Nuclear Engineering

Overview

The Department of Nuclear Engineering was established in 1958. There are currently about 70 graduate students in the Department. Graduates find opportunities for employment and professional careers in the United States and abroad. Recent graduates are employed in academia, industry, national laboratories, and state and federal agencies.

The Nuclear Engineering program of the University of California, Berkeley is comprised of classroom and laboratory instruction at the undergraduate and graduate levels and a strong, diverse research program. The projects are part of the Department's ongoing mission to provide an education to individuals who will make key contributions and become future leaders serving California and the nation by improving and applying nuclear science and technology. The Department's research areas include applied nuclear physics; bionuclear and radiological physics; energy systems and the environment; ethics and the impact of technology on society; fission reactor analysis; fuel cycles and radioactive waste; fusion science and technology; laser, particle beam, and plasma technologies; nuclear materials and chemistry; nuclear thermal hydraulics; and risk, safety, and large-scale systems analysis.

The Department has strong relations with the nearby Ernest Orlando Lawrence Berkeley National Laboratory (http://lbl.gov) , Lawrence Livermore National Laboratory (http://www.llnl.gov) and Los Alamos National Laboratory (http://www.lanl.gov) . A number of faculty and students collaborate with researchers in these laboratories, and use the facilities of these laboratories in their research projects.

Other Resources

The Department hosts a Monday colloquium series during the academic year. For further information and the schedule, please see the Department's website (http://www.nuc.berkeley.edu/colloquiums) .

The Department sponsors the RadWatch project (http://radwatch.berkeley.edu) and has been performing a large range of radiation measurements since March 2011 following the releases of radioactive materials from the Daiichi Nuclear Power Plant in Japan. One of the goals of this activity was to measure the radioactivity in Californian samples that could potentially be associated with the releases in Japan using state-of-the art experiments, to publish the data without filter or restriction, and to put the results in the context of the radiation the population is exposed to in their daily lives. In response to the resurgent interest in radiation levels due to the expected arrival of cesium at the North American west coast, efforts increasing to measure samples potentially affected by the Pacific Ocean current transport have increased. In addition to measurements samples of fish, seaweed, crab, etc., the Department is part of the new Kelp Watch 2014 initiative (http://kelpwatch.berkeley.edu) , which aims at measuring a potential cesium uptake into kelp over the next year.

Undergraduate Programs

Nuclear Engineering (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/nuclear-engineering) : BS
Chemical Engineering/Nuclear Engineering (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/chemical-engineering-nuclear-joint-major) : BS (Joint Major in conjunction with the College of Chemistry)
Electrical Engineering and Computer Sciences/Nuclear Engineering (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/electrical-engineering-computer-sciences-nuclear-joint-major) : BS (Joint Major)
Materials Science and Engineering/Nuclear Engineering (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/materials-science-engineering-nuclear-joint-major) : BS (Joint Major)
Mechanical Engineering/Nuclear Engineering (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/mechanical-engineering-nuclear) : BS (Joint Major)
Nuclear Engineering (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/nuclear-engineering) : Minor

Graduate Programs

Nuclear Engineering (http://guide.berkeley.edu/archive/2014-15/graduate/degree-programs/nuclear-engineering) : MEng, MS, MS/PhD, PhD

Nuclear Engineering

NUC ENG 24 Freshman Seminars 1 Unit
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

NUC ENG 100 Introduction to Nuclear Engineering 3 Units
The class provides students with an overview of the contemporary nuclear energy technology with emphasis on nuclear fission as an energy source. Starting with the basic physics of the nuclear fission process, the class includes discussions on reactor control, thermal hydraulics, fuel production, and spent fuel management for various types of reactors in use around the world as well as analysis of safety and other nuclear-related issues. This class is intended for sophomore NE students, but is also open to transfer students and students from other majors.
Rules & Requirements

Prerequisites: PHYSICS 7A and 7B, PHYSICS 7C may be taken concurrently. Mathematics 53 and 54 may be taken concurrently

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

NUC ENG 101 Nuclear Reactions and Radiation 4 Units
Energetics and kinetics of nuclear reactions and radioactive decay, fission, fusion, and reactions of low-energy neutrons; properties of the fission products and the actinides; nuclear models and transition probabilities; interaction of radiation with matter.
Rules & Requirements

