

Course Syllabus

1	Course title	Instrumental Analysis laboratory	
2	Course number	0303316	
3	Credit hours	1	
	Contact hours (theory, practical)	Theory, ½ hour; practical, 2½ hours	
4	Prerequisites/corequisites	0303216+0303311	
5	Program title	Bachelor's in chemistry	
6	Program code	03	
7	Awarding institution	The University of Jordan	
8	School	Faculty of Science	
9	Department	Chemistry	
10	Course level	Third year	
11	Year of study and semester (s)	Second Semester 2023/2024	
12	Other department (s) involved in teaching the course	NA	
13	Main teaching language	English	
14	Delivery method	<input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online	
15	Online platforms(s)	<input type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others.....	
16	Issuing/Revision Date	09/06/2024	

17 Course Coordinator:

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**18 Other instructors:**

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Name: NA

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19 Course Description:

As stated in the approved study plan.

Instrumental analysis laboratory is an undergraduate course that covers different methods of analysis using the following instruments: UV-Vis spectroscopy, atomic absorption spectroscopy, flame emission spectroscopy, gas chromatography, high performance liquid chromatography, and refractometry.



20 Course aims and outcomes:

A- Aims:

The aim of this course is to provide the students with good experience on handling an advanced instruments in chemical analysis including UV-Visible spectrophotometer, refractometer, atomic absorption spectrometer (AAS), atomic emission spectrometer (AES), high performance liquid chromatograph (HPLC), and gas chromatograph (GC). The understanding and differentiation between different chromatographic mechanisms such as partitioning, ion exchange and adsorption chromatography are other objectives of this course. In addition to those, students will develop skills like being a team player through working in groups and technical writing skills through report writing with criteria that meets this stage.

B- Students Learning Outcomes (SLOs):

- SLO-1. **Problem Solving:** Graduates will be able to apply mathematical and scientific knowledge to identify, formulate, and solve technical or scientific problems relevant to the discipline of chemistry.
- SLO-2. **Design:** Graduate will be able to use their understanding of chemistry concepts and principles to formulate and design systems, processes, procedures, or programs to meet desired goals and outcomes.
- SLO-3. **Experimental Skills:** Graduates will be able to design, conduct, and analyze experiments or test hypothesis, utilizing appropriate chemical techniques and scientific judgments to draw meaningful conclusions.
- SLO-4. **Communications:** Graduates will be able to communicate scientific information effectively and accurately to a range of audiences, including both technical and non-technical audiences.
- SLO-5. **Ethics and Global Context:** Graduates will understand and apply ethical and professional responsibilities in the context of the impact of technical and scientific solutions on global, economic, environmental, and societal issues.
- SLO-6. **Teamwork:** Graduates will be able to work effectively as a part of a team, establishing goals, planning tasks, meeting deadlines, and analyzing risk and uncertainty in the context of chemistry-related projects and initiatives.
- SLO-7. **Handling Chemicals:** An ability to apply the proper procedures for safe handling of chemicals.

Upon successful completion of this course, students will be able to:

- CLO-1.** Demonstrate a comprehensive understanding of the principles, theories, and techniques of instrumental analysis.
- CLO-2.** Apply appropriate instrumentation and methods to analyze and quantify chemical samples accurately and precisely.
- CLO-3.** Evaluate and select suitable instrumental techniques based on the nature of the sample and the analytical requirements.
- CLO-4.** Develop proficiency in operating a range of analytical instruments, including spectroscopic, chromatographic, etc.
- CLO-5.** Interpret and analyze instrumental data to extract meaningful information and draw valid conclusions.
- CLO-6.** Identify and troubleshoot common issues and challenges encountered during instrumental analysis, such as instrumental limitations, interferences, and calibration problems.
- CLO-7.** Design and execute analytical experiments using instrumental techniques, including sample preparation, data acquisition, and data analysis.
- CLO-8.** Develop effective laboratory skills, including proper instrument handling, safety protocols, and good laboratory practices specific to instrumental analysis.
- CLO-9.** Communicate analytical results clearly and effectively through written reports, oral presentations, and graphical representations.

