

 <b>FLORIDA ATLANTIC UNIVERSITY</b>	<b>NEW COURSE PROPOSAL</b> <b>Graduate Programs</b>		UGPC Approval _____ UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner _____ Catalog _____	
	<b>Department</b> Chemistry and Biochemistry  <b>College</b> College of Science (To obtain a course number, contact <a href="mailto:erudolph@fau.edu">erudolph@fau.edu</a> )			
<b>Prefix</b> CHM  <b>Number</b> 6675	(L = Lab Course; C = Combined Lecture/Lab; add if appropriate) <b>Lab Code</b>	<b>Type of Course</b> Lecture	<b>Course Title</b> Bioinorganic Chemistry: Structure, Reactivity and Spectroscopy	
<b>Credits</b> (See <a href="#">Definition of a Credit Hour</a> )  3	<b>Grading</b> (Select One Option)  <b>Regular</b> <input checked="" type="radio"/> <b>Sat/UnSat</b> <input type="radio"/>	<b>Course Description</b> (Syllabus must be attached; see <a href="#">Template</a> and <a href="#">Guidelines</a> ) The course is designed to highlight the important role that metals play in biology and biochemistry. Topics include the structure of metalloproteins and metalloenzymes, metal transport and storage, electron transfer, small molecule transformation, and metals in medicine. Special emphasis will be placed on the role of 'synthetic metalloenzymes' in understanding the reactivity and spectroscopy of metals in their biochemical environment. Students will investigate fundamental principles of coordination chemistry as they apply to biomolecules, study metal-protein interactions, and explore reactivity of metalloenzymes.		
<b>Effective Date</b> (TERM & YEAR)  Fall 2025				
<b>Prerequisites</b>  Graduate standing   <i>Prerequisites, Corequisites and Registration Controls are enforced for all sections of course.</i>		<b>Academic Service Learning (ASL) course</b> <input type="checkbox"/> Academic Service Learning statement must be indicated in syllabus and approval attached to this form.		
		<b>Corequisites</b> None	<b>Registration Controls</b> (For example, Major, College, Level)	
<b>Minimum qualifications needed to teach course:</b> Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field).		<b>List textbook information in syllabus or here</b> • Inorganic Chemistry by Miessler, Fischer & Tarr • Principles of Bioinorganic Chemistry by Lippard & Berg • Biological Inorganic Chemistry: Struct & Reactivity by Bertini		
<b>Faculty Contact/Email/Phone</b> Zhu-Lin (Sam) Xie/xiez@fau.edu/5612973641		<b>List/Attach comments from departments affected by new course</b> There's no similar course offered by other departments/colleges		

<b>Approved by</b> Department Chair <u>Andrew Terent's</u> 2025.02.06 16:49:49 -05'00' College Curriculum Chair <u>[Signature]</u> College Dean <u>[Signature]</u> UGPC Chair <u>[Signature]</u> UGC Chair <u>[Signature]</u> Graduate College Dean <u>[Signature]</u> UFS President _____ Provost _____	<b>Date</b> 2/6/25 _____ 3/10/2025 04/03/2025 04/03/2025 04/03/2025 _____ _____
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Email this form and syllabus to [UGPC@fau.edu](mailto:UGPC@fau.edu) 10 days before the UGPC meeting.



## CHM 6675 Bioinorganic Chemistry: Structure, Reactivity and Spectroscopy

T R 9:30 am – 10:50 am

3 credits

Prof. Zhu-Lin (Sam) Xie

Office: PS55, Room 309

Office hours: XXXXXXXXXX

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### Course Description

The course is designed to highlight the important role that metals play in biology and biochemistry. Topics include the structure of metalloproteins and metalloenzymes, metal transport and storage, electron transfer, small molecule transformation, and metals in medicine. Special emphasis will be placed on the role of 'synthetic metalloenzymes' in understanding the reactivity and spectroscopy of metals in their biochemical environment. Students will investigate fundamental principles of coordination chemistry as they apply to biomolecules, study metal-protein interactions, and explore reactivity of metalloenzymes.

### Course Objectives/Student Learning Outcomes

The aim of this course is to give students a broad understanding of the roles of metals in biology and explore the principles of inorganic chemistry applied in biological systems. Students will be exposed to advanced spectroscopic and analytical techniques used to study the structure and properties of metal-containing biomolecules and develop critical thinking skills through the analysis of literature and problem-solving in bioinorganic chemistry. By the end of this course, students will:

- Explain the functions of metals in biological processes such as oxygen transport, electron transfer, catalysis, and regulatory mechanisms
- Analyze the coordination environment, ligand properties, and electronic structure of metal centers in biomolecules and synthetic models.
- Demonstrate an understanding of spectroscopic methods used to study bioinorganic systems
- Critically read, interpret, and discuss current research articles in bioinorganic chemistry, identifying experimental approaches and drawing connections to course content
- Present scientific findings in oral format, demonstrating clarity, organization, and critical evaluation of the subject matter

### Prerequisites/Corequisites

Graduate standing.