Prerequisites: PHYSICS 7C

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of lecture per week

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Norman

NUC ENG 102 Nuclear Reactions and Radiation Laboratory 3 Units
Laboratory course in nuclear physics. Experiments will allow students to directly observe phenomena discussed in Nuclear Engineering 101. These experiments will give students exposure to (1) electronics, (2) alpha, beta, gamma radiation detectors, (3) radioactive sources, and (4) experimental methods relevant for all aspects of nuclear science. Experiments include: Rutherford scattering, x-ray fluorescence, muon lifetime, gamma-gamma angular correlations, Mossbauer effect, and radon measurements.
Rules & Requirements

Prerequisites: 101

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture, 1 hour of discussion, and 4 hours of laboratory per week

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Norman

NUC ENG 104 Radiation Detection and Nuclear Instrumentation Laboratory 4 Units
Basic science of radiation measurement, nuclear instrumentation, neutronics, radiation dosimetry. The lectures emphasize the principles of radiation detection. The weekly laboratory applies a variety of radiation detection systems to the practical measurements of interest for nuclear power, nuclear and non-nuclear science, and environmental applications. Students present goals and approaches of the experiements being performed.
Rules & Requirements

Prerequisites: 101 or equivalent or consent of instructor; 150 or equivalent recommended

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 4 hours of laboratory per week

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Vetter

Formerly known as: 104A

NUC ENG 107 Introduction to Imaging 3 Units
Introduction to medical imaging physics and systems, including x-ray computed tomography (CT), nuclear magnetic resonance (NMR), positron emission tomography (PET), and SPECT; basic principles of tomography and an introduction to unfolding methods; resolution effects of counting statistics, inherent system resolution and human factors.
Rules & Requirements

Prerequisites: 101 and 104A or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Vetter

NUC ENG 120 Nuclear Materials 4 Units
Effects of irradiation on the atomic and mechanical properties of materials in nuclear reactors. Fission product swelling and release; neutron damage to structural alloys; fabrication and properties of uranium dioxide fuel.
Rules & Requirements

Prerequisites: Engineering 45 and an upper division course in thermodynamics

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Wirth

NUC ENG 124 Radioactive Waste Management 3 Units
Components and material flowsheets for nuclear fuel cycle, waste characteristics, sources of radioactive wastes, compositions, radioactivity and heat generation; waste treatment technologies; waste disposal technologies; safety assessment of waste disposal.
Rules & Requirements

Prerequisites: Engineering 117 or equivalent course

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Ahn

NUC ENG 130 Analytical Methods for Non-proliferation 4 Units
Use of nuclear measurement techniques to detect clandestine movement and/or possession of nuclear materials by third parties. Nuclear detection, forensics, signatures, and active and passive interrogation methodologies will be explored. Techniques currently deployed for arms control and treaty verification will be discussed. Emphasis will be placed on common elements of detection technology from the viewpoint of resolution of threat signatures from false positives due to naturally occurring radioactive material. Laboratory will involve experiments conducted in the Nucleonics Laboratory featuring passive and active neutron signals, gamma ray detection, fission neutron multiplicity, and U and Pu isotopic identification and age determination. Students should be familiar with alpha, beta, gamma, and neutron radiation and basic concepts of nuclear fission.
Rules & Requirements

Prerequisites: 101 or equivalent course in nuclear physics, or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Morse

NUC ENG 150 Introduction to Nuclear Reactor Theory 4 Units
Neutron interactions, nuclear fission, and chain reacting systematics in thermal and fast nuclear reactors. Diffusion and slowing down of neutrons. Criticality calculations. Nuclear reactor dynamics and reactivity feedback. Production of radionuclides in nuclear reactors.
Rules & Requirements

Prerequisites: 101; Mathematics 53 and 54

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Greenspan, Vujic

NUC ENG 155 Introduction to Numerical Simulations in Radiation Transport 3 Units
Computational methods used to analyze radiation transport described by various differential, integral, and integro-differential equations. Numerical methods include finite difference, finite elements, discrete ordinates, and Monte Carlo. Examples from neutron and photon transport; numerical solutions of neutron/photon diffusion and transport equations. Monte Carlo simulations of photon and neutron transport. An overview of optimization techniques for solving the resulting discrete equations on vector and parallel computer systems.
Rules & Requirements

