



Form: Course Syllabus	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
	The Date of the Deans Council Approval Decision	23/01/2023
	Number of Pages	06

1.	Course Title	Advanced Analytical Chemistry
2.	Course Number	0333991
3.	Credit Hours (Theory, Practical)	(3,0)
	Contact Hours (Theory, Practical)	Theory: three hour-lecture/week
4.	Prerequisites/ Corequisites	Non
5.	Program Title	Ph.D in chemistry
6.	Program Code	3
7.	School/ Center	Faculty of Graduate Studies
8.	Department	Chemistry
9.	Course Level	Ph.D
10.	Year of Study and Semester (s)	Programs years 1 st or 2 nd semesters
11.	Other Department(s) Involved in Teaching the Course	Non
12.	Main Learning Language	English
13.	Learning Types	x <input type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online
14.	Online Platforms(s)	<input type="checkbox"/> Moodle X <input type="checkbox"/> Microsoft Teams
15.	Issuing Date	21-11-2024
16.	Revision Date	23-11-2024

17. Course Coordinator:

Name: Prof. Dr. Sharif Arar	Contact hours: 11:00 am -12:00 noon
Office number: 203 old chemistry building	Phone number: 065355000 Ext. 22150
Email: s.arar@ju.edu.jo	

**18. Other Instructors:**

Name:

Office number:

Phone number:

Email:

Contact hours:

Name:

Office number:

Phone number:

Email:

Contact hours:

19. Course Description:

*This course consists of **2 modules** that possibly can be expanded to more topics in the advanced analytical chemistry:*

Model 1: This course will cover the analytical applications in environmental, forensic and chemical industries in addition to; bioanalytical applications with commitment to give in-depth knowledge of state of the art analytical techniques, instrumentation, sensors, and experimental procedures related to the analysis of inorganic and organic constituents in these application topics. Furth more with focusing on the spectroscopic methods, and electro-analytical methods including potentiometric, voltammetric methods related to these analytical applications .

Model 2: This course will cover the latest developments and advances in the field of analytical chemistry and its subfields in recent years.



20. Program Student Outcomes (SO's): (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

SO1. Develop chemistry expertise, focus on theory and practice, and contribute to advancing knowledge in a specific research field.

SO2. Conduct original, high-quality research that advances knowledge in chemistry by developing complex projects using innovative methodologies.

SO3. Mentor junior researchers and students and demonstrate leadership in the scientific community through collaboration, peer review, and knowledge exchange.

SO4. Recognize the ethical implications and responsibly use chemistry solutions to tackle global challenges.

SO5. Participate in ongoing professional development to stay up to date with the latest research and innovations.

21. Course Intended Learning Outcomes (CLO's): (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Gain advanced knowledge in analytical chemistry applications with association of state of the art instrumentation and their related analytical applications to inorganic and organic species and automated systems

2. Gain and develop in depth knowledge in sample preparation techniques for inorganic constituents

3. Ability to judge the draw backs of analytical methods, and provide technical solutions for analytical problems

4. Exposure to experimental procedures for conducting advanced analysis, and ability to evaluate data and analytical methods used

5. Upgrading and developing soft skills, scientific communications, through practicing term papers and PowerPoint presentations, in addition to presenting and discussing literature relevant to the different topics covered in class.

Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
1	✓	✓		✓		



2	✓	✓		✓		
3	✓	✓		✓		
4	✓	✓	✓	✓	✓	
5	✓	✓		✓	✓	✓

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Program SO's	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)
Course CLO's					
CLO (1)	✓	✓			
CLO (2)	✓	✓			
CLO (3)	✓	✓			
CLO (4)	✓	✓		✓	✓
CLO (5)	✓	✓	✓	✓	✓

23. Topic Outline and Schedule:



Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types Face to Face (FF) Blended (BL) Fully Online (FO)	Platform Used	Synchronous (S) Asynchronous (A)	Evaluation Methods	Learning Resources
1	2 lectures	Fast overview of instrumental analytical methods data reliability criteria, and figures of merits	1	Face to face	Non	Non	Quizzes/group discussion+ mid-exam	References-section -27-part-B
2	2 lectures	Analytical applications in forensic science	1	Face to face	Non	Non	Quizzes/group discussion+ mid-exam	References-section -27-part-B
3	2 lectures	Analytical applications in forensic science	1	Face to face	Non	Non	Quizzes/group discussion+ mid-exam	References-section -27-part-B
4	2 lectures	Analytical applications in the environmental sciences	1	Face to face	Non	Non	Quizzes/group discussion+ mid-exam	References-section -27-part-B
5	2 lectures	Analytical applications in the industry	1	Face to face	Non	Non	Quizzes/group	References-section



							p discuss ion+ mid- exam	-27- part-B
6	2 lect ures	Analytical applications in bioanalysis	1	Face to face	Non	Non	Quize s/grou p discuss ion+ mid- exam	Refere nces- section -27- part-B
7	2 lect ures	Dry and wet digestion methods	2	Face to face	Non	Non	Quize s/grou p discuss ion+ mid- exam	Refere nces- section -27- part-B
8	2 lect ures	Automated sample preparation methods	3,4	Face to face	Non	Non	Quize s/grou p discuss ion+ mid- exam	Refere nces- section -27- part-B
9	2 lect ures	Hyphenated atomic spectroscopy and mass-spectrometry	1, 3,4	Face to face	Non	Non	Quize s/grou p discuss ion+ +Mid+f inal exam	Refere nces- section -27- part-B
10	2 lect ures	Hyphenated molecular mass- spectrometry	1, 3,4	Face to face	Non	Non	Quize s/grou p discuss ion+	Refere nces- section -27- part-B



