

# FCH 410 - Inorganic Chemistry

## SUNY - College of Environmental Science and Forestry

Dr. Neal M Abrams  
Fall 2019

T/Th 9:30 AM -11:00 PM Baker 107

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Office Hours in **Gateway**: Monday 1:50-3:30 PM

Wednesday 9-10 AM *or by appointment*

This course will be an introduction to the bonding, structure and reactivity of transition metals and main group elements. Topics will include but not limited to covalent molecular structures, coordination chemistry, organometallic chemistry, catalysis, and solid-state materials.

### COURSE OBJECTIVES

After completing this course you should be able to:

- Correlate atomic properties with respect to position in the periodic table thereby expressing an understanding of the periodic table using the principles of periodicity.
- Use character tables and to interpret spectra (UV/Vis, Mass Spectrometry, NMR, IR and EPR spectra) as they apply specifically to inorganic compounds.
- Write reasonable synthetic pathways and explain synthetic strategies.
- Discuss the properties of materials and metal complexes with respect to physical properties, biological importance and other multidisciplinary fields on exams.

### COURSE MATERIALS

**Inorganic Chemistry on LibreTexts** (various authors and books, online open-source content):

<https://chem.libretexts.org/Bookshelves/InorganicChemistry>

**Molecular Modeling Kit** with geometries higher than tetrahedral (suggested)

**Chemical structure and drawing programs:** You will use ChemDraw and CrystalMaker, which can both be downloaded for personal use. The programs are also available in the computer labs. For ChemDraw, you can access it through the following link using your syr.edu email address:

<http://sitesubscription.cambridgesoft.com/sitelicense.cfm?sid=1631>. Pay no attention to the creepy Otto on the webpage. We will only use the CrystalMaker *demo* version, so there will be no cost.

### FORMAT

The class meets twice a week for 80-minutes. That is a lot of time to be “talked at”, so we are going to use the class time to explore topics through lecture as well as case studies, visualizations, and hands-on approaches. This can only happen, however, if everyone is prepared for class by completing the assigned problems and the readings.

### ASSIGNMENTS AND EXAMS

**Problem sets** are given out every 1-2 weeks, depending on topics and the exam schedule. These problem sets are ways for you to practice and master the concepts.

**Journal articles and database searches** will be assigned occasionally to further explore a topic. I'll assume you know how to access and use SciFinder and access journals

**Flash talks** begin in week 7 or 8 of the semester. Each person is responsible for presenting a 5-8 minute presentation on a topic related to inorganic chemistry. It could be a single research article, a characterization method, a material or application, or various other topics of broad interest. The idea is that you can talk about something that interests you and I wouldn't normally cover in class. Topics must be pre-approved by me at least one week in advance. Signups will be on Blackboard with no more than two people presenting per day.

**Exam** dates are shown in the course schedule. You must take the exams on the scheduled date. Your lowest exam grade will be dropped, but you will have an opportunity to submit a self-evaluation and corrections from graded exams to improve your understanding (and grade). You will be able to earn up to 33% of unearned points in your self-evaluations and correction. I do not offer makeup exams.

I do not view exams as merely an opportunity for you to directly reproduce things you have done before. While there will necessarily be questions that check for your understanding of important content and concepts, there will also be questions that are "different" in some way. If you prepare yourself with reading, problem solving, and active participation in our course, you should have the tools to address any question I am likely to put on an exam. How I phrase things, combine ideas, and use applications or data on exams is meant to be fair but challenging. I take no pleasure in "tricking" students, so that is not the position from which I write exams. I'm available to discuss your approach to learning in order to help you do your best in the course.

**Final Exam:** The final exam will draw from both the class materials as well as the American Chemical Society Inorganic Exam. There are no study guides or past exams available, so studying and mastery will come from comprehensive understanding of class content.

## GRADING

### Weighting of Course Assignments and Exams

Assignment grades are weighted based on the percentages shown in the table below.

