MSE 460, Spring 2009 **Electronic Materials and Processing I**

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SCHEDULE AND LOCATION: Lectures meet Monday, Wednesday, Friday 10–10:50 in 214 Ceramics Building.

OBJECTIVES: Your goal as a student in this course should be to advance your understanding of the science and engineering of semiconductor materials and devices. Semiconductor materials science is a large field, however, and, therefore the lectures will focus on a relatively narrow selection of topics so that we can cover these topics in depth. These topics will include epitaxial crystal growth by physical and chemical vapor deposition; electronic structure of semiconductor alloys; organic semiconductors; carrier generation and recombination; junctions; photovoltaic materials and devices; and nanoscale logic devices. The final project will allow you to explore a topic of your choosing within the general theme of solar-to-electrical energy conversion.

PREQUISITES: A course in semiconductor device physics (ECE 440 or equivalent) is a prerequisite for this course. Working knowledge of materials science at the level of a typical junior-year undergraduate curriculum—thermodynamics, kinetics, crystallography, mechanical behavior, and electronic properties—is also required.

HOUR EXAMS: I will give three hour-exams on February 18, March 18, and April 29. I will not give a final exam. You can bring a single-sheet (one side of 8.5×11 inch paper) of notes to help you with the exams.

HOMEWORK: Problem sets will be assigned most Mondays beginning January 26. The problem sets will be due in class one week after they are assigned; problem set assignments will be posted at the course homepage. Solutions will be posted at the Compass site. A penalty of 10% per day (linear, not exponential decay) will substracted if problem sets are turned in late.

WIKIPEDIA ARTICLES: For the final project for the clases, you will work in teams of ≈ 3 students to complete a contribution to Wikipedia on a narrowly focused aspect of a practical system for converting solar energy to electricity. The equivalent page length should be approximately 10 pages of double-spaced 12 point font, excluding figures and references. You will, of course, need to be concise and your topic should be focused. You will complete two drafts of the article prior to the final version. The due dates of the 1st, 2nd, and final versions are March 4, April 8, and May 1. Please communicate with me about appropriate topics, the audience, and technical level for these articles. An

oral summary of the article will be presented to the class during the final week of the semester, May 4 and 6.

GRADING: The following weighting factors will be used to determine your final grade:

1st hour exam 18 %
2nd hour exam18 %
3rd hour exam 18 %
problem sets 13 %
final project 33 %

Grades will be assigned using the following scale:
A^+=98-100%, A=93-97%, A^-=90-92%
B^+=88-90%, B=83-87%, B^-=80-82%
C^+=78-80%, C=73-77%, C^-=70-72%
D^+=68-70%, D=63-67%, D^-=60-62%
E<60%
At my discretion, the minimum score to earn a certain letter grade may be lowered but it will not be raised.

TEXT: "The Materials Science of Semiconductors" by A. Rockett (Springer, 2007). There is also an electronic version. Additional material will be posted at the Compass site. Several recommended textbooks are on reserve at the Engineering library.