



Introduction to Nanotechnology – NANO 200

School of Engineering and Science

Spring 2023

Meeting Times: Tuesday 3-5:30pm
Classroom Location: Gateway South 024
Instructor: EH Yang
Contact Info: Carnegie 206, eyang@stevens.edu, 201-216-5574
Office Hours: Wed 1:30pm – 3:30pm (email the professor for an appointment)
Course Web Address: None
Prerequisite(s): Chemistry CH 115 and Physics PEP 111
Corequisite(s): None
Cross-listed with: None

COURSE DESCRIPTION

The course addresses the scientific underpinnings of nanotechnology to provide an understanding of various phenomena observed at the nanoscale. The role of physics, materials, mechanics, and electronics will be emphasized with some basic engineering science ideas applied at the nanoscale.

LEARNING OBJECTIVES

Students will be able to understand the basic principles of physics and materials at the nanoscale and the challenges and limitations in realizing nanoscale structures and devices.

After successful completion of this course, students will be able to

- demonstrates knowledge of scientific issues that distinguish nanoscale phenomena from those at the macroscopic scale [SES Outcome 1 Scientific Foundations - an understanding of the scientific and mathematical basis of engineering (ABET Criterion 3-a)], and
- Demonstrates knowledge of how nanoscale phenomena can be harnessed to create nanoengineered materials or structures [SES Outcome 2 Engineering Foundations - the ability to use applied scientific knowledge (ABET Criterion 3-e)].

COURSE MATERIALS

Textbook(s): Nanotechnology – Understanding Small Systems, 3rd Edition by Ben Rogers, Sumita Pennathur and Jesse Adams CRC Press, Tylor & Francis Group

Other Readings:

Available online through Canvas course shell

Materials: Scientific calculators

GRADING PROCEDURES

The final grade will be based on the number of points earned from the number of points possible. Percentages are also listed below.

- Homework, pop quiz and participation 10%
- Exams (1) 25%
- Exams (2) 25%
- Exams (3) 25%
- Literature review (group) 15%

SUBMISSION OF ASSIGNMENTS

- Any assignments are by 3:00 pm on the due date listed in the course schedule. 50% of the total points will be deducted for assignments received 1 day late, and assignments received more than 1 day late will receive 0 points. An assignment file should be appended by your initials, such as “assignment1_EHY.doc”.
- Prof. Yang will be available via email and generally respond within 24 hours. When emailing the professor, please place in the subject line the course number/section and the topic of the email (i.e., NANO200 – Assignment 2 Question).

COURSE REQUIREMENTS

Attendance The grade will be pushed down by a letter grade if a student misses 3 classes or more without approval by the professor.

Excused absences (religious or medical, noted via email to the professor prior to the absence occurring) must be accompanied by proper documentation.

Participation Students may also be graded on class participation.

Homework There will be 7 homework assignments throughout this course. All homework assignments must be submitted by the assigned date and submitted on CANVAS.

Binary grading scale (0 or 1):

- 0 if not submitted, submitted drastically incomplete, or barely attempted,
- 1 if a reasonable attempt was made on most problems and much seemed correct.

Exams There will be 3 scheduled exams throughout the semester. Exams will be graded for accuracy and returned within 2 class periods. If a student is absent (unexcused) on the day that an exam is given, an automatic 0 will be given for that exam.

Notes Policy: Lecture slides will be posted to the course website, which purposefully omits certain details and examples reserved for discussion during class. These additional details ***will not*** be posted or distributed by the professor in any manner other than during class lessons. It is the *responsibility of each student* to take appropriate notes during class to reinforce the material.

Literature Review Each group of students is expected to make a presentation on a selected topic about Nanotechnology by

- (a) identifying the relevant research literature representing state of the art on a specific research subject,
- (b) structuring, summarizing and critiquing this body of literature, and
- (c) drawing conclusions from and evaluating the significance and impact of this body of literature.

Schedule

Week 3: Topic Assignment

Week 6: file name: team name_NANO200_P.ppt for Proposal Presentation

Week 11: file name: team name_NANO200_F.ppt for Final Presentation

Submission of Presentation Slides one week before the presentation

Proposal presentation format

- Presentation for **5 minutes** plus Q&A.
- Discuss your plan to study (what and how), and state who may do what (e.g., A will do this, and B will do that).
- Up to 4 slides (except the title and reference slides)

Final presentation format

- Presentation for **10 minutes** plus Q&A.
- Up to 7 slides (except the title and reference slides)
- Study at least 5 references from at least 3 different research groups in relevant areas.

Additional Details:

- Teams must consist of ~4 members.
- Students must self-select teams on Canvas.
- Each team member **MUST** individually complete and submit a team participation survey provided on Canvas after the submission deadline. No points will be given to a student if the student does not submit the survey.

EXAM FORMAT AND LOGISTICS

The instructor reserves the right to modify any conditions set forth below by printing revised exam conditions.

