Nuclear Engineering

The Department of Nuclear Engineering offers three graduate degree programs: the Doctor of Philosophy (PhD), the Master of Engineering (MEng), and the Public Policy (MPP)/Nuclear Engineering (MS) Concurrent Degree Program.

Admission to the University

Minimum Requirements for Admission

The following minimum requirements apply to all graduate programs and will be verified by the Graduate Division:

1. A bachelor's degree or recognized equivalent from an accredited institution;
2. A grade point average of B or better (3.0);
3. If the applicant has completed a basic degree from a country or political entity (e.g., Quebec) where English is not the official language, adequate proficiency in English to do graduate work, as evidenced by a TOEFL score of at least 90 on the iBT test, 570 on the paper-and-pencil test, or an IELTS Band score of at least 7 on a 9-point scale (note that individual programs may set higher levels for any of these); and
4. Sufficient undergraduate training to do graduate work in the given field.

Applicants Who Already Hold a Graduate Degree

The Graduate Council views academic degrees not as vocational training certificates, but as evidence of broad training in research methods, independent study, and articulation of learning. Therefore, applicants who already have academic graduate degrees should be able to pursue new subject matter at an advanced level without the need to enroll in a related or similar graduate program.

Programs may consider students for an additional academic master's or professional master's degree only if the additional degree is in a distinctly different field.

Applicants admitted to a doctoral program that requires a master's degree to be earned at Berkeley as a prerequisite (even though the applicant already has a master's degree from another institution in the same or a closely allied field of study) will be permitted to undertake the second master's degree, despite the overlap in field.

The Graduate Division will admit students for a second doctoral degree only if they meet the following guidelines:

1. Applicants with doctoral degrees may be admitted for an additional doctoral degree only if that degree program is in a general area of knowledge distinctly different from the field in which they earned their original degree. For example, a physics PhD could be admitted to a doctoral degree program in music or history; however, a student with a doctoral degree in mathematics would not be permitted to add a PhD in statistics.
2. Applicants who hold the PhD degree may be admitted to a professional doctorate or professional master's degree program if there is no duplication of training involved.

Applicants may apply only to one single degree program or one concurrent degree program per admission cycle.

Required Documents for Applications

1. **Transcripts:** Applicants may upload *unofficial* transcripts with your application for the departmental initial review. Unofficial transcripts must contain specific information including the name of the applicant, name of the school, all courses, grades, units, & degree conferral (if applicable).
2. **Letters of recommendation:** Applicants may request online letters of recommendation through the online application system. Hard copies of recommendation letters must be sent directly to the program, by the recommender, not the Graduate Admissions.
3. **Evidence of English language proficiency:** All applicants who have completed a basic degree from a country or political entity in which the official language is not English are required to submit official evidence of English language proficiency. This applies to institutions from Bangladesh, Burma, Nepal, India, Pakistan, Latin America, the Middle East, the People's Republic of China, Taiwan, Japan, Korea, Southeast Asia, most European countries, and Quebec (Canada). However, applicants who, at the time of application, have already completed at least one year of full-time academic course work with grades of B or better at a US university may submit an official transcript from the US university to fulfill this requirement. The following courses will not fulfill this requirement:
    - courses in English as a Second Language,
    - courses conducted in a language other than English,
    - courses that will be completed after the application is submitted, and
    - courses of a non-academic nature.

Applicants who have previously applied to Berkeley must also submit new test scores that meet the current minimum requirement from one of the standardized tests. Official TOEFL score reports must be sent directly from Educational Test Services (ETS). The institution code for Berkeley is 4833 for Graduate Organizations. Official IELTS score reports must be sent electronically from the testing center to University of California, Berkeley, Graduate Division, Sproul Hall, Rm 318 MC 5900, Berkeley, CA 94720. TOEFL and IELTS score reports are only valid for two years prior to beginning the graduate program at UC Berkeley. Note: score reports can not expire before the month of June.

Where to Apply

Visit the Berkeley Graduate Division application page (http://grad.berkeley.edu/admissions/apply/).

Admission to the Program

Admission to the graduate program in nuclear engineering is available to qualified individuals who have obtained a bachelor's degree from a recognized institution in one of the fields of engineering or the physical sciences. For all programs, required preparation in undergraduate coursework includes mathematics through partial differential equations and advanced analysis, nuclear reactions, and thermodynamics. Admission is granted on the basis of undergraduate and graduate records (if any), statement of purpose, record of work experience and professional activities, letters of recommendation, and the Graduate Record Examination (GRE) and Test of English as a Foreign Language (TOEFL), if applicable.

In order to receive the PhD in Nuclear Engineering, all students must successfully complete the following three milestones:

- Required coursework: major and minor requirements
- Departmental exams: first-year screening exams and the oral qualifying exam
- Dissertation

Curriculum

Courses Required
Major Field (6 Graduate Level Nuclear Engineering Electives). A 3.0 GPA in the major is required.
One Technical Minor Field Outside Nuclear Engineering (2-3 courses; 1 course must be graduate level). A 3.0 GPA minimum is required for both minors.
One Technical Minor Field Outside or in Nuclear Engineering (2-3 courses; 1 course must be graduate level). All courses taken to fulfill the PhD course requirement must be letter-graded.

