



Course Syllabus

1	Course title	Instrumental Analysis	
2	Course number	0343311	
3	Credit hours	3	
	Contact hours (theory, practical)	3	
4	Prerequisites/corequisites	0303211	
5	Program title	Chemistry	
6	Program code	03	
7	Awarding institution	The University of Jordan	
8	School	Science	
9	Department	Chemistry	
10	Course level	3	
11	Year of study and semester (s)	Fall 2023 / 2024	
12	Other department (s) involved in teaching the course	Bachelor	
13	Main teaching language	NA	
14	Delivery method	☐ xFace to face learning ☐ Blended ☐ Fully online	
15	Online platforms(s)	☐ Moodle ☐ xMicrosoft Teams ☐ Skype ☐ Zoom ☐ Others.....	
16	Issuing/Revision Date	16/1/2024	

17 Course Coordinator

Name: : **Prof. Dr. Sharif Arar**

Contact hours: 9:30-10:30 am

11:30-12:30 am

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**18 Other instructors:**

Name: NA

Office number:

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Contact hours:

Name:

Office number:

Phone number:

Email:

Contact hours:

19 Course Description:

Instrumental analysis and classical analysis, general components of analytical instruments, UV-Vis spectroscopy, IR spectroscopy, atomic absorption and emission spectroscopy, chromatography, gas chromatography, and liquid chromatography



Course aims and outcomes: A- Aims:

The course describes the principles of most instruments used in analytical chemistry. The course aims to show the student most of the modern instruments for analysis. This would help the student in any work in the future that needs to use instrumentation, such as medical labs, drugs manufacture, chemical product factories.....

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

- CLO-1 Instrumental concepts and estimation of the results got by instruments and laws using simple calculation and statistical methods.**
- CLO-2 Understand the calibration methods used to calibrate different instruments.**
- CLO-3 Understand the principle of different spectroscopic and chromatographic methods of analysis**

B- Students Learning Outcomes (SLOs):

- SO-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.
- SO-2. Design: Graduates 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.
- SO-3. Experimental Skills: Graduates will be able to design, conduct, and analyze experiments or test hypotheses, utilizing appropriate chemical techniques and scientific judgment to draw meaningful conclusions.
- SO-4. Communication: Graduates will be able to communicate scientific information effectively and accurately to a range of audiences, including both technical and non-technical audiences.
- SO-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.
- SO-6. Teamwork: Graduates will be able to work effectively as part of a team, establishing goals, planning tasks, meeting deadlines, and analyzing risk and uncertainty in the context of chemistry-related projects and initiatives.
- SO-7 Handling Chemicals: An ability to apply the proper procedures for safe handling of chemicals.

CLOs SLOs of the course	SLO (1)	SLO (2)	SLO (3)	SLO (4)
1	✓	✓		
2	✓	✓		✓
3	✓	✓	✓	✓



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	Introduction	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	1.2	Classification of analytical methods	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	1.3	Analysis parameters	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
2	2.1	Instrumental methods	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	2.2	Chemical and physical properties in instrumentation	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.

								et al 2016.
	2.3	Data encoding in digital, analog, or time domains	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
3	3.1	External Calibration	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	3.2	Standard Addition	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	3.3	Internal Standard	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
4	4.1	Transducers and detectors	1,2	Face to face	Microsoft Teams	NA	Class room participation+	Principles of Instrumental D. Skoog ,

							Quizzes + Exam	et al 2016.
	4.2	Selecting an Analytical Method :	1,2		Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	4.3	Signal to noise	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
5	5.1	Introduction to Spectroscopy	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	5.2	Wave parameters	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	5.3	Quantitative aspects of spectrochemical measurements	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
6	6.1	General design of optical instruments,	1,2	Face to face	Microsoft Teams	NA	Class room participation	Principles of Instrum

		sources of radiation,					ion+ Quizzes + Exam	ental D. Skoog , et al 2016.
	6.2	Wavelength selectors, sample containers, radiation transducer	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	6.3	Signal processors and readouts, fiber optics, types of instruments	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
7	7.1	Sample atomization techniques,	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	7.2	Atomic absorption atomic	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	7.3	Absorption instrumentation , interferences in atomic absorption spectroscopy, atomic absorption	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.