							Final-exam	
11	2 lectures	Spectroscopic sensors and advanced FTIR	1, 3,4	Face to face	Non	Non	Quizzes/group discussion+ Final-exam	References-section -27-part-B
12	2 lectures	Potentiometric and voltametric measuring instruments and sensors	1, 3,4	Face to face	Non	Non	Quizzes/group discussion+ Final-exam	References-section -27-part-B
13	1 lecture	Lab demonstrations and experiments	1,4	Face to face	Non	Non	Quizzes/group discussion+ Final-exam	References-section -27-part-B
14	2 lectures	Seminar topics	1,2,3,4,5	Face to face	Non	Non	Quizzes/group discussion+ Final-exam	Topic seminar references
15	14.1	Seminar topic	1,2,3,4,5	Face to face	Non	Non	Quizzes/group discussion+ Final-exam	Topic seminar references



24. Evaluation Methods:

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

Evaluation Activity	Mark	Topic(s)	CLO/s Linked to the Evaluation activity	Period (Week)	Platform
Oral presentations /term paper	20	All related topics in the course	1,2,3,4, 5	13-14	Face to face
Quizzes, HomeWorks and assignments	10	Topics in weeks 1-10	1,2,3,4, and 5	3, 6, 11	Face to face
Mid-exam	30	Weeks 1-8	1,2,3,4	11	In the department
Final-exam	40	Weeks 1-13	1,2,3,4, 5	16	In the department

25. Course Requirements:

Students should have a computer, internet connection, Microsoft teams

For Instructor, Some laboratory equipment for demonstrations, and data show for lecturing

26. Course Policies:



A- Attendance policies:

Attending the course is mandatory. Failure to sit an exam will result in a mark of zero, unless a valid reason (with supporting documentation) for the absence is presented.

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

Proof of illness requires a signed medical certificate. Notify me as soon as possible if you are going to miss an exam. If any course component is missed for a valid reason, that portion of the exam grade will/may be shifted to the final examination.

C- Health and safety procedures:

Special Needs Students: Feel free to inform your instructor of your special needs in order for you to have a productive learning experience.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

When writing a report or paper on a given topic, you must read up the necessary information on the topic, and then present it in your own words and writing. If you want to use an exact sequence of text or an idea or data from someone else's work, that is considered a quote, then that work must be cited (you must give a proper credit to the author) specifically as a reference. Therefore, if you are caught cheating on any component of Chem.741 you will be assigned a grade of zero for the course. We shall also place a letter describing the offense in your student file.

If you see someone cheating during an exam or writing a paper or report, inform us/the proctors in the following ways: 1) Write a short message on your exam paper or report indicating what is happening. 2) Raise your hand and the proctor or myself will come over – then let us know and point out your note; we will take it from there.

It is important to point out that there is a difference between plagiarism and working out answers to a lab report or an assignment with a friend. If your writing is based on your own words and your understanding of the material, then that is acceptable. If, however, you simply write your friend's thought or answer, i.e. the same thing (cut and paste), then you have committed plagiarism. Simply, plagiarism is cheating; if you are unclear about any part of this issue or have any question, please speak up and let me know.

E- Grading Scheme and policy:

- Assignments are due at the beginning of the class, unless otherwise specified.
- Assignments, and suggested problems are intended as partial preparation for exams. Failure to put forth effort is perilous.
- Assignments are due on the dates noted. Assignments will be done individually; each student must hand in their own answers. It is acceptable, however, for students to help each other in collaborating to solve problems and figuring out answers. We will be assuming that, you will be taking the responsibility to make sure you personally understand the solution to any problem



arising from such collaboration. You also must indicate on each assignment with whom you collaborated.

- The final exam for this course is cumulative covering all material presented in the class, the exam will test your comprehension and your ability to problem solve.

F- Available university services that support achievement in the course:

- E-Learning resources and Microsoft teams
- Computer Lab

27. References:

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

- Handouts
- Lecture Notes soft copies
- Videos (Recorded Lectures) if needed

B- Recommended books, materials, and media:

- 1- Skoog, D.; Holler, and West, Principles of Instrumental Analysis, 7th edition, 2016
- 2- Analytical Chemistry Methods and Applications Edited By Harold H. Trimm, 2011
- 3- Comprehensive Sampling and Sample Preparation, 2nd Edition - June 1, 2025, Editor: Mustafa Soylak
- 4- **Chemical Analysis for Forensic Evidence**, 1st Edition - November 23, 2022, Arian van Asten.
- 5- Mass Spectrometry: Principles and Applications, 3rd Edition, Edmond de Hoffmann, Vincent Stroobant, [2007](#)
- 6- Environmental Analysis by Electrochemical Sensors and Biosensors, 2014
- 7- Bioanalysis of Pharmaceuticals: Sample Preparation, Separation Techniques, and Mass Spectrometry, Editor(s):Steen Honoré Hansen, Stig Pedersen-Bjergaard, 2015
- 8- Infrared Spectroscopy: Perspectives and Applications, editors: Marwa El-Azazy, Khalid Al-Saad, Ahmed S. El-Shafie, 2023
- 9- Electroanalytical Methods, Guide to Experiments and Applications, 2014



28. Additional information:

NA

Name of the Instructor or the Course Coordinator:

Prof. Dr. Sharif Arar

Signature:

Date: 22-11-2024

The Head of Graduate Studies Committee/
Department Chemistry
Dr. Murad AIDamen, Prof.

Signature:

Date:

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The Head of Department of Chemistry
Dr. Murad AIDamen, Prof.

Signature:

Date:

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Vice Dean for Graduate Studies and Scientific
Research / School of Science
Dr. Kamal Sweidan, Prof.

Signature:

Date:

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The Dean of School of Science
Dr. Mahmoud I. Jaghoub, Prof.

Signature:

Date:

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