Departmental Exams

Screening Exam

Students must pass a written screening exam during the first year in graduate study. The exam is based on undergraduate thermodynamics, nuclear materials, heat transfer and fluid mechanics, nuclear physics, neutronics, radiaoactive waste management and fusion theory. Four of the seven areas must be passed in order the pass the exam. There are two chances to pass.

Oral Exam

After completion of the coursework for the PhD the student takes the oral exam. The content of the exam is usually a presentation of the student's research and questions relating the coursework in the outside minor. The exam committee is composed of four faculty members (normally three from the department and a non-departmental faculty member who represents an outside minor).

PhD Dissertation

A dissertation on a subject chosen by the candidate, bearing on the principal subject of the student's major study and demonstrating the candidate's ability to carry out an independent investigation, must be completed and receive the approval of the dissertation committee and the dean of the Graduate Division. The committee consists of three members, including the instructor in charge of the dissertation and one member outside the candidate's department.

Master of Engineering (MEng)

In collaboration with other departments in the College of Engineering, Nuclear Engineering offers a one-year professional master's degree. The accelerated program is designed to develop professional engineering leaders who understand the technical, environmental, economic, and social issues involved in the design and operation of nuclear engineering devices, systems, and organizations. Prospective students will be engineers, typically with industrial experience, who aspire to substantially advance in their careers and ultimately to lead large, complex organizations, including governments.

The interdisciplinary degree will consist of three major components, comprising a technical specialization in NE (minimum 12 graduate units), a “breadth” curriculum of engineering leadership courses (8 units), and an integrative capstone project (5 units). See The Fung Institute (http://funginstitute.berkeley.edu/berkeley-master-engineering/) for more details.

Technical concentrations in:

Nuclear reactors design, management and infrastructure

Applied nuclear science and radiation detection

Nuclear materials and manufacturing

Medical physics

The MEng degree requires a minimum of 25 units of coursework in three areas:

- The Core Leadership curriculum (8 units)
- Technical Specialization in NE (minimum 12 units)
- Capstone project (5 units).

CORE LEADERSHIP Curriculum (8 units, letter grade, required for degree)

FALL ENGINEERING LEADERSHIP TOPICS (3 units)

- ENGIN 270A, Organizational Behavior & Negotiations (1 unit)
- ENGIN 270B, R&D Tech Management & Ethics (1 unit)
- ENGIN 270C, Project Management and Teaming (1 unit)

Designed for Master of Engineering students, these courses explore key management and leadership concepts at the executive level that are relevant to technology-dependent enterprises. During the courses, students undertake rigorous case study analysis of actual business situations.

SPRING ENGINEERING LEADERSHIP TOPICS (3 units)

Required:

- ENGIN 270C, Project Management & Teaming (1 unit)

Students choose 2 of 5 to meet the core requirement:

- ENGIN 270D, Entrepreneurship for Engineers (1 unit)
- ENGIN 270E, Technology Strategy (1 unit)
- ENGIN 270I, Industry Analytics (1 unit)
- ENGIN 270G, Marketing & Product Management (1 unit)
- ENGIN 270H, Accounting and Finance (1 unit)

Communications for Engineering Leaders (2 units)

1 unit fall, 1 unit spring. A year-long course which supports your efforts to generate clear, engaging, and memorable content for your project’s reporting deliverables.

Reporting deliverables include presentations, pitches, press releases, promotional materials, project proposals, and research papers.

TECHNICAL ELECTIVES in Area of Concentration (minimum 12 units)

All Technical Electives must be NE graduate-level courses (200) and taken for a letter grade. Units for 298 (seminar) courses do not count for the degree.

CAPSTONE PROJECT (5 units)

5 semester units of ENGIN 296MA-B (letter graded end of spring, required)

- 1–2 semester units ENGIN 296MA – Fall
- 3–4 semester units ENGIN 296MB - Spring

CAPSTONE PROJECT SUMMARY

The 9-month capstone experience will challenge you to integrate your technical and leadership skills to innovate in a dynamic, results-driven environment. Working on a team of 3 to 6 students over the course of the fall and spring semesters (5 units) you will engineer solutions using cutting edge technology and methods to address crucial industry, market or societal needs.

Berkeley faculty or industry partners propose capstone projects and serve as technical advisors for the project teams. While details of the selection process vary by department, incoming students apply to their preferred projects, and the faculty or industry mentors make the final team assignments.

CAPSTONE CURRICULUM INTEGRATION

Capstone projects form the core of a highly integrated curriculum. Engineering Leadership (E270 series) courses provide skills necessary to engage specific industry, social, and/or economic contexts and formulate R & D, finance, and/or marketing strategy. Communications (E295) workshops support students as they reach out to a variety of stakeholders crucial to their project's success. Teaming and Project Management faculty support teams as they learn about project scoping, assessment, and improvement; stakeholder management; conflict resolution, etc.

