CHEM 584 Introduction to Materials Chemistry
Fall, 2008

MWF, 2:00 – 2:50 pm
163 Noyes

4 Hours
Course Registration Number 46582

website: http://www.scs.uiuc.edu/~chem584/

Instructor: **Ken Suslick**, A420 CLS, 333-2794, email: ksuslick@uiuc.edu
Office Hours by appointment, anytime except Monday a.m. and MWF 12-2 pm

TA: **Eric Brueckner <ebrueck2@illinois.edu>**, 3011 MRL, 265-5068
Office Hours: Wed., 3-4 pm in 212 CA or Thurs., 11-12 3011 MRL

Prerequisites: Undergrad organic chemistry, inorganic chemistry, and physical chemistry.

Textbook: Callister, William D
Materials Science and Engineering: An Introduction
John Wiley & Sons 2007; 721 pages, $105.60 new (Hardcover)

\+ Other Primary Literature and Current Reviews to be handed out in class.

Grading Policy:

Homework:	100 points possible
Midterm Exam:	100 points possible
Final Exam:	150 points possible

Homework: Homework problems will be assigned approximately weekly, graded, and returned to you. Assigned homework problems are due by the beginning of class on the due date. Late assignments will be assessed a 50% penalty; no credit will be given for homework turned in after the homework solutions are posted.

Grading will be assigned based on the total points accumulated.
The +/- grading scheme will be used for course grades.
The grading distribution will be B's ~ A's >> C's.

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Course Syllabus, Fall 2008

Date	Topic	reading assignments
8/25	Solid State Structures & Unit cell basics	Chapters 1 and 3
8/27	Metallic crystal structures	
8/29	Metallic crystal structures	
9/1	Labor day: No class	
9/3	Imperfections in crystals	Chapter 4
9/5	Imperfections in crystals	
9/8	Diffusion in the solid State	Chapter 5
9/10	Diffusion in the solid State	Chapter 5
9/12	Electronic structure of solids	Handout
9/15	Electronic structure of solids/ band theory	
9/17	Electronic structure of solids/ band theory	
9/19	k-Space	Handout
9/22	Brillouin Zone	
9/24	Phase Diagrams	Chapter 9, 10
9/26	Phase Diagrams/ Chemistry of Fe	
9/29	Thin films: Vapor Deposition	Handout
10/1	Thin films: Vapor Deposition, Intro to Vacuum Technology	Handout
10/3	No Lecture	
10/6	Thin films: Vapor Deposition	
10/8	Thin films: Wet Chemical Deposition	
10/10	Inorganic nanoparticles/powders Synthesis	Handout
10/10	Inorganic nanoparticles/powders Synthesis	
10/13	Nanoscale Materials	
10/15	MIDTERM EXAM	
10/17	Nanoscale Materials	
10/20	Ceramics/Ionic crystal structures/ Ceramic Structures /	Chapter 12, 13
10/22	Silicates, Clays, Zeolites/ Processing of Ceramics	
10/24	No Lecture	
10/27	Intro to Polymers/ Types of polymerization reactions	Chapter 14, 15
10/29	Polymers continued	
10/31	Polymers continued	
11/3	Mechanical properties of materials	Chapters 6,7,8
11/5	Mechanical properties of polymers	
11/7	Mechanical properties: Dislocation & Deformation	
11/10	Mechanical properties: failure, fracture, fatigue, creep	
11/12	Electrical properties of materials	Chapter 18
11/14	Electrical properties of materials/ Semiconductors	
11/17	Electrical properties of materials/ Semiconductors	
11/19	Ferroic Materials	Chapter 20
11/21	Ferroic Materials	
11/24	Thanksgiving holiday, No class	
11/26	Thanksgiving holiday, No class	
11/28	Thanksgiving holiday, No class	
12/1	Magnets and Magnetism	Chapter 20
12/3	Thermal properties of Materials	Chapter 19
12/5	Thermal properties of Materials	
12/8	Optical Properties	Chapter 21
12/10	Optical Properties	Chapter 21
12/16	FINAL, 1:30 until 4:30 pm (note: 12/16 is a TUESDAY)	163 Noyes Lab

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Textbooks, Reserved Books, Material Not Covered
Fall 2008

Required Textbook

Callister, W.D. *Materials Science and Engineering and Introduction;* John Wiley & Sons 2007; 721 pages.

Books on Reserve

Stevens, M.P. *Polymer Chemistry an Introduction*; Oxford university Press 1999; 551 pages, $102 new

West, A.R. *Solid State Chemistry and Its Applications*; John Wiley and Sons 1984; 734 pages, $310 new

Topics NOT Covered

The following topics will *not* be covered. I will assume that you are familiar with these topics from undergraduate classes you have taken. Please see me if you have any questions about what I expect you to know about these topics:

1) Organic and inorganic chemical nomenclature

2) Chemistry of acids and bases; definition of Bronsted vs. Lewis acids and bases; self-ionization of protic solvents; polar vs. non-polar molecules

3) Recognizing and balancing redox reactions

4) Ionic lattice energies; Born-Haber cycle

5) Simple periodic trends (electronegativities, ionization potentials, radii, preferred oxidation states, metallic vs. non-metallic behavior)

6) Hybridization; Schrodinger equation; hydrogen atom wave functions; polyelectronic configurations; the basis of MO theory

7) Simple Werner chemistry (coordination complexes)

8) Octahedral and tetrahedral d-orbital splitting diagrams; determining oxidation states and d-electron counts of metals in coordination complexes; high-spin vs. low-spin electronic configurations

9) Octet rule, 18 electron rule; concept of σ vs. π bonding in metal-ligand bonds