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Chemistry 455:
Advanced Inorganic Chemistry

I. Course Description and Learning Outcomes.

This course will be an advanced look at modern inorganic chemistry. Inorganic chemistry combines aspects from almost all areas of chemistry: general chemistry; organic chemistry; physical chemistry; analytical chemistry; and biochemistry. Becoming comfortable with **chemistry** is one of the most important goals of this course.

We will use group theory to frame our inorganic studies. Group theory is a very powerful tool for looking at the molecular world, and is particularly applicable to inorganic systems. Much of what we know about transition metal complexes and their visible spectra, vibrational modes, and electronic structures, can be explained and predicted using group theory. Carter's text, along with supplemental notes, will give us insight into this fascinating area of chemistry.

One key aspect of the course will be the use of current literature. We will draw heavily on the literature in order to apply our knowledge from the course. Chemical literature is one of the best places to learn about techniques and methodologies, and to get fresh ideas for research. The onus will, of course, be on you to read all of the assigned material. I will not necessarily cover every reading assignment in class; it will be up to you to ask questions on the readings.

I strive for **inclusive excellence** in Chem 455—*regardless of race, ethnicity, gender, sexual orientation, beliefs, socio-economic status, or cognitive ability, you should feel comfortable in this class.* If at any point you think something is amiss, please come see me.

After completing Chem 455, you should be able to ...

1. ... use molecular orbital theory to explain the structure and bonding in main-group and transition metal complexes.
2. ... use group theory to augment, and simplify, the MO description of the bonding in main-group and transition metal complexes.
3. ... explain the electronic structure of transition metal complexes using spectroscopic techniques.
4. ... explain catalytic reaction mechanisms of transition-metal organometallic complexes.
5. ... search and evaluate the modern inorganic chemical literature.
6. ... orally explain scientific ideas to your peers and instructors.

II. Course Information

Schedule for Spring Semester, 2018

	Monday	Tuesday	Wednesday	Thursday	Friday
08:00	R, P, G	Off Campus	Off Campus	R, P, G	R, P, G
09:00	R, P, G			Class Prep	Class Prep
10:00	R, P, G	455 Lec 1 A111	Meetings	455 Lec 1 A111	455 Lec 1 A111
11:00	Busy	Busy	Busy	Busy	Busy
12:00	R, P, G	R, P, G	R, P, G	R, P, G	R, P, G
13:00	R, P, G	R, P, G	R, P, G	R, P, G	R, P, G
14:00	Office Hour	Office Hour	Office Hour	R, P, G	Meetings
15:00	Off Campus	R, P, G	Meetings	Meetings	
16:00					

R, P, G stands for Research, Projects, Grading.

A. Course Materials

1. Miessler, G.L.; Fischer, P.J.; Tarr, D.A. *Inorganic Chemistry* (**Required**)
2. Carter, R.L. *Molecular Symmetry and Group Theory* (**Required**)
3. <http://pubs.acs.org>: American Chemical Society Journals
4. <http://www.rsc.org/Publishing/index.asp>: Royal Society of Chemistry Journals
5. <http://chemdac.uwsp.edu>: My URL for the course
6. <http://www.uwsp.edu/d2l/Pages/default.aspx>: Use D2L to follow your progress!

B. Supplemental Materials. The following texts will be made available in the Chemistry AV lab (A113 in the Science building). You may find them helpful when working on problem sets.

