Prerequisites: 4:170 (Adv. Inorg. Chem.) or the equivalent: This course provides a comprehensive introduction to various characterization methods that are applied to inorganic chemical systems. This course will examine the chemical and physical characterization of molecular (solution and solid-state) and extended solid-state structures by NMR and EPR, magnetic susceptibility, and X-ray methods (powder and single-crystal diffraction and photoelectron spectroscopy). The utility and limitations of a variety of physical characterization methods will be emphasized, as will the interplay between structure and properties of "real world" examples. Emphasis will be given to characterization methods available at UI.

Instructor: Prof. Edward Gillan
Contact information: email (edward-gillan@uiowa.edu), phone (335-1308)
Office hours (W325 CB): Mon/Wed 10:00 - 11:30 am and by appointment
Course info including handout copies and exam solutions will be available on our ICON web site

Suggested Texts: Selected chapters from relevant texts will distributed at appropriate points in the course (page 3 of syllabus for details): Drago (Physical Methods for Chemists); Ebsworth et al. (Structural Methods in Inorganic Chemistry, 2nd ed.); Derome (Modern NMR Techniques for Chemistry Research); West (Solid State Chemistry and its Applications); Cheetham and Day [Solid State Chemistry Techniques (vol. 1) and Compounds (vol. 2)]; Glusker et al. (Crystal Structure Analysis for Chemists and Biologists); Jolly (The Synthesis and Characterization of Inorganic Compounds).

Course grading (500 total points, +/- course grades will be given):
5 Problem sets @ 20 points each = 100 pts (20%)
2 In-class exams @ 100 points each = 200 pts (40%)
Research paper and short oral presentation (end of semester) = 100 pts (20%)
Cumulative final exam = 100 pts (20%)

Approx. lecture dates | General topics | Reference texts
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Jan. 19 - 28 | Course introduction and NMR basics | Pavia(3,4), Ebsworth(2)
 |  | Drago(7), Freibolin(1-6)
Feb. 2 - 11 | More inorganic NMR; solid state issues | Ebsworth(2), Drago(8)
 |  | Cheetham(6)
Feb. 16, 18 | EPR spectroscopy measurements | Ebsworth(3), Drago(9)
Thursday, February 25th | First In-class Exam |
Feb. 23 - March 4 | Magnetism in inorganic systems | Drago(11), Cheetham(4)
 |  | Jolly(25)
March 9 - 11 | XPS and related photoelectron spectroscopies | Cheetham(3), Drago(16)
 | Spring recess March 16-18 |  | Ebsworth(6)
March 18 - Apr. 8 | Crystal structures and X-ray diffraction | West(5-7), Cheetham(2)
 | ACS meeting March 21-25 |  | Drago(17), Ebsworth(8)
Thursday, April 15th | Second In-class Exam |
April 15 - 27 | Single crystal X-ray diffraction methods | Drago(17), Ebsworth(8)
 |  | Glusker(various)
April 29 - May 6 | Case study student oral presentations |
Final Exam (#8) Tuesday, May 11, 2010 from 9:45 - 11:45 am
Note on problem set assignments and grading: While you may engage in general discussions about the homework problems with your classmates, your answers must be in your own words and be a product of your independent reasoning. These are intended as individual assessments of your problem solving abilities and are not group assignments unless otherwise stated.

Any questions about grades and scores received for course assignments should be directed to Prof. Gillan. General class score and point distributions will be periodically posted on the class web site and individual cumulative scores may be obtained from Prof. Gillan.

Collegiate Guidelines
Your responsibilities to this class, and to your education as a whole, include attendance and participation. You are also expected to be honest and honorable in your fulfillment of assignments and in test-taking situations (the College's policy on plagiarism and cheating is on-line: http://www.clas.uiowa.edu/students/academic_handbook/). You have a responsibility to the rest of the class and to the instructor to help create a classroom environment where all may learn. At the most basic level, this means that you will respect the other members of the class and the instructor, and treat them with the courtesy you hope to receive in turn. All students in the College have specific rights and responsibilities. You have the right to adjudication of any complaints you have about classroom activities or instructor actions. Information on these procedures is available in the Schedule of Courses and on-line in the College's Student Academic Handbook (http://www.clas.uiowa.edu/students/academic_handbook/).

Any complaints with the operation of this course should be initially directed to Prof. Gillan. This includes any issues with course requirements, exams, and grading. Students in need of additional information may contact staff in the Chemistry Center (231 CB) during normal business hours. This course is given by the College of Liberal Arts and Sciences. This means that class policies on matters such as requirements, grading, and sanctions for academic dishonesty are governed by the College of Liberal Arts and Sciences.

Academic Fraud. Plagiarism and any other activities that result in a student presenting work that is not his or her own are academic fraud. Academic fraud is reported to the departmental DEO and then to the Associate Dean for Academic Programs and Services in the College of Liberal Arts and Sciences who deals with academic fraud according to these guidelines: www.clas.uiowa.edu/students/academic_handbook/ix.shtml

Americans with Disabilities Act. Guidelines for Students with Disabilities: I would like to hear from anyone who has a disability, which may require some modification of seating, testing, or other class requirements so that appropriate arrangements may be made. Please contact me after class or during my office hours. See www.uiowa.edu/~sds/

Understanding Sexual Harassment. Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. See www.sexualharassment.uiowa.edu/

Reacting Safely to Severe Weather. If severe weather is indicated by the UI outdoor warning system, class members will seek shelter in the innermost part of the building, if possible at the lowest level, staying clear of windows and of free-standing expanses which might prove unstable. The class will resume after the severe weather has ended. See the Operations Manual section 16.14, i.
Details on several 4:204 suggested reading materials
(data from Infohawk - some are being put on course reserve across the street in the Geoscience Library)

Drago, Russell S.; Physical methods for chemists /2nd ed.
Geoscience Locked reserve QD453.2.D7 1992

Ebsworth, E. A. V.; Structural methods in inorganic chemistry
Geoscience Course Reserve QD95.E29 1991

Derome, Andrew E.; Modern NMR techniques for chemistry research
Geoscience Locked reserve FOLIO QD96.N8 D47 1987

Friebolin, Horst; Basic one- and two-dimensional NMR spectroscopy
Main Chemistry Collection QP519.9.N83 F7513 1993

Pavia, Donald L.; Introduction to spectroscopy: a guide for students of organic chemistry
Main Chemistry Collection QD272.S6 P38

West, Anthony R.; Solid state chemistry and its applications
Main Chemistry Collection QD478.W47 1984

West, Anthony R.; Basic solid state chemistry
Main Chemistry Collection QD478.W47 1988

Cheetham, Anthony R. and Day, Peter; Solid state chemistry: techniques
Main Chemistry Collection QD478.S634 1987

Glusker, Jenny Pickworth; Crystal structure analysis for chemists and biologists
Main Chemistry Collection QD945.G583 1994

Jolly, William L.; The synthesis and characterization of inorganic compounds
Hardin Library For Health Sci Chemistry Collection QD156.J65 1991