CAPSTONE DELIVERABLES

Students must submit a team capstone project report. In addition, each team is expected to provide the project advisor with a final project deliverable, the form of which is to be defined in collaboration with the project advisor. Examples of project deliverables include product prototypes, algorithms, conceptual designs, software code, and proof-of-concept.

All students are required to have a minimum overall GPA of 3.0 or higher.

COMPREHENSIVE FINAL EXAM

The Comprehensive Exam will be divided into two components, one devoted to leadership topics (to be administered by the Fung Institute), and the other to technical topics (to be administered by individual departments within COE). The exam may be written, oral, or a combination of the two.

NE students that participate in a capstone project outside of the NE department are required to highlight the NE component of their project or will be tested on NE related topics based on coursework taken.

Visit the program website (https://nuc.berkeley.edu/master-of-engineering-program/) for more detailed information.

The Master's of Science Track is only accessible to students enrolled in our PhD program. Applicants interested in the Master's degree are encouraged to apply to the Nuclear Engineering Master of Engineering program.

Students pursuing the MS Degree have two program options: Plan I, and Plan II.

MS Plan I requirements

Plan I requires at least 20 semester units of upper division (100 level) and graduate courses (200 level), plus a thesis.

The following requirements must be met:

1. Minimum 8 units of graduate-level courses in NE. Note: No more than 2-299 units may count towards these 8 units. All 8 units must be taken for a letter grade (except the 299 units).
2. Minimum 12 units of graduate-level or upper division courses in NE or another department. Note: No more than 2-299 units may count towards these 12 units.
3. NE major field adviser must approve all coursework each semester.
4. NUC ENG 298 (seminar) units do not count towards the 20-unit requirement.
5. Must have a cumulative GPA of 3.0 or higher to receive the degree.
6. Two-thirds of the total 20 units must be letter-graded.

Thesis Requirement

A Master's Thesis is required for the MS Plan I program. Guidelines on "Thesis Writing and Filing" can be found at this link http://grad.berkeley.edu/academic-progress/thesis/. Please note that you must apply for MS candidacy by submitting an application for advancement to MS candidacy using the eForm in Cal Central. The Graduate Division must approve the MS candidacy to be able to file a master's thesis.

Committee Requirement

Students must have a properly constituted thesis committee that includes three Academic Senate NE faculty members. If a proposed committee member does not belong to the Academic Senate (i.e. LBL or LLNL), you are required to include a request for an exception (and the CV) together with the application for advancement to MS candidacy. Contact the Student Services Advisor if you require an exception request for a committee member, as you will be required to upload an exception memo and the committee members CV when applying for MS candidacy using the eForm in Cal Central.

MS Plan II requirements

Plan II requires at least 24 semester units of upper division (100 level) and graduate courses (200 level), followed by a comprehensive final examination administered by the department. In Nuclear Engineering, the "examination" takes the form of an oral project presentation, and a written report.

The following requirements must be met:

1. Minimum 12 units of graduate-level courses in NE. Note: No more than 2-299 units may count towards these 12 units. All 12 units must be taken for a letter grade (except the 299 units).

2. Minimum 12 units of graduate or upper division courses in NE or another department. Note: No more than 2-299 units may count towards these 12 units.

3. NE major field adviser must approve all coursework each semester.

4. NUC ENG 298 (seminar) units do not count towards the 24-unit requirement.

5. Must have a cumulative GPA of 3.0 or higher to receive the degree.
6. Two-thirds of the 24 units must be letter-graded.

Comprehensive Exam and Committee

Completion of a project culminating in a written report (10-50 pages) and an oral presentation (30 minutes) before a committee of three Academic Senate NE faculty members, or two Senate NE faculty members and one approved non-Senate member. The written report must be submitted to the MS committee chair, and to the NE Student Services Adviser at least one week prior to the oral presentation. Approval by the professor in charge of the research project and the HGA is required.

Public Policy (MPP) and Nuclear Engineering (MS) Concurrent Degree Program

Government and technology interact more, and with greater consequences, every year. Whether the issue area is nuclear security, environmental protection, intellectual property (copyright and the internet), health care, water supply, or any of myriad other contexts, government agencies at all levels, non-profit organizations and private industry need people who understand technology on its own terms and also the ways government supports, controls, or directs it. Because this program is small, each student's program tends to be customized with the agreement of advisors in both programs.

Basic Requirements

Year 1	
	Completion of the MPP first year core curriculum.
	Summer Internship.
Year 2	
	Complete required units in nuclear engineering, plus six elective agreeable to both schools.
	Complete a paper that satisfies the MS Plan I or Plan II requirement, and the MPP APA (Advanced Policy Analysis) requirement.

For more information about this program, contact Michael Nacht (Professor of Public Policy, 510-643-4038) or Karl van Bibber (Chair of the Nuclear Engineering Department, 510-642-3477).