If you are eligible for accommodations via the Office of Disability Services (ODS), you **must** follow up on this ASAP. Please notify me directly in advance; however, I cannot honor these accommodations without receiving official notice from ODS in a timely manner.

Summary of exam format:

- Upon grading completion, grades will be posted to Canvas, with comments
 - Full exam solutions will NOT be posted or emailed.
 - Please email TA to set up an appointment to discuss solutions or grading concerns.

Exam protocol:

1. The exam is a closed book.
2. Please provide procedures or explanations for yielding answers. Credit may not be awarded if the reasoning is not provided.
3. Please complete problems on blank paper or graph paper, as appropriate.
4. No course materials or information may be shared for the duration of the exam availability window. No communication regarding the exam is permitted during this window with anyone other than the professor / TAs for clarification.
5. **Reproduction, storage, or online posting of quiz problems is strictly prohibited.**
6. Include a signed version of the Stevens Pledge for each problem. Recall the course stipulations regarding academic integrity as outlined in the syllabus.

Again, students **are not** permitted to work [or communicate] with other students during quizzes. Sharing of resources during exams is strictly prohibited. Copying, storing, reproducing, or posting quiz problems online is strictly prohibited.

TESTING ROOM CONDITIONS

The following procedures apply to pop quizzes and exams for this course, respectively. The professor reserves the right to modify any conditions set forth below by printing revised conditions on the quiz / exam.

Students may use the indicated devices / materials during **exams**. Any items not mentioned are **not permitted**.

Device	Permitted?		Material	Permitted?	
Laptops		No	Typed Notes		No
Cell Phones		No	Textbooks		No
Tablets		No	Readings		No
Smart Watches		No	Lecture Slides		No
Google Glass		No	Printed Documents		No
Calculator <ul style="list-style-type: none"> • NOT calculator apps 	Yes		Handwritten Notes [Cheat Sheet] <ul style="list-style-type: none"> • Original ink/pencil • 2 sheet, double sided [4 sides total] • 8.5" x 11" maximum page size 	Yes	

ACADEMIC INTEGRITY

Undergraduate Honor System

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the [Honor System Constitution](#). More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at <http://web.stevens.edu/honor/>

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"I pledge my honor that I have abided by the Stevens Honor System."

Reporting Honor System Violations

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at www.stevens.edu/honor.

LEARNING ACCOMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. Student Counseling and Disability Services works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, and psychiatric disorders in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from SCDS staff. The SCDS staff will facilitate the provision of accommodations on a case-by-case basis. These academic accommodations are provided at no cost to the student.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the office of Student Counseling, Psychological & Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

For more information about Disability Services and the process to receive accommodations, visit <https://www.stevens.edu/sit/counseling/disability-services>. If you have any questions please contact:

Lauren Poleyeff, Psy.M., LCSW - Disability Services Coordinator and Staff Clinician in Student Counseling and Disability Services at Stevens Institute of Technology at lpoleyef@stevens.edu or by phone (201) 216-8728.

INCLUSIVITY STATEMENT

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in education and innovation. Our community represents a rich variety of backgrounds, experiences, demographics and perspectives and Stevens is committed to fostering a learning environment where

every individual is respected and engaged. To facilitate a dynamic and inclusive educational experience, we ask all members of the community to:

- be open to the perspectives of others
- appreciate the uniqueness their colleagues
- take advantage of the opportunity to learn from each other
- exchange experiences, values and beliefs
- communicate in a respectful manner
- be aware of individuals who are marginalized and involve them
- keep confidential discussions private

COURSE SCHEDULE (Spring 2023)

Dates	Topic(s)	Readings	Assignment
1/24	Introduction/ Miniaturization	Required: Textbook Ch. 2	Group literature review (Intro)
1/31	Miniaturization /Nanoscale Physics	Required: Textbook Ch. 2,3	HW #1 due
2/7	Nanomaterials	Required: Textbook Ch. 4	Group literature review (Discussion) HW #2 due
2/14	Nanomechanics and Review	Required: Textbook Ch. 5	HW #3 due
2/21	Exam 1	<i>Miniaturization, Nanoscale Physics, Nanomaterials</i>	
2/28	Nanomechanics/ Nanoelectronics	Required: Textbook Ch. 5	Submission of literature review proposal slides
3/7	Nanoelectronics/ Literature review proposal	Required: Textbook Ch. 6	HW #4 due
3/14	Spring Recess		
3/21	Review/ Nano Lab Tour		HW #5 due
3/28	Exam 2	<i>Nanomechanics, Nanoelectronics</i>	
4/4	Nano Heat Transfer	Required: Textbook Ch. 7	
4/11	Nanophotonics	Required: Textbook Ch. 8	Submission of literature review final slides HW #6 due
4/18	Literature review final		
4/25	Review		HW #7 due Course evaluation
5/2	Exam 3	<i>Nanoscale Heat Transfer, Nanophotonics</i>	