Prerequisites: Mathematics 53 and 54

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Vujic, Wirth

NUC ENG 161 Nuclear Power Engineering 4 Units
Energy conversion in nuclear power systems; design of fission reactors; thermal and structural analysis of reactor core and plant components; thermal-hydraulic analysis of accidents in nuclear power plants; safety evaluation and engineered safety systems.
Rules & Requirements

Prerequisites: Course(s) in fluid mechanics and heat transfer; junior-level course in thermodynamics

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Peterson

NUC ENG 162 Radiation Biophysics and Dosimetry 3 Units
Interaction of radiation with matter; physical, chemical, and biological effects of radiation on human tissues; dosimetry units and measurements; internal and external radiation fields and dosimetry; radiation exposure regulations; sources of radiation and radioactivity; basic shielding concepts; elements of radiation protection and control; theories and models for cell survival, radiation sensitivity, carcinogenesis, and dose calculation.
Rules & Requirements

Prerequisites: Upper division standing or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Vujic

NUC ENG 167 Nuclear Reactor Safety 3 Units
Principles and methods used in the safety evaluation of nuclear power plants. Safety philosophies, design criteria, and regulations. Deterministic and probabilistic models, reliability analysis, nuclear and thermal-hydraulic transients, rediological consequences, and risk assessment. Design-basis and severe accident analysis, role of engineered safety systems, siting, and licensing.
Rules & Requirements

Prerequisites: 150, 161, or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Kastenberg

NUC ENG 170A Nuclear Design: Design in Nuclear Power Technology and Instrumentation 3 Units
Design of various fission and fusion power systems and other physically based applications. Each semester a topic will be chosen by the class as a whole. In addition to technology, the design should address issues relating to economics, the environment, and risk assessment.
Rules & Requirements

Prerequisites: Senior standing or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: 170

NUC ENG 170B Nuclear Design: Design in Bionuclear, Nuclear Medicine, and Radiation Therapy 3 Units
A systems approach to the development of procedures for nuclear medicine and radiation therapy. Each semester a specific procedure will be studied and will entail the development of the biological and physiological basis for a procedure, the chemical and biochemical characteristics of appropriate drugs, dosimetric requirements and limitations, the production and distribution of radionuclides and/or radiation fields to be applied, and the characteristics of the instrumentation to be used.
Rules & Requirements

Prerequisites: 107, 161, or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: 167

NUC ENG 175 Methods of Risk Analysis 3 Units
Methodological approaches for the quantification of technological risk and risk based decision making. Probabilistic safety assessment, human health risks, environmental and ecological risk analysis.
Rules & Requirements

Prerequisites: Upper division standing

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of lecture per week

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Kastenberg

NUC ENG 180 Introduction to Controlled Fusion 3 Units
Introduction to energy production by controlled thermonuclear reactions. Nuclear fusion reactions, energy balances for fusion systems, survey of plasma physics; neutral beam injection; RF heating methods; vacuum systems; tritium handling.
Rules & Requirements

Prerequisites: PHYSICS 7C

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Morse

NUC ENG H194 Honors Undergraduate Research 1 - 4 Units
Supervised research. Students who have completed three or more upper division courses may pursue original research under the direction of one of the members of the staff. A final report or presentation is required. A maximum of three units of H194 may be used to fulfill a technical elective requirement in the Nuclear Engineering general program or joint major programs.
Rules & Requirements

Prerequisites: Upper division technical GPA of 3.3, consent of instructor and faculty advisor

Repeat rules: Course may be repeated for credit once. Course may be repeated once for credit.Course may be repeated for a maximum of 8 units.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer: 10 weeks - 1.5-6 hours of independent study per week

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

NUC ENG 199 Supervised Independent Study 1 - 4 Units
Supervised independent study. Enrollment restrictions apply; see the Introduction to Courses and Curricula section of this catalog.
Rules & Requirements

Prerequisites: Consent of instructor and major adviser

Credit Restrictions: Course may be repeated for credit for a maximum of 4 units per semester.

