MECHE 118 - INTRODUCTION TO NANOTECHNOLOGY (3 UNITS)

COURSE OVERVIEW

SUMMARY

Mechanical Engineering 118 is a cursory overview of current research topics in nanotechnology intended for both undergraduate and graduate students. It is an elective that can count towards the materials concentration for chemistry majors. As it is a course offered by the mechanical engineering class, a large focus of the class is on device design and assembly.

Lectures in the class focus predominantly on examples of nanotechnology in current scientific literature, and a portion of the lecture is dedicated to student literature review presentations. Assigned readings each week are 1-2 papers which are typically quite recent. The class also involves two labs, in which students are invited to go to the professor's lab and watch the GSI demonstrate a nanofabrication technique. Experiments performed in these labs vary from semester to semester. The final portion of the class involves a design project, in which each student applies principles from the class to propose a design for a nano-scale device.

PREREQUISITES

Chem 1A (chem1a.html) or 4A (chem4a.html), Physics 7B (phys7b.html)

TOPICS COVERED

- Bottom-up nanofabrication
- Top-down nanofabrication
- Interdisciplinary applications of nanotechnology (chemistry, materials science, molecular biology)
- Nanoscience phenomena, quantum mechanical properties
- Applications to integrated circuits
- MEMS/NEMS

WORKLOAD

COURSEWORK

- One short literature review presentation, in class.
- Short nanotubes/nanowires midterm design project.
- One midterm exam, in class.
- One final exam, in class (not during finals week).
- Design project and oral presentation.

TIME COMMITMENT

Three hours of lecture per week. Seven problem sets on material covered in lecture (1-2 hours each). One in-class midterm and one in-class final exam. Assigned readings are 1-2 research articles per week (1 hour to read and digest). Two labs total, each of which include 2-3 hours spent in the laboratory watching or helping with the experiment and 2-3 hours spent writing up a summary of the experimental setup and results.

The midterm design project is quite straightforward and the time commitment depends on the student's experience with this subject. The final design project is the major time commitment in this class at the end of the semester which chemistry students might find challenging because device design is not covered in any core chemistry class. The design project can take anywhere from 10-15 hours depending on comfort with the material. The design project involves a short oral presentation, either in-class or during RRR week.

CHOOSING THE COURSE

WHEN TO TAKE

This class can be taken anytime after completion of general chemistry and physics 7B. It is an interesting elective with a relatively light workload. This is an especially good course for underclassmen who might not have much experience reading and understanding scientific papers.

WHAT NEXT?

The next steps for students interested in nanotechnology and nanofabrication proposed by Professor Lin are:

- EE 143, Microfabrication
- Physics 137, Quantum Mechanics
- EE 235, Nanofabrication
- Physics 201, Fundamentals of Nanoscience

ADDITIONAL COMMENTS AND TIPS

This is a really great elective! It really emphasizes the interdisciplinary nature of nanoscience, and the course content changes to reflect the current trends in this research area.

Written by: Sophia Weng

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lang=en) students/peer-
advising