Nuclear Engineering

Expand all course descriptions [+]Collapse all course descriptions [-]

NUC ENG 200M Introduction to Nuclear Engineering 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
Overview of the elements of nuclear technology in use today for the production of energy and other radiation applications. Emphasis is on nuclear fission as an energy source, with a study of the basic physics of the nuclear fission process followed by detailed discussions of issues related to the control, radioactivity management, thermal energy management, fuel production, and spent fuel management. A discussion of the various reactor types in use around the world will include analysis of safety and nuclear proliferation issues surrounding the various technologies. Case studies of some reactor accidents and other nuclear-related incidents will be included.
Introduction to Nuclear Engineering: Read More [+]
Objectives & Outcomes

Course Objectives: (1) To give students an understanding of the basic concepts of nuclear energy and other radiation applications, together with an overview of related aspects such as proliferation and waste management.
(2) To provide students an overview of the elements of nuclear technology in use today for the production of energy and to set those elements in the broader contest of nuclear technology.

Student Learning Outcomes: At the end of the course, students should be able to:
- understand basic theoretical concepts of nuclear physics, reactor physics, and energy removal
- describe radiation damage mechanisms in materials and biological tissue, estimate radiation dose, understand radiation shielding
- understand the concepts of chain reaction, neutron balance, criticality, reactivity, and reactivity control
- describe the main nuclear power reactor designs and identify their major components
- describe core components and understand their function
- calculate cost of electricity based on simple economic principles
- describe the difference between PWR and BWR in terms of core design, steam cycle, and operation
- understand the concept of design-basis accidents, their causes, and their consequences
- identify the main steps and related facilities of fuel cycle
- understand the fundamental aspects of used fuel reprocessing and disposal

Rules & Requirements

Prerequisites: PHYSICS 7A, PHYSICS 7B, and MATH 54

Credit Restrictions: This course is restricted to students enrolled in the Master of Engineering degree program.

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: Fratoni

Introduction to Nuclear Engineering: Read Less [-]

NUC ENG 201 Nuclear Reactions and Interactions of Radiation with Matter 4 Units

Terms offered: Spring 2022, Spring 2020, Spring 2018
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.
Nuclear Reactions and Interactions of Radiation with Matter: Read More [+]
Rules & Requirements

Prerequisites: NUC ENG 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

Nuclear Reactions and Interactions of Radiation with Matter: Read Less [-]

NUC ENG 204 Advanced Concepts in Radiation Detection and Measurements 3 Units

Terms offered: Fall 2022, Fall 2018, Fall 2015
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.
Advanced Concepts in Radiation Detection and Measurements: Read More [+]
Rules & Requirements

Prerequisites: Graduate standing, NUC ENG 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

Advanced Concepts in Radiation Detection and Measurements: Read Less [-]

NUC ENG 207 Physical Principles of CT, PET, and SPECT Imaging 4 Units

Terms offered: Fall 2022, Fall 2021
This course is designed to build the basic knowledge base to understand the physical principles of x-ray computed tomography (CT), positron emission tomography (PET), and single photon emission computed tomography (SPECT), radiologic imaging modalities using ionizing radiation. Using examples of CT, PET, and SPECT used in everyday disease management, this course will introduce theoretical foundations and practical applications for comprehensive understanding of these important noninvasive imaging techniques.
Physical Principles of CT, PET, and SPECT Imaging: Read More [+]
Objectives & Outcomes

Course Objectives: The objective of this course is to understand physical principles of how biomedical imaging systems utilizing ionizing radiation (i.e., x-ray and gamma-ray) work.

Student Learning Outcomes: The students will have good understanding of physical principles of CT, PET, and SPECT imaging, and how these ionizing radiation imaging modalities are used in medicine and biomedical research

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: Youngho

Physical Principles of CT, PET, and SPECT Imaging: Read Less [-]

NUC ENG 210M Nuclear Reactions and Radiation 4 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
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.
Nuclear Reactions and Radiation: Read More [+]
Objectives & Outcomes

Course Objectives: Provide the students with a solid understanding of the fundamentals of those aspect of low-energy nuclear physics that are most important to applications in such areas as nuclear engineering, nuclear and radiochemistry, geosciences, biotechnology, etc.

Student Learning Outcomes: Calculate estimates of nuclear masses and energetics based on empirical data and nuclear models.
Calculate estimates of the lifetimes of nuclear states that are unstable to alpha-,beta- and gamma decay and internal conversion based on the theory of simple nuclear models.
Calculate the consequences of radioactive growth and decay and nuclear reactions.
Calculate the energies of fission fragments and understand the charge and mass distributions of the fission products, and prompt neutron and gamma rays from fission
Calculate the kinematics of the interaction of photons with matter and apply stopping power to determine the energy loss rate and ranges of charged particles in matter
Use nuclear models to predict low-energy level structure and level energies.
Use nuclear models to predict the spins and parities of low-lying levels and estimate their consequences with respect to radioactive decay
Use nuclear models to understand the properties of neutron capture and the Breit-Wigner single level formula to calculate cross sections at resonance and thermal energies.

Rules & Requirements

Prerequisites: PHYSICS 7C or consent of instructor

Credit Restrictions: This course is restricted to students enrolled in the Master of Engineering degree program.

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/Graduate

Grading: Letter grade.