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

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

NUC ENG S199 Supervised Independent Study 1 - 4 Units
Supervised independent study. Please see section of the for description and prerequisites.
Rules & Requirements

Prerequisites: Consent of instructor and major adviser

Credit Restrictions: Course may be repeated for credit for a maximum of 4 units per semester.

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

Hours & Format

Summer: 8 weeks - 0 hours of independent study per week

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

NUC ENG 201 Nuclear Reactions and Interactions of Radiation with Matter 4 Units
Interaction of gamma rays, neutrons, and charged particles with matter; nuclear structure and radioactive decay; cross sections and energetics of nuclear reactions; nuclear fission and the fission products; fission and fusion reactions as energy sources.
Rules & Requirements

Prerequisites: 101

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of lecture per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Norman

NUC ENG 204 Advanced Concepts in Radiation Detection and Measurements 3 Units
Advanced concepts in the detection of ionizing radiation relevant for basic and applied sciences, nuclear non-proliferation, and homeland security. Concepts of signal generation and processing with advantages and drawbacks of a range of detection technologies. Laboratory comprises experiments to compare conventional analog and advanced digital signal processing, information generation and processing, position-sensitive detection, tracking, and imaging modalities.
Rules & Requirements

Prerequisites: Graduate standing, 104 or similar course or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 4 hours of laboratory per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Vetter

NUC ENG 220 Irradiation Effects in Nuclear Materials 3 Units
Physical aspects and computer simulation of radiation damage in metals. Void swelling and irradiation creep. Mechanical analysis of structures under irradiation. Sputtering, blistering, and hydrogen behavior in fusion reactor materials.
Rules & Requirements

Prerequisites: 120 or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Wirth

NUC ENG 221 Corrosion in Nuclear Power Systems 3 Units
Structural metals in nuclear power plants; properties and fabrication of Zircaloy; aqueous corrosion of reactor components; structural integrity of reactor components under combined mechanical loading, neutron irradiation, and chemical environment.
Rules & Requirements

Prerequisites: 120, Materials Science and Mineral Engineering 112 recommended

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Wirth

NUC ENG 224 Safety Assessment for Geological Disposal of Radioactive Wastes 3 Units
Multi-barrier concept; groundwater hydrology, mathematical modeling of mass transport in heterogeneous media, source term for far-field model; near-field chemical environment, radionuclide release from waste solids, modeling of radionuclide transport in the near field, effect of temperature on repository performance, effect of water flow, effect of geochemical conditions, effect of engineered barrier alteration; overall performance assessment, performance index, uncertainty associated with assessment, regulation and standards.
Rules & Requirements

Prerequisites: 124 or upper division course in differential equations

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Ahn

NUC ENG 225 The Nuclear Fuel Cycle 3 Units
This course is intended for graduate students interested in acquiring a foundation in nuclear fuel cycle with topics ranging from nuclear-fuel reprocessing to waste treatment and final disposal. The emphasis is on the relationship between nuclear-power utilization and its environmental impacts. The goal is for graduate engineering students to gain sufficient understanding in how nuclear-power utilization affects the environment, so that they are better prepared to design an advanced system that would result in minimized environmental impact. The lectures will consist of two parts. The first half includes mathematical models for individual processes in a fuel cycle, such as nuclear fuel reprocessing, waste solidification, repository performance, and nuclear transmutation in a nuclear reactor. In the second half, these individual models are integrated, which enables students to evaluate environmental impact of a fuel cycle.
Rules & Requirements

Prerequisites: Graduate standing or consent of instructor; 124 and 150 are recommended

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Ahn

NUC ENG 230 Analytical Methods for Non-Proliferation 4 Units
Use of nuclear measurement techniques to detect clandestine movement and/or possession of nuclear materials by third parties. Nuclear detection, forensics, signatures, and active passive interrogation methodologies will be explored. Techniques currently deployed for arms control and treaty verification will be discussed. Emphasis will be placed on common elements of detection technology from the viewpoint of resolution of threat signatures from false positives due to naturally occurring radioactive material. Laboratory will involve experiments conducted in the Nucleonics Laboratory featuring passive and active neutron signals, gamma ray detection, fission neutron multiplicity, and U and Pu isotopic identification and age determination. Students should be familiar with alpha, beta, gamma, and neutron radiation and basic concepts of nuclear fission.
Rules & Requirements

