CHEMISTRY 150—Inorganic and Materials Chemistry Laboratory
Spring 2012 Course Syllabus

Instructor: Erik Menke, emenke@ucmerced.edu, tel. 209.228.4187, office SE 358.
TA: Cory Sobotta

Meeting Times and Location
Section 1: M 11:30-5:20 pm, room SE 118
Section 2: T 12:00-5:50 pm, room SE 118

Office Hours: As I am the primary instructor for the lab and will be in the lab with you for most of the lab time, I have not scheduled office hours. However, I am happy to meet with students at other times, either by appointment or whenever you can find me in my office. I will also try to respond promptly to e-mails.

Course Description: Laboratory experiments focusing on the synthesis and characterization of inorganic compounds.
Prerequisite: CHEM 120, which may be taken concurrently.

Course Purpose and Goals: Synthetic chemistry, whether organic or inorganic, requires attention to detail and a strong understanding of the underlying chemical behavior. CHEM 150 provides the students with an opportunity to learn and practice various synthesis techniques (Schlenk lines, glovebags, chromatography, etc.), analyze the synthesized products using various instrumental methods (NMR, FTIR, cyclic voltammetry, etc.), and communicate their results and findings.

Course Learning Outcomes: Upon completion of CHEM 150, students should have mastery of the fundamental skills and knowledge associated with inorganic lab techniques as well as communication and teamwork skills. In addition, students should have a highly developed understanding of scientific methodology, citizenship, ethics, and the role of chemistry in society. Specifically, at the end of the semester students should be able to:

- Synthesize a variety of inorganic, organometallic, and bioinorganic compounds using standard methods and procedures.
- Operate a number of common instruments, such as XRD, NMR, and FTIR, to characterize inorganic compounds, as well as interpret the resulting data.
- Write clear, concise, and correct (scientifically as well as grammatically) lab reports that include appropriate citations to the chemical literature.
- Work safely and effectively in an inorganic chemistry lab, both individually and with others.
- Conduct themselves ethically and responsibly in a scientific context.

Relationship to Program Learning Outcomes and Program Requirements: All Chemical Sciences majors are required to successfully complete CHEM 150. This course addresses all four of the learning outcomes for the Chemical Sciences program:

- Fundamental knowledge and skills. As a lab course, CHEM 150 provides an opportunity for the students to practice a variety of synthetic chemistry techniques.

- Scientific methodology. CHEM 150 requires the students to both gather and interpret data based on experiments they perform, and critically analyze these results based on their knowledge of the system studied.
- Communication and teamwork skills: CHEM 150 requires written lab reports on each lab performed, and a number of the labs are done either with partners or in groups.
- Ethics, citizenship, and role of chemistry in society: In a lab course, students must be completely honest and ethical in their reporting of experimental results, and must often grapple with "gray areas" such as when it is permissible to "throw out" a piece of data.

Course Structure: This course consists of nine experiments in synthetic inorganic chemistry. Some of these experiments will be done individually, which means that you will be allowed and encouraged to discuss the experiments with other students, but you will be responsible for obtaining and interpreting your own data. Due to space and equipment limitations a number of these experiments will be done in small groups on a rotating basis. Each experiment is allocated between one and two class periods depending on its length and complexity.
While I will start each experiment with a brief explanation of the procedure and expected results, you will need to read and think about the procedure before you come to lab, as well as carry out any preliminary calculations that will be necessary for your experiment. This is both to make sure that you are spending your time in the lab efficiently, as well as to ensure that you are working safely.

Each student will hand in a typed lab report for each of the nine experiments. These lab reports are to be prepared individually, even for experiments done with others. The lab reports are due fourteen days after the end of each experiment. Your lowest short score will be dropped.
There are no quizzes or exams for this course. However, for each experiment I will evaluate your performance and assign a score of zero, one, or two points. A number of factors will be taken into consideration for this performance score, including your preparedness, efficiency in the lab, cleanliness, safety, and doing your fair share when working in groups.

Grading System: CHEM 150 can only be taken for a letter grade. Grades in CHEM 150 will be based on lab reports and in-lab performance evaluations according to the following scales:

Best 8 lab scores (lowest dropped) @ 9 points each	72 points
9 lab skill evaluations @ 2 points each	18 points
Lab notebook	10 points
Total	100 points

Grades will be assigned according to a standard 10-point scale, with +/- to be left to the instructor's discretion.

