This graduate course is a comprehensive introduction to the language and techniques of solid-state and materials chemistry. Emphasis will be on synthetic approaches to inorganic materials and the utility/limitations of a variety of physical characterization methods. The interplay between structure and properties of "real world" examples is described with heavy weight placed on extended bonding in solids.

Instructor: Prof. Edward Gillan  
Contact info: email (edward-gillan@uiowa.edu), phone (335-1308)  
Office hours (W325 CB): Tuesday/Thursday (8:30-9:30 AM) and by appointment.

Course web page: see ICON for news updates, handout copies, problem set solutions, exams, web links

Texts: *Solid State Chemistry* 2nd ed. by A. R. West (required, ISBN: 9781119942948). ICON has link to e-book version of text. Other handout supplements from; *Solid State Chemistry Techniques* (vol. 1) and *Compounds* (vol. 2) by A. K. Cheetham and P. Day; assorted research articles and reviews.

Course grading (450 total points, +/- course grades will be given):
- 5 Problem sets @ 20 points each = 100 pts (22 %)
- 2 In-class 50-min exams @ 100 points each = 200 pts (45 %)
- Final exam (2 hr cumulative) = 150 pts (33 %)

Class assignment scores and point distributions will be updated on the ICON web site after each exam. Since this is a graduate level course, the average course grade will be near the B+/A- level (~3.5 GPA).

**Approx. dates** | **General topics (approx. # of MWF lectures)** | **West Text Chapters**
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Week 1 - 2 | General preparative and crystal growth methods (4.5) | Chp. 4 and handouts
Week 2 - 4 | Atomic packing in solids and crystal structure types (5) | 1, 2 [PS1]
Week 4 - 5 | Bonding descriptions, energetics, and defects (2) | 2, 3
Week 5 - 7 | X-ray diffraction: theory and practice (6) | 5 [PS2]

**Friday October 11th (week 7)** | **First Exam (in class)** |  
Week 8 - 9 | More XRD, solid solutions, powder structure solutions (3) | 5, parts of 1 & 2
Week 9 - 10 | MO to band structure approach to solids (3) | 3, handouts [PS3]
Week 10 - 11 | Electrical and optical properties and semiconductors (3) | 8, parts of 10
Week 11 - 12 | Magnetic properties of solids: local and extended (3) | 9
Week 12 | Superconductivity: properties and structures (2) | 8
Week 13 | Thermal analysis: TGA, DTA, DSC (1.5) | 6.4, handouts [PS4]

**Friday, November 22nd (week 13)** | **Second Exam (in class)** |  
Week 14 | Low dimensional solids: layered and chain structures (2) | 8, supplements
Week 14 - 15 | Organic polymeric conductors and inorganic topics (4) | 8, supplements [PS5]

**Cumulative Final Exam:** time/date TBA after Registrar determines final exam schedule.

**Note on Problem Set Assignments:** You may engage in *general discussions* about the homework problems with your classmates, but your work and answers must be a product of your *independent* reasoning and words. These are individual assessments of your problem solving abilities and not group assignments. Some of our text's book problems have posted abbreviated online solutions, but these are not sufficient for full credit answers.
Absences and Attendance. Students are responsible for attending class and for contributing to the learning environment of a course. Students are also responsible for knowing their course absence policies, which will vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, including Holy Day obligations, unavoidable circumstances, or University authorized activities (https://clas.uiowa.edu/students/handbook/attendance-absences). Students may use this absence form to aid communication; the instructor will decide if the absence is excused or unexcused (https://clas.uiowa.edu/sites/default/files/ABSENCE%20EXPLANATION%20FORM2019.pdf).

Academic Integrity. All undergraduates enrolled in courses offered by CLAS have, in essence, agreed to the College's Code of Academic Honesty. Misconduct is reported to the College, resulting in suspension or other sanctions, with sanctions communicated with the student through the UI email address (https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code).

Accommodations for Disabilities. UI is committed to an educational experience that is accessible to all students. A student may request academic accommodations for a disability (such as mental health, attention, learning, vision, and physical or health-related condition) by registering with Student Disability Services (SDS). The student is then responsible for discussing specific accommodations with the instructor. More information is at https://sds.studentlife.uiowa.edu/.

Administrative Home of the Course. The College of Liberal Arts and Sciences (CLAS) is the administrative home of this course and governs its add/drop deadlines, the second-grade-only option, and related policies. Other colleges may have different policies. CLAS policies may be found here: https://clas.uiowa.edu/students/handbook.

Communication and the Required Use of UI Email. Students are responsible for official correspondences sent to the UI email address (uiowa.edu) and must use this address for all communication within UI (https://opsmanual.uiowa.edu/human-resources/professional-ethics-and-academic-responsibility#15.2).

Complaints. Students with a complaint about an academic issue should first visit with the instructor or course supervisor and then with the Chair of the department or program offering the course; students may next bring the issue to the College of Liberal Arts and Sciences. For more information, see https://clas.uiowa.edu/students/handbook/student-rights-responsibilities.

Final Examination Policies. The final exam schedule is announced around the fifth week of classes; students are responsible for knowing the date, time, and place of a final exam. Students should not make travel plans until knowing this information. No exams of any kind are allowed the week before finals. Visit https://registrar.uiowa.edu/final-examination-scheduling-policies.

Nondiscrimination in the Classroom. UI is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious, or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University's Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity (https://diversity.uiowa.edu/office/equal-opportunity-and-diversity).

Sexual Harassment. Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community must uphold the UI mission and contribute to a safe environment that enhances learning. Incidents of sexual harassment must be reported immediately. For assistance, please see https://osmrc.uiowa.edu/.