Nanoscale Science and Engineering (NSE)

Courses

NSE C201 Introduction to Nano-Science and Engineering 3 Units
Terms offered: Spring 2015, Spring 2013, Spring 2012
A three-module introduction to the fundamental topics of Nano-Science and Engineering (NSE) theory and research within chemistry, physics, biology, and engineering. This course includes quantum and solid-state physics; chemical synthesis, growth fabrication, and characterization techniques; structures and properties of semiconductors, polymer, and biomedical materials on nanoscales; and devices based on nanostructures. Students must take this course to satisfy the NSE Designated Emphasis core requirement.

NSE C203 Nanoscale Fabrication 4 Units
Terms offered: Spring 2016, Spring 2015, Spring 2013
This course discusses various top-down and bottom-up approaches to synthesizing and processing nanostructured materials. The topics include fundamentals of self assembly, nano-imprint lithography, electron beam lithography, nanowire and nanotube synthesis, quantum dot synthesis (strain patterned and colloidal), postsynthesis modification (oxidation, doping, diffusion, surface interactions, and etching techniques). In addition, techniques to bridging length scales such as heterogeneous integration will be discussed. We will discuss new electronic, optical, thermal, mechanical, and chemical properties brought forth by the very small sizes.

NSE C237 Computational Nano-mechanics 3 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018, Spring 2017, Fall 2014
Basic mathematics foundations, physical models, computational formulations and algorithms that are used in nanoscale simulations and modelings. They include (1) cohesive finite element methods and discontinuous Galerkin methods; (2) meshfree methods, partition of unity methods, and the eXtended finite element methods (X-FEM); (3) quasicontinuum method; (4) molecular dynamics; (5) multiscale simulations; (6) Boltzmann method.

NSE C242 Computational Nanoscience 3 Units
A multidisciplinary overview of computational nanoscience for both theorists and experimentalists. This course teaches the main ideas behind different simulation methods; how to decompose a problem into "simulatable" constituents; how to simulate the same thing two different ways; knowing what you are doing and why thinking is still important; the importance of talking to experimentalists; what to do with your data and how to judge its validity; why multiscale modeling is both important and nonsense.

Computational Nanoscience: Read More [+]

Rules & Requirements
Prerequisites: Graduate standing or consent of instructor

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details
Subject/Course Level: Nanoscale Science and Engineering/Graduate
Grading: Letter grade.

Also listed as: PHYSICS C203

NSE 290 Special Topics in Nanoscale Science and Engineering 3 Units
Terms offered: Fall 2017, Fall 2016, Fall 2015
Lectures and appropriate assignments on fundamental or applied topics of current interest in nanoscale science and engineering.

Special Topics in Nanoscale Science and Engineering: Read More [+]

Rules & Requirements
Prerequisites: Graduate standing or consent of instructor

Credit Restrictions: Subject to home department limitations.
Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details
Subject/Course Level: Nanoscale Science and Engineering/Graduate
Grading: Letter grade.

NSE 298 Group Studies, Seminars, or Group Research 1 Unit
Terms offered: Spring 2020, Fall 2019, Spring 2019
Advanced studies in various subjects through special seminars on topics to be selected each year. Informal group studies of special problems, group participation in comprehensive design problems, or group research on complete problems for analysis and experimentation.

Group Studies, Seminars, or Group Research: Read More [+]

Rules & Requirements
Prerequisites: Required for participants in Designated Emphasis
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details
Subject/Course Level: Nanoscale Science and Engineering/Graduate
Grading: Offered for satisfactory/unsatisfactory grade only.

Group Studies, Seminars, or Group Research: Read Less [-]

Special Topics in Nanoscale Science and Engineering: Read Less [-]