Course Syllabus
Chemistry (CHE) 503 – Inorganic Chemistry – Fall 2016
Mon, Wed, Fri • 10:00AM – 10:50 AM • Hoch 139

Instructor Information:
Dr. Timothy R. Cook
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Office Hours
Wed 12:00 – 1:30 PM, 856 NSC
or by appointment (arrange in class or by email)

1 - Course Description:

CHE 503 is a graduate level course meant to establish proficiency in advanced topics of relevance to inorganic chemistry. Symmetry and group theory will be used to explore atomic and molecular properties relevant to bonding, spectroscopy, and reactivity in the context of transition metal complexes.

2 - Academic Topics:

2.1 – Structure:

2.1.1 - Atomic Structure and Properties
2.1.2 - Simple Theories of Bonding and Molecular Geometries
2.1.3 - Symmetry and Group Theory
2.1.4 - Theories of Bonding
2.1.5 - Donor-Acceptor Chemistry
2.1.6 - Electronic Structure and Magnetism
2.1.7 - Symmetry and Spectroscopy (Electronic and Vibrational)

2.2 – Reactivity:

2.2.1 - Nomenclature and Electron Counting
2.2.2 - Ligand substitution mechanisms
2.2.3 - Metal-centered reaction mechanisms
2.2.4 - Exemplary catalytic transformations
2.2.5 - Resources for the practicing researcher

3 - Student Learning Outcomes and Course Requirements

The objectives summarized in the left column will be assessed by four problem sets, two midterm exams, and a final exam. A timeline for these assessments is given in Section 4 - Academic Content.

Successful completion of CHE503 indicates proficiency in the following concepts and/or objectives:	*The specific objects given in the right column will be assessed by:*[§]
-Quantum numbers and atomic wave functions/orbitals as the basis for two-center two-electron bonding and molecular geometries -Symmetry elements and operators, character tables, and point group assignments.	PS1 Midterm Exam 1 Final Exam
-Chemical applications of group theory: using theories of bonding to construct molecular orbital diagrams and predict electronic and magnetic properties. -Inorganic nomenclature and electron counting.	PS2, PS3 Midterm Exam 1 Midterm Exam 2 Final Exam
-Mechanisms of ligand- and metal-centered reactivity including ligand substitutions and redox chemistry of relevance to catalytic transformations. -Utilizing SciFinder and other databases and resources for chemistry research	PS3 Midterm Exam 2 Final Exam

[§]Specific objective/assessment groupings may vary. Changes will be discussed in advance during lecture.

4 - Academic Content: Calendar

Week	Mon, Wed, Fri	Assignments and notes (for dates in bold)‡
1	Aug. 29, 31, Sept. **2**	No class: Fri, Sept. 2
2	Sept. **5**, 7, 9	No class: Mon, Sept. 5 (Labor Day)
3	Sept. 12, 14, **16**,	PS1 Due: Fri, Sept. 16
4	Sept. 19, 21, 23	
5	Sept. 26, 28, **30**	PS2 Due: Fri, Sept. 30
6	Oct. **3** Oct. 5, 7	No class: Mon, Oct. 3
7	Oct. 10, **12**, **14**	Midterm Exam 1: Wed, Oct. 12
8	Oct. 17, 19, 21	
9	Oct. 24, 26, 28	
10	Oct. 31, Nov. 2, **4**	PS 3 Due: Fri, Nov. 4
11	Nov. 7, 9, 11	
12	Nov. 14, 16, **18**	Midterm Exam 2: Fri, Nov. 18
13	Nov. 21, **23, 25**	No class: Wed, Nov. 23 and Fri, Nov 25 (fall recess)
14	Nov. 28, 30, Dec. 2	
16	Dec. 5, **7**, 9	PS 4 Due: Wed, Dec. 7
Final	Dec. 16	Room: NSC 218*

‡due dates are tentative; changes will be announced with adequate notice. *note room is different from lecture.

5 - Grading Policy

Problem Sets: 30%
Midterm Exam 1: 15%
Midterm Exam 2: 15%
Attendance and Participation: 10%
Final Exam: 30%

Final grades will be norm-referenced.

Exams missed for permissible reasons may be rescheduled for a time outside of class to be arranged with the instructor. A score of 0 will be given unless suitable documentation justifying the absence is provided.

Scores for late problem sets have a half-life of one week:

$$Late\ Grade = Grade * \left(\frac{1}{2}\right)^{\frac{days\ late}{7}}$$

The University's policy on Incomplete Grades can be found at:
http://grad.buffalo.edu/Academics/Policies-Procedures/Grading-Procedures.html

6 - Academic Integrity

This course will operate under the University's graduate policy regarding academic integrity:
http://grad.buffalo.edu/Academics/Policies-Procedures/Academic-Integrity.html

7 - Accessibility Resources

Resources are available for students with physical and/or learning so as to provide an equal opportunity to succeed in this course. The UB's Accessibility Resource Office (25 Capen Hall) requires registration to receive these accommodations. More information may be found at:
http://www.student-affairs.buffalo.edu/ods/

8 - Academic Content: Texts

Primary Text:

Miessler, G. L.; Tarr, D. A. *Inorganic Chemistry*, *5th Ed.* Upper Saddle River, NJ: Prentice Hall, 2013. ISBN: 0321811054

-Coursework and readings are designed to be compatible with previous editions. The text has been placed on reserve in the Silverman Library.

Additional Reading:

The following books are excellent additional resources on the themes of this course. They are a valuable addition to the library of any chemist, particularly inorganic students, but are not required for the course. Copies have been placed on reserve in the Silverman Library.

Cotton, F. A. *Chemical Applications of Group Theory*, *3rd Ed.*

A widely recognized text focused entirely on group theory and symmetry with many practical examples. Provides the linear algebra necessary for a mathematical understanding of symmetry operations and elements, and how these are organized into groups.

Harris, D. C.; Bertolucci, M. D. *Symmetry and Spectroscopy*

A low-cost (~$13 new) book with an excellent introduction to group theory its applications to electronic and vibrational spectroscopy. The sections using stereographic projections to describe symmetry elements and operators may be useful to visual learners.

Cotton, F. A.; Wilkinson, G.; Murillo, C. A.; Bochmann, M. *Advanced Inorganic Chemistry* , *6th Ed.*

A classic general reference text for inorganic chemistry with many examples of complexes and reactivity for metals in specific oxidation states. In addition to descriptive sections on various groups of compounds, sections on coordination geometries and bonding are provided.

Spessard, G. O.; Missler, G. L. *Organometallic Chemistry*

Sharing an author with the primary text, this book overlaps somewhat in its descriptions of bonding and molecular orbital theory, but focuses exclusively on organometallic systems. Due to its narrower scope, it provides a fuller treatment of reactivity and mechanisms.