Nanoscale Science and Engineering

Overview

The Graduate Group in Nanoscale Science and Engineering (NSE) administers the Designated Emphasis (DE). Faculty members associated with the group come from many engineering and physical science departments and share an interest in the growing body of research surrounding the synthesis, characterization, modeling, and fabrication of nanostructured materials and devices.

Doctoral students in associated departments who wish to pursue an emphasis in nanoscale research can add the Designated Emphasis to their PhD degree goals. The DE curriculum is designed to fulfill one of the required area emphases of the student's PhD program while providing additional opportunities for study and collaboration across the associated disciplines.

Undergraduate Program

While there is no undergraduate program in Nanoscale Science and Engineering, there are many opportunities for interested undergraduates to get involved in research, participate in relevant extracurricular clubs and activities, and enroll in preparatory coursework that explores nano-related science and engineering. Students are invited to contact the program office for more information and referrals.

Graduate Program

Nanoscale Science and Engineering (http://guide.berkeley.edu/graduate/degree-programs/nanoscale-science-engineering): Designated Emphasis (DE)

Nanoscale Science and Engineering
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.

Introduction to Nano-Science and Engineering: Read More [+]

Rules & Requirements

Prerequisites: Major in physical science such as chemistry, physics, etc., or engineering; consent of advisor or instructor

Repeat rules: Course may be repeated for credit without restriction.

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.

Instructors: Gronsky, S.W. Lee, Wu

Also listed as: BIO ENG C280/MAT SCI C261/PHYSICS C201

Introduction to Nano-Science and Engineering: Read Less [-]
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.
Nanoscale Fabrication: Read More [+]

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.
Instructor: Chang-Hasnain
Also listed as: EL ENG C235

NSE C237 Computational Nano-mechanics 3 Units
Terms offered: Spring 2018, Spring 2017, Fall 2014, Spring 2013
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.
Computational Nano-mechanics: Read More [+]

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

Additional Details
Subject/Course Level: Nanoscale Science and Engineering/Graduate
Grading: Letter grade.
Instructor: Li
Also listed as: CIV ENG C237

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.
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.

Special Topics in Nanoscale Science and Engineering: Read Less [-]
NSE 298 Group Studies, Seminars, or Group Research 1 Unit
Terms offered: Spring 2018, Fall 2017, Spring 2017
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 [-]