Instructor: Bernstein

Nuclear Reactions and Radiation: Read Less [-]

NUC ENG 211M Radiation Detection and Nuclear Instrumentation Laboratory 4 Units

Terms offered: Not yet offered
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 experiments being performed.
Radiation Detection and Nuclear Instrumentation Laboratory: Read More [+]
Rules & Requirements

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

Credit Restrictions: This course is restricted to students enrolled in the Master of Engineering degree program.

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

Radiation Detection and Nuclear Instrumentation Laboratory: Read Less [-]

NUC ENG 215M Introduction to Nuclear Reactor Theory 4 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
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. General aspects of nuclear core designs.
Introduction to Nuclear Reactor Theory: Read More [+]
Rules & Requirements

Prerequisites: NUC ENG 101; MATH 53; and MATH 54

Credit Restrictions: This course is restricted to students enrolled in the Master of Engineering degree program.

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/Graduate

Grading: Letter grade.

Instructors: Vujic, Fratoni, Slaybaugh

Introduction to Nuclear Reactor Theory: Read Less [-]

NUC ENG 220 Irradiation Effects in Nuclear Materials 3 Units

Terms offered: Spring 2021, Spring 2019, Spring 2017
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.
Irradiation Effects in Nuclear Materials: Read More [+]
Rules & Requirements

Prerequisites: NUC ENG 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

Irradiation Effects in Nuclear Materials: Read Less [-]

NUC ENG 220M Nuclear Materials 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
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.
Nuclear Materials: Read More [+]
Objectives & Outcomes

Course Objectives: Develop an understanding of failure mechanism in materials and their impact in nuclear technology.

Explain quantitatively the production of damage, in materials.

Give an understanding of the behavior of fission products in ceramic fuel, how they are formed, how they migrate, and how they affect properties of the fuel.

Review those aspects of fundamental solid state physics that are pertinent to understanding the effects of radiation on crystalline solids.
Show how radiation, particularly by fast neutrons, affects the mechanical properties of fuel, cladding, and structural materials in a reactor core.

Student Learning Outcomes: Analyze the processes of fission gas release and swelling of reactor fuel.
Deal with point defects in solids; how they are produced at thermal equilibrium and by neutron irradiation; how they agglomerate to form voids in metals or grow gas bubbles in the fuel. Kinchin-Pease model.
Know the principal effects of radiation on metals: dislocation loops, voids, precipitates, and helium bubbles.
Solve diffusion problems beginning from Fick's law; understand how the diffusion coefficient is related to the mobility of atoms in the crystalline lattice.
Understand how the grain structure influences properties such as creep rate and fission product release (ceramic UO_2).
Understand the concept and quantitative properties of dislocations, and how irradiation-produced point defects influences their motion and hence material properties.

Rules & Requirements

Prerequisites: Introductory course on properties of materials (MAT SCI 45); and upper division course in thermodynamics (ENGIN 40 or CHM ENG 141)

Credit Restrictions: This course is restricted to students enrolled in the Master of Engineering degree program.

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/Graduate

Grading: Letter grade.

Instructor: Hosemann

Nuclear Materials: Read Less [-]

NUC ENG 221 Corrosion in Nuclear Power Systems 3 Units

Terms offered: Spring 2022, Spring 2018, Spring 2016
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.
Corrosion in Nuclear Power Systems: Read More [+]
Rules & Requirements

Prerequisites: NUC ENG 120. MAT SCI 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

Corrosion in Nuclear Power Systems: Read Less [-]

NUC ENG 224 Safety Assessment for Geological Disposal of Radioactive Wastes 3 Units

Terms offered: Spring 2014, Spring 2013, Spring 2012
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.
Safety Assessment for Geological Disposal of Radioactive Wastes: Read More [+]
Rules & Requirements

Prerequisites: NUC ENG 124 or an 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

Safety Assessment for Geological Disposal of Radioactive Wastes: Read Less [-]

NUC ENG 225 The Nuclear Fuel Cycle 3 Units

Terms offered: Spring 2015, Spring 2013, Spring 2011
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.
The Nuclear Fuel Cycle: Read More [+]
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

The Nuclear Fuel Cycle: Read Less [-]

NUC ENG C226 Modeling and Simulation of Advanced Manufacturing Processes 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
This course provides the student with a modern introduction to the basic industrial practices, modeling techniques, theoretical background, and computational methods to treat classical and cutting edge manufacturing processes in a coherent and self-consistent manner.
Modeling and Simulation of Advanced Manufacturing Processes: Read More [+]
Objectives & Outcomes

Course Objectives: An introduction to modeling and simulation of modern manufacturing processes.

Rules & Requirements

Prerequisites: An undergraduate course in strength of materials or 122

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/Graduate

Grading: Letter grade.

