CORNELL UNIVERSITY

AEP 1200 / ENGRI 1200

Introduction to Nanoscience and Nanoengineering

Fall 2021

Course instructor:

Lena F. Kourkoutis 235 Clark Hall, (607) 255-9121 lena.f.kourkoutis@cornell.edu

Office hours: Mo & Wed 5:00-6:00, or by appointment

Lab instructor:

Jon Velazquez 265 Clark Hall, (607) 255-6327 jv16@cornell.edu

Office hours: TBA

Course secretary/registrar:

Cynthia Reynolds 261 Clark Hall, (607) 255-0638 crr8@cornell.edu

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Lectures: Tues, Thu 8:00-8:40 AM 103 Rockefeller Hall

No lectures: October 12 (Fall break); November 25 (Thanksgiving break)

Laboratories: M/T/W/R 2:40-4:35 PM 125 Physical Science Building

No labs: Week of August 23 (first week of the semester)
Weeks of September 6 and December 6

Course web site (Canvas): Go to the AEP 1200 site at http://canvas.cornell.edu
Lecture slides, recordings, lab manual, homework assignments, and reading assignments will be posted.

Course description: Lecture/laboratory course designed to introduce first-year students to some of the ideas and concepts of nanoscience and nanotechnology. **(3 credits)**

Topics include:

- Nanoscience and Nanotechnology – what they are and why they are of interest *(~3 lectures)*
- Nanofabrication – how to make nanoscale structures *(~8 lectures)*
- Nanocharacterization – how to measure nanoscale structures *(~4 lectures)*
- Applications of nanoscale materials and devices *(~9 lectures)*
- Fundamental physical processes that underlie nanoscience *(~4 lectures and throughout course)*

Laboratory topics:

- Crystal radio *(Lab 1)*
- Photolithography and thin-film deposition *(Labs 2-4)*
- Microfluidics *(Labs 5a-5b)*
- Synthesis and imaging of nanostructures *(Labs 6-7)*
- Scanning tunneling microscopy *(Lab 8)*
- Semiconductor nanostructures: quantum dots *(Lab 9)*
- Giant magnetoresistance *(Lab 10)*
- Tour of Cornell Nanofabrication Facility

Textbook: This is a rapidly evolving area of science and technology and there is no textbook that adequately covers all of the topics that will be addressed in this course. Recommended readings may be posted on the course web site. The only required text is the AEP 1200 / ENGRI 1200 lab manual. The manual is posted on the course web site. Hard copies of the manual will be distributed during the first week in class. A 3-ring binder is recommended for the lab manual.

Reserved books available as E-Reserve: Two texts discussing a number of the topics covered in the course are put on reserve and available via Canvas. Additional texts may be added later.

- *Introduction to nanoscience and nanotechnology*, A. Nouailhat, Wiley (2008)
- *Nanoscale science and technology*, R.W. Kelsall, I.W. Hamley, M. Geoghegan, Wiley (2005)

Lectures: Lectures are an important component of this course and students will be responsible for the material presented in lectures. Questions during lecture are strongly encouraged. PowerPoint slides presented during the lectures will be handed out at the beginning of the lecture and posted on Canvas after each lecture. Slides with additional material covered during lecture may be added. Lecture notes will be posted on Canvas after each lecture.

Homework: Problem sets will be assigned each week on Thursday and will be due the following Thursday. Submission with be electronically through Canvas. Late homework assignments will have 10% deducted per day until the answer key is handed out, after which they will not receive any credit. I will drop your lowest homework score for the semester. In other words, you get one but only one "freebie". Please use it wisely.

Examinations: There will be two exams: a preliminary exam and a final exam. These exams will cover material from lectures, labs, and assigned readings.

Preliminary exam:	21 October 2021, 7:30pm
Final:	TBA

Laboratory reports and Prelabs: Students will prepare 1-2 page written reports for each laboratory experiment and/or demonstration. These reports are due at the start of the following laboratory section. Late lab reports will have 10% deducted per week. In preparation for each lab, students will prepare a short prelab. There is a 10% reduction in the lab report grade if the prelab is not turned in before (or at the beginning of) the lab session. The laboratory grade constitutes 35% of the course grade.

Grading:

Laboratory grade:	35%
Homework:	20%
Midterm exam:	15%
Final exam:	30%

POLICIES

Academic Integrity

Students are expected to abide by the Cornell University *Code of Academic Integrity* with work submitted for credit representing the student's own work. Discussion and collaboration on homework assignments is permitted and encouraged, but final work should represent the student's own understanding and should acknowledge such extra help by name.

Course materials posted on Canvas are intellectual property belonging to the author. Students are not permitted to buy or sell any course materials without the express permission of the instructor. Such unauthorized behavior will constitute academic misconduct.

Accommodations
This course complies with the Cornell University policy and equal access laws to ensure that students with disabilities can still participate fully in this course. Please request your accommodation letter early in the semester, or as soon as you become registered with Student Disability Services (SDS), so that we have adequate time to arrange your approved academic accommodations. Once SDS approves your accommodation letter, it will be emailed to both you and me. Please follow up with me to discuss the necessary logistics of your accommodations. If you are approved for exam accommodations, please consult with me at least two weeks before the scheduled exam date to confirm the testing arrangements. Finally, if you experience any access barriers in this course reach out to me or your SDS counselor right away.

Respect in Class
Everyone, the instructor, TAs, and students, must be respectful of everyone else in this class. All communication, in class and online, will be held to a high standard for thoughtfulness and inclusiveness: it may never target individuals or groups for harassment, and it may not exclude specific groups. That includes everything from outright animosity to the subtle ways we phrase things and even our timing.

If any of the communication in this class doesn't meet these standards, please contact the instructor as early as possible. If for whatever reason you don't feel comfortable discussing something directly with the instructor please contact your advising office or the department chair.