		analytical techniques						
8	8.1	Measurement of transmittance and absorbance, Beer's law	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	8.2	Interferences in atomic spectroscopy	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	8.3	Molecular spectroscopy introduction	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
9	9.1	Molecular spectroscopy instrumentation	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	9.2	Application of molecular spectroscopy	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	9.3	Introduction to IR	1,2	Face to face	Microsoft Teams	NA	Class room participation	Principles of Instrumental

							ion+ Quizzes + Exam	ental D. Skoog , et al 2016.
10	10.1	General description of chromatograph y	1,2	Face to face	Microsoft Teams	NA	Class room participat ion+ Quizzes + Exam	Principl es of Instrum ental D. Skoog , et al 2016.
	10.2	Migration rates of solutes, zone broadening and column efficiency	1,2	Face to face	Microsoft Teams	NA	Class room participat ion+ Quizzes + Exam	Principl es of Instrum ental D. Skoog , et al 2016.
	10.3	Optimization of column performance, applications of chromatograph y.	1,2	Face to face	Microsoft Teams	NA	Class room participat ion+ Quizzes + Exam	Principl es of Instrum ental D. Skoog , et al 2016.
11	11.1	Principles of gas liquid chromatograph y, instruments for gas liquid chromatograph y,	1,2	Face to face	Microsoft Teams	NA	Class room participat ion+ Quizzes + Exam	Principl es of Instrum ental D. Skoog , et al 2016.
	11.2	Gas chromatograph y columns and stationary phases,	1,2	Face to face	Microsoft Teams	NA	Class room participat ion+ Quizzes + Exam	Principl es of Instrum ental D. Skoog , et al 2016.

	11.3	Applications of gas-liquid chromatography (GLC), gas-solid chromatography.	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
12	12.1	Scope of HPLC, column efficiency in liquid chromatography,	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	12.2	Instruments for liquid chromatography, partition chromatography, adsorption chromatography,	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam Laboratory lecture and experiment on HPLC and GC	Principles of Instrumental D. Skoog , et al 2016.
	12.3	Ion exchange chromatography, size exclusion chromatography,	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
13	13.1	Affinity chromatography	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.

	13.2	Planner chromatography	1,2	Face to face	Microsoft Teams	NA	Class room participation+ Quizzes + Exam	Principles of Instrumental D. Skoog , et al 2016.
	13.3							
14	14.1							
	14.2							
	14.3							
15	15.1							
	15.2							
	15.3							

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
Class room participation	5	All topics of this course	1,2,3,4	1-13	Class room
Quizzes	15	Introduction to instrumental analysis+ calibration methods+ spectroscopy	1,2,3,4	6, 9	Class room
Mid-exam	30	Introduction to instrumental analysis+ calibration methods+ all sections of spectroscopy	1,2,3,4	10	University of Jordan halls or rooms
Final exam	50	Chromatography, all spectroscopy sections, signal to	1,2,3,4	14	University of Jordan halls or rooms



		noise, calibration methods, introduction to instrumentation			

23 Course Requirements

Students have to have Microsoft Teams account, Data show to present lecturing material

24 Course Policies:

A- Attendance policies: Maximum 20% absence is allowed.

B- Absences from exams and submitting assignments on time: Incomplete Exams are conducted later after arrangement a new date.

C- Health and safety procedures: Safety rules and guidelines related to the attending classrooms is followed according to health procedures at the University of Jordan

D- Honesty policy regarding cheating, plagiarism, misbehavior: The general Jordan University's laws are applied in any case of cheating.

E- Grading policy: Letters scale is applied and following the new guidelines from the University of Jordan Administration for letters scale and percentage of students for each letter

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:

You tubes videos about chemical instrumentation, and animation videos

B- Recommended books, materials, and media:

Principles of Instrumental Analysis, D. Skoog , F. Holler and S. Crouch, , Seventh Edition, Thomson/Brooks/Cole 2016.



مركز الاعتماد
وإضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

26 Additional information:

NA

Name of Course Coordinator: Prof. Dr. Sharif Arar-Signature: _____	Date: 16-1-2024
Head of Curriculum Committee/Department: -----	Signature: -----
Head of Department: -----	Signature: -----
Head of Curriculum Committee/Faculty: -----	Signature: -----
Dean: -----	Signature: -----