Exams	35%
In-class exercises	10%
Problem sets	15%
Flash talk	10%
Participation and professionalism	5%
Final Exam	25%

The grading scale for this class is:

A = 93–100%	B+=87-89%	B- = 80-82%	C = 73-76%	D = 60-69%
A- = 90-92%	B= 83-86%	C+ = 77-79%	C- = 70-72%	F = <60%

## STUDENTS WITH LEARNING AND PHYSICAL DISABILITIES

SUNY-ESF works with the Office of Disability Services (ODS) at Syracuse University, who is responsible for coordinating disability-related accommodations. Students can contact ESF Student Affairs in 110 Bray or Syracuse University ODS at 315-443-4498 to schedule an appointment and discuss their needs and the process for requesting accommodations. To learn more about ODS, visit <http://disabilityservices.syr.edu>. Authorized accommodation forms must be in the instructor's possession one week prior to any anticipated accommodation. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

## **ACADEMIC DISHONESTY**

Academic dishonesty is a breach of trust between a student, one's fellow students, or the instructor(s). By registering for courses at ESF you acknowledge your awareness of the ESF Code of Student Conduct (<https://www.esf.edu/students/handbook/>), in particular academic dishonesty includes but is not limited to plagiarism and cheating, and other forms of academic misconduct. The Academic Integrity Handbook contains further information and guidance (<http://www.esf.edu/students/integrity/>). Infractions of the academic integrity code may lead to academic penalties as per the ESF Grading Policy (<https://www.esf.edu/provost/documents/GradingPolicy.11.12.2013.pdf>).

## **EMAIL**

Email is the single best way to contact me. Please be sure to use a salutation to start your email and a closing to end it. Without these niceties, email comes across as abrupt and negative. Further, be careful how you phrase your email, sometimes you do not intend for a message to be offensive, but your choice of phrasing may make it appear that way.

## **CHOSEN NAME**

Some of you may have a Chosen name and/or specific pronoun use which I will support both informally and formally. ESF has a Chosen name policy and it would be greatly appreciated if you would take advantage of it so that I have a formal record of it. The link is <http://www.esf.edu/registrar/preferred.htm>. We have no control over the Blackboard site, but I will do my best to accurately recognize the person you are. ESF is committed to an inclusive environment, so let us know what you choose to be called!

## **INCLUSION AND EQUITY STATEMENT**

As an institution, we embrace inclusive excellence and the strengths of a diverse and inclusive community. During classroom discussions, we may be challenged by ideas different from our lived experiences and cultures. Understanding individual differences and broader social differences will deepen our understanding of each other and the world around us. In this course, all people (including but not limited to, people of all races, ethnicities, sexual orientation, gender, gender identity and expression, students undergoing transition, religions, ages, abilities, socioeconomic backgrounds, veteran status, regions and nationalities, intellectual perspectives and political persuasion) are strongly encouraged to respectfully share their unique perspectives and experiences. This statement is intended to help cultivate a respectful environment, and it should not be used in a way that limits expression or restricts academic freedom at ESF.

# Schedule

*Subject to change*

Date	Week	Chapter/section	Topic
8/27	1	1	Atomic structure
8/29			
9/03	2	6	Solids, unit cells, and sphere packing
9/05			Ionic solids, alloys, intermetallics
9/10	3	6	Lattice enthalpy, band theory
9/12			Molecular structure and MO theory
9/17	4	2	MO theory
9/19		3	Symmetry I
9/24	5	3	Symmetry II
9/26			Point groups and Character tables
10/01	6	3	Group theory
10/03			Vibrational spectroscopy
10/08	7		Exam review
10/10			Exam 1
10/15	8	7	Acids and Bases I
10/17			Acids and Bases II
10/22	9	19	Coordination chemistry, nomenclature, and chelates
10/24			Coordination chemistry II
10/29	10	20	Electronic structure theories: crystal field and ligand field
10/31			Spectrochemical series, Shape, Jahn-Teller
11/05	11	20	Tanabe-Sugano diagrams, Charge transfer bands
11/07			Coordination reactions: Kinetics, lability, chelate effects
11/12	12		Exam 2
11/14			25
11/19	13	23, 24	Organometallics
11/21		29	Bioinorganic
11/26	14	<a href="#">Physical Methods</a>	Physical methods: UV-vis and Ionization
11/28		<a href="#">Supplemental</a>	Physical methods: X-ray and NMR
12/03	15	10.2 (wikibook)	Magnetism and superconductors
12/05			Review
Finals			Final exam TBD