



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 Bioinorganic Chemistry
2.	Course Number	0303725
3.	Credit Hours (Theory, Practical)	3 theory
	Contact Hours (Theory, Practical)	
4.	Prerequisites/ Corequisites	-
5.	Program Title	M.Sc. Chemistry
6.	Program Code	0303
7.	School/ Center	Science
8.	Department	Chemistry
9.	Course Level	Master Level
10.	Year of Study and Semester (s)	-
11.	Other Department(s) Involved in Teaching the Course	-
12.	Main Learning Language	English
13.	Learning Types	<input type="checkbox"/> Face to face learning <input checked="" type="checkbox"/> Blended <input type="checkbox"/> Fully online
14.	Online Platforms(s)	<input type="checkbox"/> Moodle <input type="checkbox"/> Microsoft Teams
15.	Issuing Date	
16.	Revision Date	

17. Course Coordinator:

Name: Dr. Afnan Al-hunaiti	Contact hours:
Office number:	Phone number:
Email: a.alhunaiti@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:

An introductory as well as advanced aspect and methods in bioinorganic chemistry are all developed during the course. The course will provide students with a general overview of the many very fundamental tasks performed by inorganic elements like “Metal Ions in Proteins” and “Special Cofactors and Metal Clusters” in living organisms. Methods and theories with particular emphasis on enzymatic conversions and electron transfer will be discussed in view of its importance in bioinorganic chemistry. This goes along with the elucidation of model systems and technical applications of both, concepts learned from nature as well as biological systems.

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. Demonstrate comprehensive knowledge and understanding of chemistry topics, achieving expertise in foundational research principles.

SO2. Develop independent research skills to solve complex problems, focusing on analytical and critical thinking.

SO3. Improve communication of scientific knowledge through structured reports, presentations, and discussions.

SO4. Engage in activities that enhance practical scientific skills and improve professional expertise.

SO5. Maintain ethical standards in research.



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. Understand how metal ions interact with biological environments and how these interactions influence the properties of metal centres.
2. Apply principles of coordination chemistry as well as principles of inorganic chemistry and organometallics to explain how nature tailors the properties of metal centres for specific applications.
3. Analyze critical questions (asked by fellow students or the instructor) and engage in scientific discussion on bioinorganic chemistry-related topics
4. Demonstrate in written homework the ability to comprehend current problems in bioinorganic chemistry and answer specific scientific questions using the knowledge provided during the course.
5. Understand current publications and reviews in bioinorganic chemistry in high-impact journals at the level that is required to present a self-selected topic to an audience in a conference-style seminar.

Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analyzing	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	1,2	Introduction to bioinorganic chemistry, general terms, how and why does nature select inorganic elements? Inorganic Elements and evolution	1,2	FF	Class room	S	Mid-Final	Required book in section 25



2	2.1- 2.1	Basic biological Coordination Chemistry. Kinetic and spectroscopic characteristics of bioinorganic systems.	1,2	FF	Class room	S	Mid-Final	Required book in section 25
3	3.1- 3.2	Stroll through the periodic system. Systematic overview over tasks and examples of inorganic elements in biology	1,2	FF	Class room	S	Mid-Final	Required book in section 25
4	4.1- 4.2	Ion transport: membranes, energy, channels, pumps	1,2	FF	Class room	S	Mid-Final	Required book in section 25
5	5.1- 5.2	Biom mineralization : the hard part of bioinorganic chemistry	1,2	FF	Class room	S	Mid-Final	Required book in section 25
6	6.1- 6.2	Nanoparticles, Inorganic structural elements in proteins, RNA & DNA, Lewis acid catalysis	1,2	FF	Class room	S	Mid-Final	Required book in section 25
7	7.1- 7.2	Bioinorganic coordination chemistry II – transition metals: apply coordination chemistry of redox active metal ions to explain properties of these metal centers	1,2	FF	Class room	S	Mid-Final	Required book in section 25
8	8.1- 8.2	Electron transport in biology – iron sulfur clusters, enzymes for respiration, photosynthesis and related pathways		FF	Class room	S	HW+ Final	Required book in section 25



9	9.1-9.2	Oxygen transport – metal-oxygen coordination in proteins		FF	Class room	S	HW+ Final	Required book in section 25
10	10.1-10.2	Oxygen activation and processing by cytochromes		FF	Class room	S	HW+ Final	Required book in section 25
11	11.1-11.2	Small molecule activation and conversion by metalloenzymes – photosynthetic water splitting		FF	Class room	S	HW+ Final	Required book in section 25
12	12.1-12.2	Radicals and Bioorganometallic Chemistry – from RNA to DNA and from Vitamin B12 to methanogens and methanotrophs	1,2,4,6	FF	Class room	S	HW+ Final	Required book in section 25
13	13.1	Biological conversion and formation of hydrogen and nitrogen– hydrogenases and nitrogenases	1,2,4,6	FF	Class room	S	Seminar- Final	Required book in section 25
14	14.1	Metal pharmacology: uptake storage toxicity	1,2,4,6	FF	Class room	S	Seminar- Final	Required book in section 25
15	15.1-15-2	Metals in medicine: anti cancer agents, diabetes, arthritis, radionuclides and related applications	1,2,4,6	FF	Class room	S	Seminar- Final	Required book in section 25



16							Final Exam	
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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
Midterm	30	As per Sec. 21 above	1,2	Week 10	In the department
Seminar+Homework	20	As per Sec. 21 above	1,2,4,6	Last week	In the department
Final	50	As per Sec. 21 above	1,2	End of the semester	In the department

25. Course Requirements:

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

26. Course Policies:



- A- Attendance policies: All students are expected to follow the of attendance policies of the University of Jordan, absences exceeding 15% of total number of class meeting (6-hour classes) will result in F grade or course drop.
- B- Absences from exams and handing in assignments on time: University rules and regulations regarding make-up exams.
- C- Health and safety procedures: N/A
- D- Honesty policy regarding cheating, plagiarism, misbehaviour: University rules and regulations.
- E- Grading policy: University rules and regulations
- F- Available university services that support achievement in the course: N/A

27. References:

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

1- Ivano Bertini, Harry B. Gray, Edward I. Stiefel, Joan Selverstone Valentine, Biological Inorganic Chemistry – Structure & Reactivity “

B- Recommended books, materials, and media: 1. Inorganic Chemistry, by Catherine E. Housecroft and Alan G. Sharpe, 5th edition, Pearson, 2018. Page 1098 / chapter 29 / The trace metals of life

28. Additional information:

Name of the Instructor or the Course Coordinator:
Dr. Afnan Al-Hunati.....

Signature:

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Date:

16.11.2024

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

Signature:

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Date:

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

Signature:

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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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