Applied Science and Technology

Overview

The Graduate Group is administered by the College of Engineering, Materials Science and Engineering Department. The program has three major areas of emphasis: applied physics, engineering science, and mathematical sciences. Faculty associated with the program are drawn from several departments within the College of Engineering as well as from the Departments of Physics, Chemistry, Chemical and Biomolecular Engineering, Statistics, and Mathematics. Topics of interest include the novel properties and applications of nanostructures, thin films and interface science, microelectromechanical systems (MEMS), short wavelength coherent radiation, X-ray micro-imaging for the life and physical sciences, plasma physics and plasma-assisted materials processing, laser-induced chemical processes, laser probing of complex reacting systems, ultrafast phenomena, particle accelerators, nonlinear dynamics, chaotic systems, numerical methods, and topics in computational fluid mechanics and reacting flows. The Applied Science and Technology (AS&T) program awards the Doctor of Philosophy degree.

Graduate research in the AS&T Program benefits from state-of-the-art experimental facilities at the Berkeley campus and the Lawrence Berkeley National Laboratory. Among these facilities are the National Center for Electron Microscopy, with the world's highest resolution high-voltage microscope; a microfabrication lab for student work involving lithography, MEMS ion-implantation, and thin-film deposition; an integrated sensors laboratory; femtosecond laser laboratories; optical, electrical, and magnetic resonance spectroscopies; short wavelength laser and X-ray research laboratories; an unparalleled variety of material, chemical, and surface science analytic equipment; and a soft X-ray synchrotron dedicated to materials, chemical, and biological research using high-brightness and partially coherent X-rays. The interdisciplinary, collaborative nature of the AS&T Program provides ample opportunity to develop new research directions by making the best use possible of these facilities and of the other research instrumentation available to AS&T faculty.

Students admitted to AS&T have an opportunity to choose a research advisor from a diverse group of world-renowned faculty members engaged in cutting-edge research at the University of California, Berkeley. Among more than 80 associated AS&T faculty, students will find internationally-recognized faculty who have achieved great distinction in their scholarship. All have published in top-tier archival journals, and most have been recognized by their peers as recipients of numerous awards, including membership in the National Academy of Sciences, the National Academy of Engineering, the American Academy of Arts and Sciences, the American Association for the Advancement of Science, the American Physical Society, and many more.

Undergraduate Programs

There is no undergraduate program in Applied Science and Technology.

Graduate Program

Applied Science and Technology (http://guide.berkeley.edu/archive/2014-15/graduate/degree-programs/applied-science-technology) : PhD

Applied Science and Technology

AST C210 Soft X-rays and Extreme Ultraviolet Radiation 3 Units
This course will explore modern developments in the physics and applications of soft x-rays. It begins with a review of electromagnetic radiation at short wavelengths including dipole radiation, scattering and refractive index, using a semi-classical atomic model. Subject matter will include the generation of x-rays with laboratory tubes, synchrotron radiation, laser-plasma sources, x-ray lasers, and black body radiation. Concepts of spatial and temporal coherence will be discussed.
Rules & Requirements

Prerequisites: Physics 110, 137, and Mathematics 53, 54 or equivalent

Hours & Format

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

Additional Details

Subject/Course Level: Applied Science and Technology/Graduate

Grading: Letter grade.

Formerly known as: El Engineering 290G

Also listed as: EL ENG C213

AST C225 Thin-Film Science and Technology 3 Units
Thin-film nucleation and growth, microstructural evolution and reactions. Comparison of thin-film deposition techniques. Characterization techniques. Processing of thin films by ion implantation and rapid annealing. Processing-microstructure-property-performance relationships in the context of applications in information storage, ICs, micro-electromechanical systems and optoelectronics.
Rules & Requirements

Prerequisites: Graduate standing in engineering, physics, chemistry, or chemical engineering

Hours & Format

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

Additional Details

Subject/Course Level: Applied Science and Technology/Graduate

Grading: Letter grade.

Instructors: Wu, Dubon

Also listed as: MAT SCI C225

AST C239 Partially Ionized Plasmas 3 Units
Introduction to partially ionized, chemically reactive plasmas, including collisional processes, diffusion, sources, sheaths, boundaries, and diagnostics. DC, RF, and microwave discharges. Applications to plasma-assisted materials processing and to plasma wall interactions.
Rules & Requirements

Prerequisites: An upper division course in electromagnetics or fluid dynamics

Hours & Format

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

Additional Details

Subject/Course Level: Applied Science and Technology/Graduate

Grading: Letter grade.

Formerly known as: 239

Also listed as: EL ENG C239

AST C295R Applied Spectroscopy 3 Units
After a brief review of quantum mechanics and semi-classical theories for the interaction of radiation with matter, this course will survey the various spectroscopies associated with the electromagnetic spectrum, from gamma rays to radio waves. Special emphasis is placed on application to research problems in applied and engineering sciences. Graduate researchers interested in systematic in situ process characterization, analysis, or discovery are best served by this course.
Rules & Requirements

Prerequisites: Graduate standing in engineering, physics, chemistry, or chemical engineering; courses: quantum mechanics, linear vector space theory

Hours & Format

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

Additional Details

Subject/Course Level: Applied Science and Technology/Graduate

Grading: Letter grade.

Instructor: Reimer

Also listed as: CHM ENG C295R

AST 299 Individual Study or Research 1 - 12 Units
Investigations of advanced problems in applied science and technology. Sponsored by Engineering Interdisciplinary Studies Center.
Rules & Requirements

Prerequisites: Consent of instructor; graduate standing

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-12 hours of independent study per week

Summer:
3 weeks - 5-60 hours of independent study per week
8 weeks - 1-12 hours of independent study per week

Additional Details

Subject/Course Level: Applied Science and Technology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.