

## Syllabus

### Chem 520 B. ADVANCED INORG CHEM

Instructor: Dr. Jing Gu

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Class Schedule: Tues. & Thurs. 12:30-1:45 pm, GMCS 327

Office Hours and Location: By appointment on Tues. or Thurs., Zoom or In-person

### Textbooks:

Crabtree, Robert H. The Organometallic Chemistry of the Transition Metals, 4th Ed., John Wiley & Sons. 2005 (ISBN-13: 978-0471662563).

Turro, Nicholas J. Modern Molecular Photochemistry. 1991 (ISBN-10: 0935702717)

### Prerequisite

We will be building on some of the concepts you learned in Chem 520A.

**Course Description:** This course is intended for Chemistry, Materials Science, Physics, and Geology majors, and is designed to prepare students for further research in Inorganic Chemistry, Materials Science, Nanotechnology, Renewable Energy or, more generally, employment in physical or materials sciences fields. The course content will include advanced concepts in structure, bonding, and chemical/physical properties of inorganic compounds, understanding of which is central to the study of all areas of chemistry. The course will rely both on the books and literatures. Not all material in the text book will be covered and not all material covered will be found in the textbooks. Additional reading from primary literatures and presenting will be an integral part of this course. This course cannot be exhaustive in its coverage of organometallic chemistry but it is hoped that it will serve as a rational foundation of self-development in further studies.

### Major topics will include:

- 1) Introduction to Current Inorganic Related Topics: Inorganic Materials, Renewable Energy, Catalysis, Nanotechnology, Functional Materials (length: 1 week)
- 2) Brief introduction of solid state chemistry and Semiconductor photophysics and photovoltaic characterization (length: 1 week)
- 3) Coordination Compounds/Organometallics (including 18-electron rule, oxidation state, molecular orbital theory, Survey of Various Ligand Types, Elementary Organometallic Reactions) (length: 8-10 weeks)
- 4) History and Current Advanced Topics in Inorganics/Organometallics (length: 2 weeks)
- 5) Photochemical and Photophysical Properties of Organometallic Compounds (length: 2 weeks)

### **Expected Outcomes:**

#### **Upon completion of Chemistry 520B, students should be able to:**

- Apply knowledge obtained in this class to problem solving and critical thinking in the field of Inorganic Chemistry.
- Master Inorganic Chemistry concepts, knowledge, histories
- Understand the direction of future Inorganic Chemistry
- Utilize knowledge gained from this class to perform logic thinking and utilize concepts and theories to predict the properties of common/general Inorganics/Organometallics.
- Grasp the advanced knowledge to characterize inorganic materials and organometallic molecules by physical and spectroscopic means, including UV-vis, fluorescent, and ultra-fast techniques etc.
- Develop the skill set necessary to continue on to further Inorganic Chemistry graduate Research.

### **Examinations and Points:**

Attendance and class performance: 100 points

Presentations: 200 points

In-class quiz: 200 points

Homework: 200 points

Final Exam: 300 points

Total points: 1000 points (100%)

**Grading:** A: 90-100%, A<sup>-</sup>: 85-89%, B<sup>+</sup>: 80-85% B: 75-79% B<sup>-</sup>: 70-75% C: 60-69%, D: 50-59%, F < 50%

Other useful course materials: peer reviewed Journal papers in: Journal of American Chemical Society; Inorganic Chemistry; Nature Materials; Energy & Environmental Science

I will teach primarily from the required text, with occasional use of the suggested text, as well as other texts, literature works, internet videos, etc.