomes (CLO)	(SO*)
<b>CLO1</b>	Discuss ideas about advanced instrumental methods	a, c, e
<b>CLO2</b>	Discuss atomic and molecular instrumental techniques.	a, b, e, f
<b>CLO3</b>	Learn some advanced instrumentation and their recent applicability in research.	a, b, c, e, f
<b>CLO4</b>	Discuss surface characterization techniques and their recent applications.	a, c, d, e
<b>CLO5</b>	Write a report about an advanced topic in instrumental analysis.	a, b, d, e, f
<b>CLO6</b>	Discuss and evaluate new ideas and topics presented by other colleagues	a, b, c, e

\*(SO) = Student Outcomes Addressed by the Course.

#### ❖ Student Outcomes (SO) Addressed by the Program:

#	Outcomes Description	Contribution
	Chemistry Student Outcomes	
(a)	Recognize and explain the fundamentals of the main areas of chemistry: Analytical, Organic, Inorganic, and Physical.	H
(b)	Explain principles and theories related to chemical structure, reactivity, reaction mechanisms, and properties of matter.	H
(c)	Perform mathematical calculations and data analysis related to chemistry disciplines.	H
(d)	Perform experimental procedures and lab measurements, examine data, and interpret results required to carry out a chemical research.	M
(e)	Relate and value the role of chemistry in industry and daily life.	H
(f)	Handle chemical substances and follow safety procedures and regulations in lab and workplace.	M
H = High, M = Medium, L = Low		

**General Notes: (Attendance Policy)** students are expected to attend every class and arrive on time in compliance with HU regulations. In case you find yourself in a situation that prevents you from attending class, lab, or exam, you have to inform your instructor. If you miss more than 4 classes, you cannot pass the course. Makeup excuses will be accepted only for very limited justified cases, such as illness and emergencies. Missing a quiz or an exam without an acceptable excuse will result in a grade of zero.

*Good Luck!*

*Dr. Ayman Issa*