Prerequisites: 101, PHYSICS 7C, or equivalent course in nuclear physics

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Morse

NUC ENG 250 Nuclear Reactor Theory 4 Units
Fission characteristics; neutron chain reactions, neutron transport and diffusion theory; reactor kinetics; multigroup methods, fast and thermal spectrum calculations, inhomogeneous reactor design, effects of poisons and fuel depletion.
Rules & Requirements

Prerequisites: 101, 150; Engineering 117 recommended

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of lecture per week

Summer: 6 weeks - 10 hours of lecture per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Greenspan

NUC ENG 255 Numerical Simulation in Radiation Transport 3 Units
Computational methods used to analyze nuclear reactor systems described by various differential, integral, and integro-differential equations. Numerical methods include finite difference, finite elements, discrete ordinates, and Monte Carlo. Examples from neutron and photon transport, heat transfer, and thermal hydraulics. An overview of optimization techniques for solving the resulting discrete equations on vector and parallel computer systems.
Rules & Requirements

Prerequisites: 150

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Vujic

NUC ENG 260 Thermal Aspects of Nuclear Reactors 4 Units
Fluid dynamics and heat transfer; thermal and hydraulic analysis of nuclear reactors; two-phase flow and boiling; compressible flow; stress analysis; energy conversion methods.
Rules & Requirements

Prerequisites: Mechanical Engineering 106 and 109 or Chemical Engineering 150B

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of lecture per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Peterson

NUC ENG 265 Design Analysis of Nuclear Reactors 3 Units
Principles and techniques of economic analysis to determine capital and operating costs; fuel management and fuel cycle optimization; thermal limits on reactor performance, thermal converters, and fast breeders; control and transient problems; reactor safety and licensing; release of radioactivity from reactors and fuel processing plants.
Rules & Requirements

Prerequisites: 150 and 161

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Greenspan

NUC ENG 267 Nuclear Reactor Safety 3 Units
Principles and methods used in the safety evaluation of nuclear power plants. Safety philosophies, design criteria and regulations. Deterministic and probabilistic models, reliability analysis, nuclear and thermal-hydraulic transients, radiological consequences, and risk assessment. Design-basis and severe accident analysis, role of engineered safety systems, siting, and licensing. Case studies of accidents.
Rules & Requirements

Prerequisites: 150 and 161

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Peterson

NUC ENG 275 Principles and Methods of Risk Analysis 4 Units
Principles and methodological approaches for the quantification of technological risk and risk-based decision making.
Rules & Requirements

Prerequisites: Consent of instructor. Civil Engineering 193 and Industrial Engineering 166 recommended

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of lecture per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Kastenberg

NUC ENG 280 Fusion Reactor Engineering 3 Units
Engineering and design of fusion systems. Introduction to controlled thermonuclear fusion as an energy economy, from the standpoint of the physics and technology involved. Case studies of fusion reactor design. Engineering principles of support technology for fusion systems.
Rules & Requirements

Prerequisites: 120 and 180

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Morse

NUC ENG 281 Fully Ionized Plasmas 3 Units
Introduction to warm and hot magnetized plasmas. Single particle motion in electric and magnetic fields. Collective particle oscillations, waves and instabilities. Magnetohydrodynamic equilibria, stability and transport. Magnetically confined plasmas for controlled fusion. Space plasmas.
Rules & Requirements

Prerequisites: Consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Morse

Formerly known as: Electrical Engineering 239B

NUC ENG C282 Charged Particle Sources and Beam Technology 3 Units
Topics in this course will include the latest technology of various types of ion and electron sources, extraction and formation of charge particle beams, computer simulation of beam propagation, diagnostics of ion sources and beams, and the applications of beams in fusion, synchrotron light source, neutron generation, microelectronics, lithography, and medical therapy. This is a general accelerator technology and engineering course that will be of interest to graduate students in physics, electrical engineering, and nuclear engineering.
Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructors: Leung, Steier

