

Chemistry 455  
Chemical Nanotechnology  
**4 units**

Prof. Michael Inkpen  
Spring 2020  
(Lecture = 12:00–12:50 pm MWF)  
SGM 226

CHEM 455 is an upper-division undergraduate course in Chemical Nanotechnology. The intent of this course is to describe how properties change when reducing the size of solids to the nanoscale, and explain, using concepts of solid-state chemistry and physics, why these changes occur. Representative properties that may be covered include optoelectronic properties, magnetic properties, dielectric properties, and superconductivity. *Prerequisite: CHEM 322aL or CHEM 325aL.*

**Required Texts:** West, *Solid State Chemistry and its Applications* (2<sup>nd</sup> Ed.)

**Supplemental Texts:** Owens & Poole, *The Physics and Chemistry of Nanosolids*  
Smart & Moore, *Solid State Chemistry: An Introduction*  
Kittel, *Introduction to Solid State Physics*

**Office/Contact:** LJS 250 ([inkpen@usc.edu](mailto:inkpen@usc.edu)); office hours by appointment.

**Grading:**<sup>†</sup>

Final Exam:	40% (May 8, 11 am-1 pm)
Critical Review:	30% (due May 4)
Solid-State Structure Report: <sup>‡</sup>	10% (due February 19)
3 x Problem Sets:	10% (tentatively due February 3, March 9, April 6)
Pop Quizzes:	10% (given periodically throughout semester)

<sup>†</sup> **There will be absolutely no make ups, extra time, or special arrangements given for any exams, problem sets, or projects.**

<sup>‡</sup> **Based on a Field Trip to the Natural History Museum on February 5.**

**Outline:**

- I. Introduction, Feynman Lecture
- II. Solid-State Structures
- III. Ionic Bonding
- IV. Defects in Ionic Solids
- V. Diffraction
- VI. Phase Transitions
- VII. Optoelectronic Properties of Solids
- VIII. Other Properties of Solids [time permitting]

**Academic Conduct:**

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” <https://policy.usc.edu/scampus-part-b/>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

**Support Systems:**

*Student Counseling Services (SCS)* - (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. <https://engemannshc.usc.edu/counseling/>

*National Suicide Prevention Lifeline - 1-800-273-8255*

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org>

*Relationship & Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call*

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

<https://engemannshc.usc.edu/rsvp/>

*Sexual Assault Resource Center*

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: <http://sarc.usc.edu/>

*Office of Equity and Diversity (OED)/Title IX compliance – (213) 740-5086*

Works with faculty, staff, visitors, applicants, and students around issues of protected class. <https://equity.usc.edu/>

*Bias Assessment Response and Support*

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response.

<https://studentaffairs.usc.edu/bias-assessment-response-support/>

*Student Support & Advocacy – (213) 821-4710*

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. <https://studentaffairs.usc.edu/ssa/>

*Diversity at USC – <https://diversity.usc.edu/>*

Tab for Events, Programs and Training, Task Force (including representatives for each school), Chronology, Participate, Resources for Students.

**Learning Experience Evaluations** will be conducted toward the end of the semester. This will be your opportunity to provide feedback about your learning experience in the class. This feedback helps the instructor determine whether students are having the intended learning experiences for the class. It is important to remember that the learning process is collaborative and requires significant effort from the instructor, individual students, and the class as a whole. Students should provide a thoughtful assessment of their experience, as well as of their own effort, with comments focused on specific aspects of instruction or the course. Comments on personal characteristics of the instructor are not appropriate and will not be considered. For this feedback to be as comprehensive as possible, all students should complete the evaluation.