Instructor: Zohdi

Also listed as: MAT SCI C286/MEC ENG C201

Modeling and Simulation of Advanced Manufacturing Processes: Read Less [-]

NUC ENG 230 Analytical Methods for Non-Proliferation 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
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. Topics include passive and active neutron signals, gamma ray detection, fission neutron multiplicity, and U and Puisotopic identification and age determination.
Analytical Methods for Non-Proliferation: Read More [+]
Rules & Requirements

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

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

Analytical Methods for Non-Proliferation: Read Less [-]

NUC ENG C231 Medical Imaging Signals and Systems 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
Biomedical imaging is a clinically important application of engineering, applied mathematics, physics, and medicine. In this course, we apply linear systems theory and basic physics to analyze X-ray imaging, computerized tomography, nuclear medicine, and MRI. We cover the basic physics and instrumentation that characterizes medical image as an ideal perfect-resolution image blurred by an impulse response. This material could prepare the student for a career in designing new medical imaging systems that reliably detect small tumors or infarcts.
Medical Imaging Signals and Systems: Read More [+]

Objectives & Outcomes

Course Objectives: •
understand how 2D impulse response or 2D spatial frequency transfer function (or Modulation Transfer Function) allow one to quantify the spatial resolution of an imaging system.
•
understand 2D sampling requirements to avoid aliasing
•
understand 2D filtered backprojection reconstruction from projections based on the projection-slice theorem of Fourier Transforms
•
understand the concept of image reconstruction as solving a mathematical inverse problem.
•
understand the limitations of poorly conditioned inverse problems and noise amplification
•
understand how diffraction can limit resolution---but not for the imaging systems in this class
•
understand the hardware components of an X-ray imaging scanner
•
•
understand the physics and hardware limits to spatial resolution of an X-ray imaging system
•
understand tradeoffs between depth, contrast, and dose for X-ray sources
•
understand resolution limits for CT scanners
•
understand how to reconstruct a 2D CT image from projection data using the filtered backprojection algorithm
•
understand the hardware and physics of Nuclear Medicine scanners
•
understand how PET and SPECT images are created using filtered backprojection
•
understand resolution limits of nuclear medicine scanners
•
understand MRI hardware components, resolution limits and image reconstruction via a 2D FFT
•
understand how to construct a medical imaging scanner that will achieve a desired spatial resolution specification.

Student Learning Outcomes: •
students will be tested for their understanding of the key concepts above
•
undergraduate students will apply to graduate programs and be admitted
•
students will apply this knowledge to their research at Berkeley, UCSF

NUC ENG C235 Principles of Magnetic Resonance Imaging 4 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019, Spring 2017
Fundamentals of MRI including signal-to-noise ratio, resolution, and contrast as dictated by physics, pulse sequences, and instrumentation. Image reconstruction via 2D FFT methods. Fast imaging reconstruction via convolution-back projection and gridding methods and FFTs. Hardware for modern MRI scanners including main field, gradient fields, RF coils, and shim supplies. Software for MRI including imaging methods such as 2D FT, RARE, SSFP, spiral and echo planar imaging methods.
Principles of Magnetic Resonance Imaging: Read More [+]

Objectives & Outcomes

Course Objectives: Graduate level understanding of physics, hardware, and systems engineering description of image formation, and image reconstruction in MRI. Experience in Imaging with different MR Imaging systems. This course should enable students to begin graduate level research at Berkeley (Neuroscience labs, EECS and Bioengineering), LBNL or at UCSF (Radiology and Bioengineering) at an advanced level and make research-level contribution

Rules & Requirements

Prerequisites: EL ENG 120 or BIO ENG C165/EL ENG C145B or consent of instructor

Credit Restrictions: Students will receive no credit for Bioengineering C265/El Engineering C225E after taking El Engineering 265.

Repeat rules: Course may be repeated for credit under special circumstances: Students can only receive credit for 1 of the 2 versions of the class,BioEc265 or EE c225e, not both

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructors: Conolly, Vandsburger

Also listed as: BIO ENG C265/EL ENG C225E

Principles of Magnetic Resonance Imaging: Read Less [-]

NUC ENG 250 Nuclear Reactor Theory 4 Units

Terms offered: Fall 2022, Fall 2020, Fall 2017
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.
Nuclear Reactor Theory: Read More [+]
Rules & Requirements

Prerequisites: NUC ENG 101 and NUC ENG 150; ENGIN 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

Nuclear Reactor Theory: Read Less [-]

NUC ENG 255 Numerical Simulation in Radiation Transport 3 Units

Terms offered: Spring 2022, Spring 2021, Fall 2019
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.
Numerical Simulation in Radiation Transport: Read More [+]
Rules & Requirements

Prerequisites: NUC ENG 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

Numerical Simulation in Radiation Transport: Read Less [-]

NUC ENG 256M Nuclear Criticality Safety 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
This course provides an introduction to the field of nuclear criticality safety. Topics include: a review of basic concepts related to criticality (fission, cross sections, multiplication factor, etc.); criticality safety accidents; standards applicable to criticality safety; hand calculations and Monte Carlo methods used in criticality safety analysis; criticality safety evaluation documents.
Nuclear Criticality Safety: Read More [+]
Objectives & Outcomes

Course Objectives: The objective of this course is to acquaint Nuclear Engineering students with the concepts and practice of nuclear criticality safety, and to help prepare them for a future career in this field.

