جامعة الإسراء
ISRA UNIVERSITY

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Instrumental Analysis (1)

Course Number: 11013133

General Course Information:

Course title	**Instrumental Analysis (1)**
Course number	**11013133**
Credit hours	**3**
Education type	**[Online (Synchronous, Asynchronous)], [Hybrid (Face-to-Face, Online (Synchronous, Asynchronous)], OR [Face-to-Face]**
Prerequisites/corequisites	**Analytical Chemistry 11012131**
Academic Program	**Bachelor**
Program code	**01**
Faculty	**Science**
Department	**Chemistry**
Level of course	**Third- year students**
Academic year /semester	**2021/2022- Summer Semester**
Awarded qualification	**Bachelor degree in chemistry**
Other department(s) involved in teaching the course	**N/A**
Language of instruction	**English**
Date of production/revision	**October 5, 2022**

Course Coordinator:

Coordinator's name	**Dr. Abed Abdel Qader**
Office No	**Basement of Engineering Building**
Office Phone extension number	**2607**
Office Hours	**11:00-1:00 Sunday, Tuesday, Thursday.**
Email	**abed.abdelqader@iu.edu.jo**

Other Instructors:

Instructor name	
Office No	
Office Phone extension number	
Office Hours	
Email	

Course Description *(English/Arabic)*:

English	This course is intended to provide basic skills in instrumental analysis. The students in this course are introduced to the different types of calibration methods and figures of merits for the instruments. Also students will learn properties of electromagnetic radiation and its interaction with matter, components of spectroscopic instruments and evaluation or their features, basics of molecular and atomic spectroscopic methods, details of atomic absorption (flame and graphite furnace) and emission spectroscopy (arc, spark and plasma), UV-Vis absorption spectroscopy, Luminescence methods.
Arabic	

Textbook: ***Author(s), Title, Publisher, Edition, Year, Book website.***

1. D.A. Skoog, D.M.West, F.J. Holler, S.R. Crouch, *Principles of Instrumental Analysis*, Brooks Cole, New York, 7th Edition,2017

References: ***Author(s), Title, Publisher, Edition, Year, Book website.***

1. D.C. Harris, *Quantitative Chemical Analysis*, 9th Ed., W.H. Freeman and Co., New York, NY, 2015.

Course Educational Objectives (CEOs):

1.	**To Set up principles and to know the main concepts and requirements of instrumental analysis such as precision, accuracy, signal to noise ratio, limit of detection, sensitivity, selectivity, etc.**
2.	**To introduce and illustrate the main concepts related to different instrumental techniques both qualitative and quantitative instruments.**
3.	**To solve problems related to each type of instruments.**
4.	**To learn about each instrument: components, how does it work, etc.**
5.	**To study the main applications of the modern analytical instruments in different aspects of science in particular identification of chemical and pharmaceutical compounds.**

Intended Learning Outcomes (ILO's):

1.	**Subject Intended learning outcomes (ILOs) describe what students are expected to know and be able to do at the end of the course. These outcomes are related to the knowledge, skill and competence that students acquire:**	**Relationship to CEOs**	**Contribution to PLOs**	**Bloom Taxonomy Levels***	**Descriptors****
2. A	**Knowledge and Understanding:**				
3. A1	**Calculate the figures of merits from the results of analysis. These calculations include: precision, accuracy, detection limit, calibration sensitivity, analytical sensitivity, and selectivity.**	**1**	**1**	**4**	**K**
4. A2	**Define the electromagnetic radiation and determine the six phenomena of interaction of electromagnetic radiation with matter. These are namely, absorption, emission, fluorescence, phosphorescence, scattering and chemiluminescence.**	**2**	**1,3**	**1**	**K**
5. A3	**Students will develop an understanding of the function of basic components of chemical instrumentation.**	**2,3**	**4**	**3**	**S**

6. B	**Intellectual skills:**				
7. B1	**Define different scientific terms related to instrumental analysis, and describe it.**	**3**	**3,4**	**3**	**K**
8.					
9. C	**Subject specific skills:**				
10. C1					
11. D	**Transferable skills:**				
12. D1					

***Bloom Taxonomy Levels**

Level #	**1**	**2**	**3**	**4**	**5**	**6**
Level Name	**Knowledge**	**Comprehension**	**Application**	**Analysis**	**Evaluation**	**Synthesis**

**** Descriptor (National Qualification Framework Descriptors): K : Knowledge, S: Skill, C: Competency.**

Program Learning Outcome (PLOs):

Program Learning Outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviours that students acquire as they progress through the program. A graduate of the (_____) program will demonstrate:	**Descriptors****		
	K	**S**	**C**