Notebook: The lab notebook is a permanent record of your work and all scientists keep notebooks for later reference. The basic guideline is simple. A scientist with your level of training should be able to take your notebook and reproduce exactly what you have done in your notebook. This is not difficult to achieve, but it does require practice and diligence. Your notebook must always be current and complete. This means that you need to write what you have done, as you do it. Do not take notes on a separate piece of paper and transcribe them to your notebook at a later time. Do not write your notes from memory during dinner. Your notebook is not meant to be neat or pretty, but current and complete.

A complete notebook has:

- Sequential page numbers.
- All notes in permanent ink (black or blue).
- Dates and times when procedures are performed or data recorded
- All data, either written in a table or glued securely

Lab Reports: A formal lab report is required for each experiment from each student that performs the experiment (i.e. each student will turn in their own report). Reports are to be written as if you were submitting the work for publication as a communication article to the ACS journal *Inorganic Chemistry*. You can find the author guidelines at http://pubs.acs.org/paragonplus/submission/inocaj/inocaj_authguide.pdf as well as a MS Word template at http://pubs.acs.org/page/inocaj/submission/templates.html. The names of all the students who worked on the lab must be listed as authors, with the student submitting the report listed as the first author. In addition, you must address all of the questions posed at the end of the experiment in the lab text. This must be done in the body of the report, as there is no "Answers" section in journal articles.

Required Materials:
Text: "Synthesis and Technique in Inorganic Chemistry: A Laboratory Manual" 3rd edition, by Gregory S. Girolami, Thomas B. Rauchfuss, and Robert J. Angelici. ISBN 978-0935702484.

Other Materials:

-A bound laboratory notebook.
-Safety goggles.
-A lab coat.
-A USB drive (for saving data from instruments).

Class Policies: While you are in the lab, I expect you to act in a professional and responsible manner. This means that you should show up to each lab period on time and prepared to work, dressed in the appropriate attire. You should be focused on what is happening in the lab. This means that you should not be surfing the internet, texting your friends, or having conversations on the phone. While there will be downtime during some of the experiments, you should use that time to your advantage, i.e. asking questions, working on your lab reports, interpreting results, etc.

Safety: Inorganic and organometallic compounds are generally more toxic, carcinogenic, and reactive than organic compounds. In addition, a number of experiments are in this lab are carried out under vacuum or high-pressure conditions. For these reasons, you are expected to wear goggles and a lab coat at all times. In addition, if you are presenting a serious risk to either yourself or those around you, I will not hesitate to kick you out of the lab.

Academic Integrity: This is a topic that I take very seriously. While I understand that shortcuts are attractive, they very rarely end up helping in the long run. Dishonest practices, like cheating and plagiarism, typically prevent you from understanding the material, which is ultimately why you are here in school. A full description of the University policy, as well as the judicial process and potential penalties, can be found on the student life website (studentlife.ucmerced.edu/what-we-do/student-judicial-affairs/academicy-honesty-policy). Students should be familiar with the University policy as anyone caught violating it will be dealt with harshly.

Disability Services: A disability should not impede learning. To this end, UC Merced provides a number of options to help students with disabilities succeed in their academic career. If you have a disability, I encourage you to contact the University Disability Services Office to find out how they can help. You can find more information on their website (disability.ucmerced.edu), e-mailing them at disabilityservices@ucmerced.edu, or calling them at 209.228.6996.

Schedule (subject to revision)

Lab starting on:

January 21st:
Class overview. Lab safety. Lab report expectations. No report due.

Working in groups of 2:
January 28th:
Synthesis of the layered solids VO(PO4)(H2O)2. 2 periods.

February 11th:
Preparation of molecular sieve Zeolite-X. 2 periods.

February 25th:
Tin chemistry. 2 periods.

Working in groups of 4, rotating through
March 11th:
Synthesis of YBa2Cu3O7. 1 periods.

March 18th:
Paramagnetic Mn(acac)3. 1 periods.

April 1st:
Microscale synthesis of IrCl(CO)[P(C6H5)3]2. 1 periods.

April 8th:
C60 and its electrochemistry. 1 periods.

April 15th:
Copper (II) Tetraphenylporphyrinate. 2 periods.

Working in groups of 2, same week:
April 29th:
Four-coordinate Nickel (II) Complexes. 2 periods.