Student Learning Outcomes: At the end of this course, students should be able to:
Explain and define criticality safety factors for operations.
Discuss previous criticality accidents and their causal factors, including parameters involved in solution and metal critical accidents.
Identify and discuss the application of several common hand calculation methods.
Describe the importance of validation of computer codes and how it is accomplished.
Discuss ANSI/ANS criticality safety regulations.
Describe DOE regulations and practices in the nuclear criticality safety field.
Complete a Criticality Safety Evaluation

Rules & Requirements

Prerequisites: NUC ENG 150 or instructor consent

Credit Restrictions: This course is restricted to students enrolled in the Master of Engineering degree program.

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: Fratoni

Nuclear Criticality Safety: Read Less [-]

NUC ENG 260 Thermal Aspects of Nuclear Reactors 4 Units

Terms offered: Fall 2016, Fall 2014, Fall 2012
Fluid dynamics and heat transfer; thermal and hydraulic analysis of nuclear reactors; two-phase flow and boiling; compressible flow; stress analysis; energy conversion methods.
Thermal Aspects of Nuclear Reactors: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 106 and MEC ENG 109; or CHM ENG 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

Thermal Aspects of Nuclear Reactors: Read Less [-]

NUC ENG 261M Nuclear Power Engineering 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
The class covers a wide range of topics applicable to nuclear power plant engineering. 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. The instructor has 30 years' experience in the commercial power industry.
Nuclear Power Engineering: Read More [+]
Rules & Requirements

Prerequisites: Course(s) in fluid mechanics and heat transfer; junior-level course in thermodynamics. Must be enrolled in the Master of Engineering degree program

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/Graduate

Grading: Letter grade.

Instructor: Berger

Nuclear Power Engineering: Read Less [-]

NUC ENG 262 Radiobiology 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
Radiobiology is concerned with the action of ionizing radiation on biological tissues and living organisms. It combines two disciplines: radiation physics and biology. Radiobiology combines our understanding of ionizing radiation and molecular biology, and is a required knowledge for health physicists, radiation biologists and medical physicists. This course will provide such knowledge for a diverse group of students with need in either disciplines. This course represents one of the requisites for the Joint UC Berkeley-UC San Francisco Medical Physics Certificate Program.
Radiobiology: Read More [+]
Objectives & Outcomes

Course Objectives: A group project will be expected from students and computer models will be turned in at the end of the semester, either focusing on cancer risk tools, epidemiologic analysis, radiation cancer models or cancer treatment by radiation. The project should give students strong foundation to tackle more advanced risk models or dynamic cancer models.
They will be exposed to the multi-scale complexity of the tissue response to ionizing radiation from the whole organism to individual cells and down to the DNA. Molecular biology describing the cellular response and the DNA repair mechanisms will be covered, with an emphasis on cell kinetics such as recovery processes and cell cycle sensitivity. The overall tissue response will also be discussed with an effort to distinguish acute and delayed effects. Radiation risk models and their impact on limits will be introduced and described in the context of past and current research. This course is designed for Nuclear Engineering students and in particular those pursuing a Medical Physics Certificate with knowledge essential to radiobiology. Students will learn about the history of radiation effects, epidemiology of radiation and evidence of cancer in populations.

Student Learning Outcomes: By the end of the class, students should:
-
Be proficient in the main mechanisms describing the interaction of ionizing radiation with tissue;
-
Be able to know the existing gaps in this field and where more research is needed;
-
Understand how radiation affects DNA and leads to gene mutation
-
Understand how cancer rises from various radiation damage in the tissue (targeted and non-targeted effects)
-
Able to write computer model for radiation risk assessment
-
Able to write computer model for cancer formation
-
Understand the main methods to treat cancer with radiation
-
Can differentiate tissue effect between low and high LET
-
Understand the various risk issues dealing with radiation: occupational (medical, nuclear worker, astronauts ...), vs population (accident, terrorism ...)
-
Be able to read scientific articles in the radiation biology field

Rules & Requirements

Prerequisites: Students are expected to have completed a course in basic radiology, radiation protection, and dosimetry (NE162 or equivalent). In addition, a class in radiation detection and instrumentation (e.g. NE104 or equivalent) and in introductory programming (Engineering

NUC ENG 265 Design Analysis of Nuclear Reactors 3 Units

Terms offered: Fall 2016, Fall 2015, Fall 2013
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.
Design Analysis of Nuclear Reactors: Read More [+]
Rules & Requirements

Prerequisites: NUC ENG 150 and NUC ENG 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

Design Analysis of Nuclear Reactors: Read Less [-]

NUC ENG 267 Risk-Informed Design for Advanced Nuclear Systems 3 Units

Terms offered: Fall 2021, Fall 2019, Fall 2017
Project-based class for design and licensing of nuclear facilities,including advanced reactors. Elements of a project proposal. Regulatory framework and use of deterministic and probabilistic licensing criteria. Siting criteria. External and internal events. Identification and analysis of design basis and beyond design basis
events. Communication with regulators and stakeholders. Ability to work in and contribute to a design team.
Risk-Informed Design for Advanced Nuclear Systems: Read More [+]
Rules & Requirements