Also listed as: ENGIN C282

NUC ENG C285 Nuclear Security: The Nexus Between Policy and Technology 4 Units
The course will review the origins and evolution of nuclear energy, how it has been applied for both peaceful and military purposes, and the current and prospective challenges it presents. The purpose of the course is to educate students on the policy roots and technological foundations of nuclear energy and nuclear weapons so they are positioned to make original contributions to the field in their scholarly and professional careers.
Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructors: Nacht, Prussin

Also listed as: PUB POL C285

NUC ENG 290A Special Topics in Applied Nuclear Physics 3 Units
Special topics in applied nuclear physics. Topics may include applied nuclear reactions and instrumentation, bionuclear and radiological physics, and subsurface nuclear technology, among other possibilities. Course content may vary from semester to semester depending upon the instructor.
Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

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: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: van Bibber

NUC ENG 290B Special Topics in Nuclear Materials and Chemistry 3 Units
Special topics in nuclear materials and chemistry. Topics may include advanced nuclear materials and corrosion. Course content may vary from semester to semester depending upon the instructor.
Rules & Requirements

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: Nuclear Engineering/Graduate

Grading: Letter grade.

NUC ENG 290C Special Topics in Nuclear Energy 3 Units
Special topics in nuclear energy. Topics may include fission reactor analysis and engineering, nuclear thermal hydraulics, and risk, safety and large-scale systems analysis. Course content may vary from semester to semester depending on the instructor.
Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

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: Nuclear Engineering/Graduate

Grading: Letter grade.

NUC ENG 290D Special Topics in Nuclear Non-Proliferation 3 Units
Special topics in nuclear non-proliferation. Topics may include homeland security and nuclear policy, and nuclear fuel cycle and waster management. Course content may vary from semester to semester depending on the instructor.
Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

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: Nuclear Engineering/Graduate

Grading: Letter grade.

NUC ENG 290E Special Topics in Environmental Aspects of Nuclear Energy 3 Units
Special topics in environmental aspects of nuclear energy. Lectures on special topics of interest in environmental impacts of nuclear power utilizations, including severe accidents. The course content may vary from semester to semester, and will be announced at the beginning of each semester.
Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

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: Nuclear Engineering/Graduate

Grading: Letter grade.

NUC ENG 290F Special Topics in Fusion and Plasma Physics 3 Units
Special topics in fusion and plasma physics. Topics may include laser, particle bean and plasma technologies, fusion science and technology, and accelerators. Course content may vary
from semester to semester depending upon the instructor.
Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

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: Nuclear Engineering/Graduate

Grading: Letter grade.

NUC ENG 295 Nuclear Engineering Colloquium 0.0 Units
Presentations on current topics of interest in nuclear technology by experts from government, industry and universities. Open to the campus community.
Rules & Requirements

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

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of lecture per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Peterson

NUC ENG 298 Group Research Seminars 1 Unit
Seminars in current research topics in nuclear engineering: Section 1 - Fusion; Section 2 - Nuclear Waste Management; Section 3 - Nuclear Thermal Hydraulics; Section 4 - Nuclear Chemistry; Section 6 - Nuclear Materials; Section 7 - Fusion reaction design; Section 8 - Nuclear Instrumentation.
Rules & Requirements

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 - 1.5 hours of seminar per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

NUC ENG 299 Individual Research 1 - 12 Units
Investigation of advanced nuclear engineering problems.
Rules & Requirements

Prerequisites: 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 - 0 hours of independent study per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

NUC ENG 375 Teaching Techniques in Nuclear Engineering 1 - 3 Units
This course is designed to acquaint new teaching assistants with the nature of graduate student instruction in courses in the department of Nuclear Engineering. Discussion, practice, and review of issues relevant to the teaching of nuclear engineering. Effective teaching methods will be introduced by experienced GSIs and faculty.
Rules & Requirements

Prerequisites: Graduate standing or ASE status

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 hour of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Nuclear Engineering/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.

Formerly known as: Nuclear Enginering 301

NUC ENG 602 Individual Study for Doctoral Students 1 - 8 Units
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D.
Rules & Requirements

Prerequisites: For candidates for doctoral degree

Credit Restrictions: Course does not satisfy unit or residence requirements for doctoral degree.

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 - 0 hours of independent study per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.