EEL 6936/4937: Introduction to Nanotechnology; Fall 2006

Instructor: Dr. Rudy Schlaf

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Office Hours: M/W 2:00-4:00. Check lab (ENB 351) if I am not in the office.

Teaching Assistant: TBD

COURSE OBJECTIVE:

Introduce basic quantum mechanical principles

Introduce various nanomaterials, principal fabrication approaches and nano-scale characterization tools.

Discuss applications for nanotechnology.

COURSE DESCRIPTION:

This course gives an introduction into basic fabrication and characterization techniques currently used or being developed for the development of nanometerscale devices and materials. Materials considered basic building blocks of nanodevices, such as organic molecules, carbon nanotubes and nanocrystals will be covered. Top-down and bottom-up assembly processes such as thin film patterning through advanced lithography methods, self-assembly of molecular structures, and biological systems will be discussed. Nano-applications such as molecular computers and electronic devices, nano-sensors and molecular mechanical devices such as motors and actuators will be among the treated topics.

Prerequisites: Physics I, Chemistry I and Calculus I&II

Helpful “Predesirables”: Electronic Materials, Semiconductor Devices

COURSE STRUCTURE:

Two lectures per week on Mondays and Wednesdays.

Location: ENC 1002

Time: 12:30 am – 1:45 pm

BOOK:

We will use journal papers/web documents.

STUDENTS' OBLIGATIONS:

Read used journal papers/web sites before lecture.

Students are responsible for supplementary material presented/handed out in class that may not appear in the pre-assigned publications.

COMMUNICATION POLICY:

The instructor will use MyUSF (URL: https://my.usf.edu) as main communication channel for announcements and course materials. All students are expected to check MyUSF at least once every 48 hours for course announcements.

GRADING POLICY:

This is a combined graduate/undergraduate course. Two different grading policies will therefore apply:

1) Graduate Students:

Final Grade:	2 Exams; No final exam.	~50%
	Approximately 6 quizzes	~25%
	Web site (see below)	~25%

2) Undergraduate Students:

Final Grade:	2 Exams; No final exam.	~70%
	Approximately 6 quizzes	~30%

Grades will be assigned according to the following approximate scale:

A	>90%
B	80-89%
C	70-79%
D	60-69%
F	<60%

-There will be two non-comprehensive exams. Dates and details will be announced at least one week prior to each test.

-Make-up exams will be given only under very special circumstances. Appropriate documentation in writing (doctor's certificate, police report etc…) will have to be provided by the students.

-Quizzes will be given on approximately every second Wednesday. Tentative dates are given below. Study the old quizzes and exams posted on MyUSF/Blackboard to get an idea.

ADDITIONAL GRADUATE STUDENT OBLIGATIONS:

Graduate Students will (Undergraduates can also for additional credit) design a web site for a nanotechnology related topic of their choice (approval of the instructor is needed). This website needs to contain:

a) A comprehensive introduction into the topic, description of the purpose of the particular technology/method/…, and a description of the potential applications.

b) A comprehensive list of HTML links to web sites of the main institutions/researchers working in the particular field.

Procedure:

Oct.4th: Graduate student abstracts for web sites are due. Write 1/2 page what topic will be discussed on your web site and what you plan to post. Example topics will be posted soon.

Nov, 22rd: Graduate student web sites need to be posted on each student's USF web site, and the working links emailed to the instructor. The links will then be posted on blackboard.

After the links have been posted, all students of the class (including undergraduates) will grade the web sites and email their list of grades to the instructor **(deadline: Dec, 6th).** The averages of the student's grades (50%), together with the instructor's grades (50%), will determine the final grade for each web site.

NOTICE OF PERMISSION/NON-PERMISSION TO SELL NOTES OR RECORDINGS OF CLASS LECTURES:

It is not permitted to sell notes or recordings of class lectures.

POLICY ON RELIGIOUS HOLIDAYS:

Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide notice of the date(s) to the instructor, in writing, by the second class meeting.

TENTATIVE SCHEDULE:

This schedule is under development and will likely partially changed as we proceed through the semester.

Week	Dates	Topics
1	Aug 28/30	Introduction / Applications for Nanotechnology / Quantum Mechanics Revisited
2	Sept 4/6	Labor Day (4th), QM Revisited / End of the road for conventional Si processing technology / Quiz#1
3	Sept 11/13	Nanofabrication I: Low-dimensional Quantum Structures, Molecular Beam Epitaxy
4	Sept 18/20	MBE / Quiz#2
5	Sept 25/27	Quantum Dots/QD-Laser/Single electron transistor
6	Oct 2/4	Nanocharacterization I: SEM/TEM/STEM, Quiz#3 **Oct 4th: Graduate student abstracts for web sites due.**
7	Oct 9/11	Nanofabrication II: E-beam lithography
8	Oct 16/18	Nanocharacterization II: AFM, STM, NSOM, Nanofabrication: 3-D polymerization/ Exam I
9	Oct 23/25	Carbon Nanostructures / Quiz#4
10	Oct 30/Nov 1	Nanofabrication III: Bottom Up Methods/Molecular Self Assembly / Guest Lecture by Prof. Mike Zaworotko
11	Nov 6/8	Nano-magnetism / Guest lecture by Prof. Srikanth Hariharan/ Quiz#5
12	Nov 13/15	Self Assembly in Biological Systems
13	Nov 20/22	Self Assembly in Biological Systems / Quiz#6/Thanksgiving **Nov, 22rd: Graduate student web sited need to be posted**

		and links emailed to the instructor.
14	Nov 27/29	Nano-wires
15	Dec 4/6	Porous Silicon / Exam II **Dec, 6th: All Students need to have their grades for the web sites emailed to the instructor.**
16	Finals Week	No finals