

MSE 500: Materials Physics and Chemistry – W14

Monday and Wednesday: 1:30 -3:00 pm, 2233 G.G. Brown

Brief Description: Physical properties of a wide range of materials, including crystalline and organic materials, from the electronic and atomic point of view. The bonding and structure of materials will be placed in context of quantum mechanics and band theory; and the electrical, optical, thermal, mechanical, and magnetic properties will be emphasized.

Instructor:

Professor Goldman (rsgold@umich.edu)

office: 2094 H.H. Dow Building

north campus labs: 2105A H.H. Dow & B115 C.A. Gerstaker

central campus lab: SB225 Randall Laboratory

Phone: (734) 647-6821 FAX: (734) 763-4788

Office Hours: *To be announced*

You are encouraged to come to my office hours to ask questions. I will set the time after I receive feedback from everyone regarding the preferred times. Please fill out your notecard with your name, major & class standing, e-mail address, and preferred times for office hours. I will do my best to choose times that are most convenient for everyone. You may also make an appointment to talk with me at other possibly more convenient times. Finally, e-mail is often useful for questions.

Course Website: go to <https://ctools.umich.edu/> [MATSCIE 500 001 W14]

Course Materials:

Daniel D. Pollock, "Physical Properties of Materials for Engineers", 2nd edition, CRC Press, 1993. (ISBN#978-0-849-34237-0)

Angus Rockett, "The Materials Science of Semiconductors", Springer US, 2008. (print ISBN # 978-0-387-25653-5; online ISBN # 978-0-387-68650-9)

download book and/or individual chapters (or purchase for \$24.99):

<http://link.springer.com.proxy.lib.umich.edu/book/10.1007/978-0-387-68650-9>

The course will also involve supplemental reading assignments from textbooks on reserve and recent literature reports.

Homework:

Homework will consist of assigned reading, questions, problems, and computational assignments. The homework will count for 20% of your course grade. Doing the homework is your practice; and as with any learned skill, good practice leads to improved performance and mastery! Also, you can make homework fun by discussing it with your classmates – I therefore encourage you to form a study group (or groups). However, *you alone should write up the homework in your own words.*

Exams: We will have two open book exams: a midterm and a final exam.

Midterm: Wednesday February 26, 2014
 1:30 – 3:00pm
 2233 G.G. Brown

Final Exam: Tuesday, April 30, 2014
 1:30 – 3:00pm
 Location TBD

Seminar Report

You will be required to attend one departmental seminar (from a list of eligible seminars) during the Fall semester. Within one week of the seminar, you will write and submit a two-page report summarizing the seminar. More details will be provided in a separate handout.

Final Project

The final project will involve writing a summary and critical assessment of a recent paper published in a refereed archival journal by your chosen seminar speaker. More details will be provided in a separate handout.

Grading

Your course grade will be calculated from homework, exams, and final project, as follows:

Homework	20%
Midterm Exam	25%
Final Exam	25%
Seminar Report	5%
Final Project	25%

Tentative* Schedule for MSE 500 – Winter 2014

Week	Monday Lecture	Wednesday Lecture
1/5		Introduction
1/12	Blackbody Radiation	Photoelectric Effect
1/19	No Class (MLK Day)	Bohr Model
1/26	Compton Effect	Schrödinger Equation
2/2	Finite & Infinite Wells	Barriers & Tunneling
2/9	Heat Capacity	Thermal Conductivity
2/16	Drude Theory	Classical & Quantum Statistics
2/23	Fermi-Dirac Statistics	Midterm Exam
3/2	No Class (Spring Break)	No Class (Spring Break)
3/9	Band Theory	Electrical Resistivity
3/16	Thermoelectric Effects	Thermoelectric Models
3/23	Diamagnetism	Paramagnetism
3/30	Ferromagnetism	Anti-ferromagnetism
4/6	Semiconductors	Semiconductor Devices
4/13	Dielectric Properties	Ionic Conduction
4/20	Ferroelectrics	No Class (Study Day)

Final Exam: Tuesday 4/30: 1:30 - 3:30pm