### Suggested textbooks/materials

- *Inorganic Chemistry* by Miessler, Fischer & Tarr
- *Principles of Bioinorganic Chemistry* by Lippard & Berg

- *Biological Inorganic Chemistry: Structure & Reactivity* by Bertini, Gray, Stiefel & Valentine

## Course Evaluation Method

### Undergraduate:

(a) Quiz 1:	100 points
(b) Mid-term 1	200 points + Bonus Points
(c) Quiz 2:	100 points
(d) Mid-term 2:	200 points + Bonus Points
(e) Final:	250 points + Bonus Points

### Graduate:

(a) Quiz 1:	100 points
(b) Mid-term 1	200 points
(c) Quiz 2:	100 points
(d) Mid-term 2:	200 points
(e) Final:	250 points
(f) Term project:	200 points

**Exams:** Two mid-term exams and one final exam will be administered. Mid-term exams are non-cumulative and 80 min in duration. The Final Exam is cumulative (i.e., comprehensive) and 150 min in duration. *In each exam, a few advanced-level questions will be included for graduate students, who will be required to answer them. Undergraduate students will receive bonus points for answering these questions.*

**Quizzes:** Two quizzes will be given throughout the semester on days which *may not* be announced beforehand. If you are absent for a quiz, you will not be granted a makeup. All quizzes will be graded.

**Term project (graduate students only):** Each enrolled *graduate student* will be required to study a specialized topic that is not covered in lecture. A list of topics, focusing on a spectroscopic method for studying biomolecules or a specific metal-containing biological system, will be provided for students to choose. Students are expected to conduct a thorough literature review, summarize their findings, and present their analysis. The presentation, approximately 30 minutes in length, will be delivered during the final weeks of the semester. *Questions based on the presentations will be created and included in the final exam.*

## Course Grading Scale

The total grades will be normalized to 100 points, and letter grades will be assigned accordingly:

A $\geq$ 90	D $\geq$ 50
A- $\geq$ 85	F < 50
B+ $\geq$ 80	
B $\geq$ 75	
B- $\geq$ 70	
C+ $\geq$ 65	
C $\geq$ 60	
C- $\geq$ 55	

## **Policy on Makeup Tests, Late Work, and Incompletes**

- There will be no makeup mid-term exams except in the following cases, where appropriate documentation is provided: 1. Medical emergency or problem; 2. Death in the immediate family; 3. Participation in an FAU-sponsored academic or athletic activity/event; 4. Required appearance in a civil or criminal court; 5. Military obligations. In cases 1 & 2 the student or a family member must notify the Professor of the incident via email within 48 hours of the missed exam. The student will provide documentation and take the makeup exam at the *earliest possible time* (ordinarily within 1 week of the originally scheduled exam time). In cases 3-5, written documentation of the impending activity must be submitted to the Professor at least 48 hours *prior to* the scheduled exam time. The student must take the makeup exam within 1 week of the originally scheduled exam time.
- The final exam will be given as scheduled. Students will not be permitted to take the final at a different time.
- Any complaints about the exams should be addressed within 5 days the grades are published in CANVAS. No complaints can be made after this period.
- Incomplete Grade: please refer to the FAU Catalog for the policy on “I” grade.

## **Classroom Etiquette Policy**

Please arrive at the classroom *before* class begins to avoid interruptions. Cell phones should be switched off. Students are permitted to use personal computers during class for note-taking and other class-related work only. Thoughtful, courteous questions and discussion about the course material during class time are encouraged. If you have specific questions or comments about your own learning experience, you may speak with the Professor individually about this outside of class times.

## **Policy on the Recording of Lectures**

Students enrolled in this course may record video or audio of class lectures for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording class activities other than class lectures, including but not limited to student presentations (whether individually or as part of a group), class discussion (except when incidental to and incorporated within a class lecture), labs, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations between students in the class or between a student and the lecturer, is prohibited. Recordings may not be used as a substitute for class participation or class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University’s Student Code of Conduct and/or the Code of Academic Integrity.

## **Attendance Policy**

*Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student’s responsibility to give the*

*instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.*

## **Counseling and Psychological Services (CAPS) Center**

*Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>*

## **Disability Policy**

*In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at [www.fau.edu/sas/](http://www.fau.edu/sas/).*

## **Code of Academic Integrity**

*Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see [University Regulation 4.001](#).*

## **Tentative Lecture schedule**

Date		Lecture Schedule
8/19 T	L1	Overview of Bioinorganic Chemistry
8/21 R	L2	Properties of Biological Molecules
8/26 T	L3	Principles of Coordination Chemistry Related to Bioinorganic Research
8/28 R	L4	
9/2 T	L5	Binding, Stability, and Folding of Metalloproteins
9/4 R	L6	Bioinorganic Cofactors and Metal Clusters
9/9 T	L7	Metal Ion Transport and Storage
9/11 R	L8	Electron Transfer Proteins

9/16 T	Review	
9/18 R	Mid-Term 1	
9/23 T	L9	Dioxygen Carrier Proteins
9/25 R	L10	
9/30 T	L11	Dioxygen Activation Enzymes
10/2 R	L12	
10/7 T	L13	Dioxygen Reduction to Water: Enzymes and Mechanisms
10/9 R	L14	Oxygen Metabolism: Superoxide Dismutase and Reductase
10/14 T	L15	Dioxygen Production: Photosynthesis
10/16 R	L16	Dioxygen Production: Photosystem II
10/21 T	Review	
10/23 R	Mid-Term 2	
10/28 T	L17	Hydrogenases
10/30 R	L18	
11/4 T	L19	Nitrogenases
11/6 R	L20	Metalloenzymes with radical intermediates
11/11 T	Veteran's Day	No Class
11/13 R	L21	Metals in Medicine: Diagnostic Agents and Anticancer Metallodrugs
11/18 T	L22	Student Presentation
11/20 R	L23	
11/25 T	Review	
12/4 R	Final	