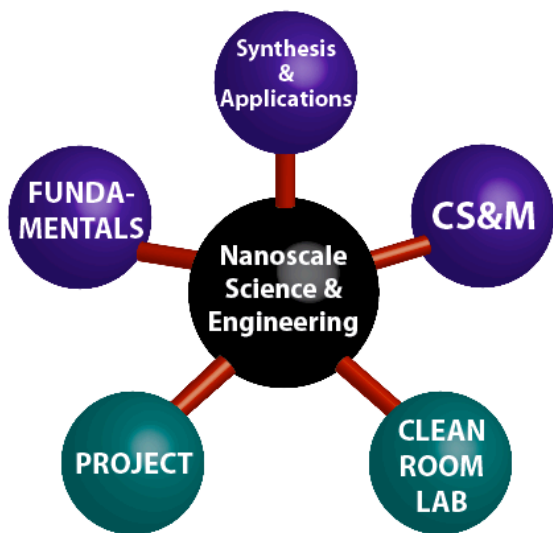


UNDERGRADUATE MINOR IN “NANOSCALE SCIENCE AND ENGINEERING”
SCHOOL OF ENGINEERING AND APPLIED SCIENCE
Available to any UG pursuing an Arts and Science or Engineering degree

I. Objective

Nanotechnology deals with materials, structures or devices one of whose dimensions are in the 1 to 100 nm length scale. These entities have properties (physical, chemical or biological) that are very different from their bulk counterparts, and can be tuned to obtain novel and desired functionalities. The goal of this Minor is to enhance the background, knowledge and skills in the topical area of nanotechnology. The Minor covers classes in several fields of science and engineering; encompassing all the departments in the School of Engineering and Applied Science and several in the School of Arts and Sciences. It is open to any UG student pursuing an Engineering or Arts & Sciences (Chemistry, Physics, Biology, Environmental Studies, Pre-Med) major.

The minor in Nanoscale Science and Engineering involves the following components. Starting with courses covering the “Fundamentals”, students gain knowledge in “Synthesis & Applications” and “Characterization/Structure and Modeling (CS&M)”. Two additional requirements are either the Cleanroom Lab class entitled, “Principles and Methods of Micro and Nanofabrication” or “Electronic Materials Processing”, and completion of a faculty supervised Independent Study “Project” for at least 2 semesters. The mix of classes should provide the student significant background in Nanotechnology, and uses an approach to promote independent thinking by work on a research or educational project. The figure below outlines the various categories, and the Table (next page) outlines the options for the classes.



Summary: Minor in Nanoscale Science and Engineering

- Take at least **ONE** course from each of the *dark blue* categories (see list in Table below) **and**
- Take either the Clean Room Lab “Principles and Methods of Micro and Nanofabrication” (MEMS 5611, EECE 494L/594L and CSE 506 M) or “Electronic Materials Processing” (MEMS 5609) **and**
- Do an Independent Study Project for two semesters with a participating faculty in the minor program (list of projects will be circulated Spring Semester for work the following year)

II. Committee to Oversee Nanoscale Science & Engineering Minor:

Rohan Mishra (MEMS, Coordinator), Pratim Biswas (EECE)

III. Listing of Classes in Different Categories:

	I. Fundamentals (pick ONE)	II. CS&M*(pick ONE)	III. Synthesis & Applications (pick ONE)
1	BIOL 4810: General Biochemistry I	BME 461: Protein Structure and Dynamics	BME 525: Engineering Aspects of Biotechnology
2	CHE 325: Materials Science	CHEM 478: Molecular Modeling	CSE 568M Imaging Sensors
3	CHEM 401: Physical Chemistry I	CHEM 543: Physical Properties of Quantum Nanostructures	EECE 518: Aerosol Science and Technology
4	CHEM 465: Solid-state and Materials Chemistry	CHEM 550: Mass Spectrometry	EECE 534 Environmental Nanochemistry
	MEMS 3601: Materials Engineering	EECE 476: Properties of Materials	ESE 336: Principles of Electronic Devices
5	MEMS 361: Materials Science	EECE 591: Computational Chemistry of Molecular and Nanoscale Systems	ESE 438: Applied Optics
6	PHYS 472: Solid State Physics	MEMS 5602: Non-metallics	ESE 532: Introduction to Nanophotonic Devices
	PHYSICS 217: Introduction to Quantum Physics	MEMS 5603: Materials Characterization Techniques I	MEMS 463: Nanotechnology Concepts and Applications
7	PHYSICS 352: Physics of Biomolecules	MEMS 5604: Materials Characterization Techniques II	MEMS 5609: Electronic Materials Processing
8	MEMS 5606: Soft Nanomaterials	MEMS 5612: Atomistic Modeling of Materials	MEMS 5801: Micro Electromechanical Systems I
9			MEMS 5802: Micro Electromechanical Systems II

*CS&M = Characterization, structure and modeling

IV. Clean Room Laboratory/Theory Class (Required)

Either Principles and Methods in Micro and Nanofabrication (MEMS 5611/CSE 506M/EECE 595B) or Electronic Materials Processing (MEMS 5609).

V. Independent Study Project (Required)

Students should sign up for at least **2 semesters** of Independent Study and work on a project related to nanotechnology under the supervision of a faculty member. A list of projects with potential faculty mentors will be circulated in the Spring Semester every year. Students will have to be signed up for the Nanoscale Science & Engineering minor and have completed at least 2 of the classes from the above categories before doing the Independent Study Project. Students can also come up with their own ideas for projects, but would need to get approval from the Nanoscale Science and Engineering Minor Committee and a faculty mentor.

The classes listed above will count for elective credit for their Major in all the Engineering Departments. However, students should check with their Major Advisors to confirm this.