1.	Describe the fundamental scientific principles and theories across the four subfields of chemistry (Organic, inorganic, analytical and physical).	**K**		
2.	Identify and confirm chemical compounds structures as well as determine chemical composition.	**K**		
3.	Establish and concludes mechanisms of physical and chemical processes in addition to the ability of mastering qualitative and quantitative determination.			**C**
4.	Solve the scientific problems using different mechanisms and procedures based on critical thinking.		**S**	
5.	Conduct scientific experiments in chemistry.			**C**
6.	Commitment and interest in lifelong learning, and collaborate effectively with other people in a team.			**C**
7.	Prepare logical, organized and concise written reports, and oral and poster presentations that effectively communicate chemical content to other scientists.		**S**	
8.	Commitment to the ethical principles of chemical research.			**C**
9.	Find information about chemistry through databases and information		**S**	
10.	Evaluation of calculations in chemistry experiments and information analysis using computer software.			**C**
11.	Demonstrate safety laboratory techniques.		**S**	

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule *(please choose the type of teaching)*

✓ **Face to Face**

☐ **Hybrid** ***(2 Lectures*** *Face – To - Face* ***+1 Lecture*** *Asynchronous)*

☐ **Hybrid (*1 Lectures*** *Face – To - Face* ***+1 Lecture*** *Asynchronous)*

☐ **Online** ***(2 Lectures*** *Synchronous* ***+1 lecture Asynchronous****)*

Week	First Lecture (*Face to Face*)	Second Lecture (*Face to Face*)	Third Lecture (*Face to Face*)	Ach. ILOs	Ach. PLOs	Descriptors**
1	Introduction	Introduction	Types of Instrumental Methods	A1	1,3	K
2	Types of Instrumental Methods	**Figures of Merits**	Calibration Methods	A1	1,3	K
3	Calibration Methods	Calibration Methods	Example	A1	1,3	K
4	General Properties of Electromagnetic Radiation	General Properties of Electromagnetic Radiation	Wave Properties of Electromagnetic Radiation	A2,A3	1,3,5	K
5	Wave Properties of Electromagnetic Radiation	Quantum Mechanical Properties of Radiation	Quantum Mechanical Properties of Radiation	A2,A3	1,3,5	K
6	Quantitative Aspects of Spectrochemical Measurement	**Quantitative Aspects of**	Example	A2,A3	1,3,5	K

		Spectrochemical Measurement				
7	General Designs of Optical Instruments Sources of Radiation	Wavelength Selectors	Radiation Transducers Types of Optical Instruments	A3	5	S
8	Optical Atomic Spectra	Atomization Methods	Sample Introduction Methods	A3,B1	1,5	S
9	Sample Atomization Techniques	Sample Atomization Techniques	Atomic Absorption Instrumentation	B1	1	S
10	Atomic Absorption Instrumentation	Interference in Atomic Absorption Spectroscopy	Atomic Absorption Analytical Techniques	B1	1	S
11	Measurement of Transmittance and Absorbance	Measurement of Transmittance and Absorbance	Beer's Law	A3	2	K
12	Beer's Law	Limitations to Beer's Law **Instrumentation**	Limitations to Beer's Law Instrumentation	A3	2	K
13	Absorbing Species	Absorbing Species	Application of Absorption Measurement to Qualitative Analysis	A3	2	S
14	Quantitative Analysis by Absorption Measurements	**Quantitative Analysis by Absorption Measurements**	Example	A3	2	C
15	Final Exam					

* **K: Knowledge, S: Skills, C: Competency**

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- **Interactive videos**
- **Practice Labs**
- **Discussion Forums**
- **Quizzes**
- **Other Interactive online activities**
- **Reports**

Course Policies:

A- Attendance policies:

The maximum allowed absences is 15% of the lectures.

B- Absences from exams and handing in assignments on time:

Midterm exam can be retaken based on approval of excuse by the instructor's discretion.

Not handing assignment on time will incur penalties.

C- Academic Health and safety procedures

D- Honesty policy regarding cheating, plagiarism, and misbehaviour:

Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.

E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) **___%**
- Midterm **___%**
- Final Exam **___%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

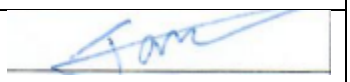
Required equipment:

- **PC / Laptop with webcam and mic**
- **Internet Connection**
- **Access to the IU E-Learning Platform at: https://elearn.iu.edu.jo/**
- **E-learning plan**
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- Training

Assessment Tools implemented in the course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework
- Practice Labs
- Discussion Forums
- Periodic reports for learning assessment
- Improvement plans for online or face-to-face teaching
- Others:…….

Responsible Persons and their Signatures:

Course Coordinator	**Dr. Abed Abdel Qader**	**Completed Date**	**25/10 /2022**
		Signature	

Received by (Department Head)	**Dr. Manal khabbas**	**Received Date**	**16 / 10 /2022**
		Signature