

EEE6425/EEL4935: Introduction to Nanotechnology; Fall 2011

Instructor: Dr. Rudy Schlaf

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Office: Interdisciplinary Research Building (IDRB), 3720 Spectrum Blvd, Suite 202F

Office Hours: M/W 1:00-3:00 pm. Check lab (IDRB 202) if I am not in the office.

Teaching Assistant: TBA

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 nanometer scale devices and materials. Materials considered basic building blocks of nano devices, 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 “Pre-desirables”: Electronic Materials, Semiconductor Devices.

COURSE STRUCTURE:

Two lectures per week on Mondays and Wednesdays.

Location: ENG 3

Time: 3:05 pm – 4:20 pm

BOOK:

No book. We will use journal papers/web documents.

STUDENTS' OBLIGATIONS:

Read slides/journal papers/web sites before lecture.

COMMUNICATION POLICY:

The instructor will use Blackboard (URL: <https://my.usf.edu>) as main communication channel for announcements and course materials. All students are expected to check Blackboard 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:

Sept 28: 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 16: 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: Nov 30)**. 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. All unauthorized recordings of class are prohibited. Recordings that accommodate individual student needs must be approved in advance and may be used for personal use during the semester only; redistribution is prohibited.

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.

POLICY ON CAMPUS EMERGENCIES (AKA AS "SWINE FLU OUTBREAK"):

In the event of an emergency, it may be necessary for USF to suspend normal operations. During this time, USF may opt to continue delivery of instruction through methods that include but are not limited to: Blackboard, Elluminate, Skype, and email messaging and/or an alternate schedule. It's the responsibility of the student to monitor Blackboard site for each class for course specific communication, and the main USF, College, and department websites, emails, and MoBull messages for important general information.

TENTATIVE SCHEDULE:

This schedule is tentative and will likely change as we proceed through the semester.

Week	Dates	Topics
1	Aug 22/24	Introduction / Applications for Nanotechnology / Quantum Mechanics Revisited
2	Aug 29/31	QM Revisited / End of the road for conventional Si processing technology / Quiz#1
3	Sept 5/7	Labor Day (5th), Nanofabrication I: Low-dimensional Quantum Structures, Molecular Beam Epitaxy
4	Sept 12/14	MBE / Quiz#2
5	Sept 19/21	Quantum Dots/QD-Laser/Single electron transistor
6	Sept 26/28	Nanocharacterization I: SEM/TEM/STEM, Quiz#3 Sept 28: Graduate student abstracts for web sites due.
7	Oct 3/5	Nanofabrication II: E-beam lithography
8	Oct 10/12	Nanocharacterization II: AFM, STM, NSOM, Nanofabrication: 3-D polymerization/ Exam I
9	Oct 17/19	Carbon nanostructures (nanotubes, graphene...) / Quiz#4
10	Oct 24/26	Nanofabrication III: Bottom Up Methods/Molecular Self Assembly / Guest Lecture by Prof. Mike Zaworotko (depending on availability)
11	Oct 31/Nov 2	Nano-magnetism/ Quiz#5
12	Nov 7/9	Self Assembly in Biological Systems
13	Nov 14/16	Self Assembly in Biological Systems / Quiz#6 Nov 16: Graduate student web sites need to be posted and links emailed to the instructor.
14	Nov 21/23	Nano-wires/colloidal nano-particles/Thanksgiving
15	Nov 28/30	Porous Silicon / Exam II Nov 30: All Students need to have their grades for the web sites emailed to the instructor.
16	Dec 5/7	Finals Week. No finals.