SLOs CLOs of the course	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)
1		√					
2	√		√				
3					√		
4						√	
5			√				
6						√	
7			√				
8		√	√				√
9				√			

21. Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Safety and general introduction to spectroscopy	SO7 SO6	Face to face	Microsoft Teams		Quizzes, mid and final exams	See references
2	2.1	Spectrophotometric determination of ferrous ion concentration	SO2 SO3 SO6	Face to face	Microsoft Teams		Quizzes, mid and final exams	See references
3	3.1	Spectrophotometric determination of tin(IV) with catechol-Violet and cetyltrimethylammonium bromide	SO2 SO3 SO6	Face to face	Microsoft Teams		Quizzes, mid and final exams	See references
4	4.1	Refractometry	SO2 SO3 SO7 SO6	Face to face	Microsoft Teams		Quizzes, mid and final exams	See references
5	5.1	Atomic absorption spectroscopy (AAS)	SO2 SO3 SO6	Face to face	Microsoft Teams		Quizzes, mid and final exams	See references
6	6.1	Flame emission spectroscopy (FES)	SO3 SO6	Face to face	Microsoft Teams		Quizzes, mid and final exams	See references
7	7.1	Break		-	Microsoft Teams		Midterm 5 experiments	See references

8	8.1	Introduction to chromatography	SO1 SO2 SO6	Face to face	Microsoft Teams		Quizzes, and final exams	See references
9	9.1	Separation of benzene, xylene and toluene using isothermal and temperature program.	SO2 SO3 SO6	Face to face	Microsoft Teams		Quizzes, and final exams	See references
10	10.1	Analysis of alcohol's mixture using GC/FID	SO2 SO3 SO6	Face to face	Microsoft Teams		Quizzes, and final exams	See references
11	11.1	Column efficiency/ HPLC	SO2 SO3 SO6	Face to face	Microsoft Teams		Quizzes, and final exams	See references
12	12.1	Adsorption chromatography	SO2 SO3 SO6	Face to face	Microsoft Teams		Quizzes, and final exams	See references
13	13.1	Ion exchange chromatography	SO2 SO3 SO6	Face to face	Microsoft Teams		Quizzes, and final exams	See references

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
Quizzes (oral and written)	10	All experiments conducted	1,3,4	Weeks 3, 5, and 11	Paper based and oral

Lab reports	15	All experiments conducted	2	All experiments conducted	Paper based lab report for each experiment
Evaluation	5	During the whole semester	3,6	All weeks in continuous way	During the whole semester
Midterm Exam	30	For the first 5 experiments	1,3,4	Week # 6	Paper based
Final Exam	40	All experiments conducted	1,3,4	Week # 15	Paper based

23 Course Requirements

(e.g: students should have a computer, internet connection, webcam, account on a specific software/platform...etc):

All instruments needed for this laboratory are available and working properly in addition to the needed chemicals and reagents.

24 Course Policies:

A- Attendance policies: 15% absence rate is allowed.

B- Absences from exams and submitting assignments on time: Incomplete exams are conducted after arranging a new date if the excuse is reasonable and accepted.

C- Health and safety procedures: Safety rules and guidelines related to the working areas in any chemistry lab are always followed.

D- Honesty policy regarding cheating, plagiarism, misbehavior: The university of Jordan laws are applied in case of cheating, plagiarism, misbehavior.

E- Grading policy: Letters scale is applied.

F- Available university services that support achievement in the course: Free internet access and E-learning and Microsoft Teams.

25 References:



A- Required book(s), assigned reading and audio-visuals:

Mahmoud Alawi and Eihab Shamayleh, Instrumental methods of analysis (laboratory manual), 1994.

B- Recommended books, materials, and media:

Skoog Hooler and Niemen, Principles of instrumental analysis, 5th edition.

26 Additional information:

NA

Name of Course Coordinator: Dr. Khaldun Al Azzam-----	Signature: 09/06/2024-----
----- Date: -----	
Head of Curriculum Committee/Department: -----	Signature: -----

Head of Department: --Dr Firas Awwadi-----	Signature: -----
Head of Curriculum Committee/Faculty: -----	Signature: -----
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Dean: -----	Signature: -----