1. Physical Methods for Chemists, Russel S. Drago.
2. Chemical Applications of Group Theory, F.A. Cotton.

C. Course Assessments

1. **Problem sets:** There will be a total of 7 problem sets, each worth 60 points, and each set will contain several questions. I will, however, grade only three problems from each set. Don't try to guess which problems I'm going to grade! There will be a 10-point penalty for *incomplete* problem sets (Didn't finish a problem? Yup, that's incomplete). Late problem sets will not be accepted. I will drop the lowest problem set score.
2. **Examinations:** Examinations will take place on Tuesday evenings from 6 to 9 PM. Exams will be divided into two parts; one part will be based on lecture material, the other part on an assigned paper. I will distribute the paper one week in advance of the exams. You will have time to read the paper, assimilate it, and ask questions about it. Questions on the paper will heavily emphasize lecture material.
3. **Quizzes:** Every so often I'll give you a quiz as a "check" on your understanding. You never know...
4. **Literature reviews:** Apart from research, reading the current chemical literature is the only way to learn about chemistry! Along those lines, I will ask you to write 3 reviews. I want you to take the role of a peer reviewer- someone who evaluates articles based on their chemical merit. If you need help finding an article, come see me. I will distribute the criteria for the literature reviews and discuss them at a later date. Late literature reviews will not be accepted.
5. **Tutorials:** Stop by during the semester to talk about the material! We'll use this time to analyze articles that you review from the literature, go over material from the course, and (maybe) see how what we're learning applies to what you're interested in.
6. **Final exam.**

D. Grade Scheme

Assignment	Point Value
3 exams, 150 points each	450 points
6 quizzes, 10 points each	60 points
7 problem sets, 60 points each, lowest dropped	360 points
2 literature reviews, 50 points each	100 points
Final exam	200 points
Total points	1170 points

Total points accumulated will be converted to a percentage of the total points possible. I reserve the right to adjust these cut-off points, but in no case will the cut-off for a particular grade be higher than those listed.

Grades will be assigned according to the following scheme: 90.0-100%, A; 88.0-89.9%, A-; 85.0-87.9%, B+; 83.0-84.9%, B; 79.0-82.9%, B-; 74.0-78.9%, C+; 68.0-73.9%, C; 65.0-67.9%, D+; 60.0-64.9%, D; 59.9% and lower, F.

January 31	Last day to add or drop a 16-week course without a grade
April 6	Last day to drop a 16 wk course

E. Schedule. The course will be loosely divided between the following topics. I will adjust the length of time spent on each topic as needed. Again, group theory will be our main focus; it will be an underlying theme throughout the course. I will provide you with the relevant reading material from Carter's text as we progress.

Topics	Chapters from MFT
1. Electronic structure of atoms and simple molecules	1-5
2. Structure and bonding in transition metal complexes	9, 10
3. Electronic spectra of transition metal complexes	11
4. Organometallic chemistry of the transition metals	13
5. Modern spectroscopic techniques in inorganic chemistry	Various sources

Exam Schedule

Exam	Date	Time
Exam 1	February 27	6-9PM
Exam 2	April 3	6-9PM
Exam 3	May 1	6-9PM
Final Exam	May 17	2:45 to 4:45PM

F. Etiquette and Inclusive Excellence. It is absolutely essential that you show respect to your peers and your instructor. As such, the following will **not** be tolerated:

a. Cell phones/iPhones/other electronic devices. **Turn them off during class.**

b. Improperly formatted e-mails. **Sending an e-mail is not like texting or tweeting.** A properly formatted e-mail should look like a letter, with a subject, salutation, body, and "signature". E-mails are routinely used as a way of effectively communicating ideas. Poorly written e-mails only serve—at best—to confuse and annoy the reader, and—at worst—to portray you as uneducated.

G. Academic Misconduct

Full information on academic misconduct can be found at: <http://www.uwsp.edu/dos/Pages/Academic-Misconduct.aspx>. Academic misconduct is a serious matter, with a wide-range of penalties. Please familiarize yourself with faculty, staff, and student rights and responsibilities regarding academic misconduct.

Academic misconduct is serious, and puts tremendous stress on everyone involved. When in doubt, come see me!

H. Disability Services. There are a number of resources available for students with documented disabilities. A full listing of them can be found at <http://www.uwsp.edu/disability/Pages/default.aspx>. Please be aware that, in order to take advantage of some of the services, you must provide me with an Accommodation Request Form I will sign. You must return the form to Disability Services.