Prerequisites: Completion of at least two upperdivision engineering courses providing relevant skills: CHM ENG 150A, CHM ENG 180, CIV ENG 111, CIV ENG 120, CIV ENG 152, CIV ENG 166, CIV ENG 175, ENGIN 120, IND ENG 166, IND ENG 172, MEC ENG 106, MEC ENG 109, MEC ENG C128, MEC ENG 146, NUC ENG 120, NUC ENG 124, NUC ENG 150, or NUC ENG 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

Risk-Informed Design for Advanced Nuclear Systems: Read Less [-]

NUC ENG 270 Advanced Nuclear Reactors 3 Units

Terms offered: Fall 2021, Spring 2019
The scope of this class is to provide students with a broad overview of Gen IV and beyond reactor systems, advanced fuel cycles, and new trends in reactor design (e.g., small modular, load following, etc.).
Advanced Nuclear Reactors: Read More [+]
Objectives & Outcomes

Course Objectives: The main objective of this course is to provide students with an understanding of how advanced nuclear reactors work, their mission, their benefits, and the challenges that remain to be addressed.
This class is intended for all graduate students (PhD, MS, and MEng) at any stage in their academic career.

Student Learning Outcomes: By the end of this course students are expected to be able:
– to identify the main advanced reactor concepts and recognize their main features;
– to discuss the benefits and challenges associated with each concept;
– to understand the difference between fuel cycle options and associated characteristics such as resource utilization, waste generation, non-proliferation and safeguards;
– to recognize the contribution and limitation of advanced reactors towards various applications (i.e., load-following, hydrogen generation, etc.).

Rules & Requirements

Prerequisites: Students will benefit the most from this class if they have basic knowledge of light water reactor design, reactor physics, and reactor thermal-hydraulics (these topics are covered in NUC ENG 150 and NUC ENG 161). Students are expected to be familiar with the following topics (mostly related to LWR): main reactor components and function; reactor layout; auxiliary systems; criticality, reactivity and reactivity feedbacks; and heat transfer, fluid flow

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: Fratoni

Advanced Nuclear Reactors: Read Less [-]

NUC ENG 275 Principles and Methods of Risk Analysis 4 Units

Terms offered: Fall 2022, Fall 2020, Fall 2018
Principles and methodological approaches for the quantification of technological risk and risk-based decision making.
Principles and Methods of Risk Analysis: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor. CIV ENG 193 and IND ENG 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

Principles and Methods of Risk Analysis: Read Less [-]

NUC ENG 280 Fusion Reactor Engineering 3 Units

Terms offered: Spring 2021, Spring 2019, Spring 2017
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.
Fusion Reactor Engineering: Read More [+]
Rules & Requirements

Prerequisites: NUC ENG 120 and NUC ENG 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

Fusion Reactor Engineering: Read Less [-]

NUC ENG 281 Fully Ionized Plasmas 3 Units

Terms offered: Spring 2022, Spring 2020, Spring 2018
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.
Fully Ionized Plasmas: Read More [+]
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

Fully Ionized Plasmas: Read Less [-]

NUC ENG C282 Charged Particle Sources and Beam Technology 3 Units

Terms offered: Spring 2022, Spring 2020, Spring 2018, Fall 2015, Fall 2013, Fall 2011
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.
Charged Particle Sources and Beam Technology: Read More [+]
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

Charged Particle Sources and Beam Technology: Read Less [-]

NUC ENG C285 Nuclear Security: The Nexus Between Policy and Technology 4 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
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.
Nuclear Security: The Nexus Between Policy and Technology: Read More [+]
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

Nuclear Security: The Nexus Between Policy and Technology: Read Less [-]

NUC ENG 290A Special Topics in Applied Nuclear Physics 3 Units

Terms offered: Fall 2017, Spring 2016, Fall 2014
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.
Special Topics in Applied Nuclear Physics: Read More [+]
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

Special Topics in Applied Nuclear Physics: Read Less [-]

NUC ENG 290B Special Topics in Nuclear Materials and Chemistry 3 Units

Terms offered: Fall 2022, Fall 2020, Spring 2016
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.
Special Topics in Nuclear Materials and Chemistry: Read More [+]
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.

Special Topics in Nuclear Materials and Chemistry: Read Less [-]

NUC ENG 290C Special Topics in Nuclear Energy 3 Units

Terms offered: Summer 2002 10 Week Session
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.
Special Topics in Nuclear Energy: Read More [+]
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.

Special Topics in Nuclear Energy: Read Less [-]

NUC ENG 290D Special Topics in Nuclear Non-Proliferation 3 Units

Terms offered: Spring 2021, Fall 2014, Summer 2005 10 Week Session
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.
Special Topics in Nuclear Non-Proliferation: Read More [+]
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.

Special Topics in Nuclear Non-Proliferation: Read Less [-]

NUC ENG 290E Special Topics in Environmental Aspects of Nuclear Energy 1 - 3 Units

Terms offered: Fall 2021, Spring 2019, Fall 2015
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.
Special Topics in Environmental Aspects of Nuclear Energy: Read More [+]
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 - 1-3 hours of lecture per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Special Topics in Environmental Aspects of Nuclear Energy: Read Less [-]

NUC ENG 290F Special Topics in Fusion and Plasma Physics 3 Units

Terms offered: Summer 2007 10 Week Session, Summer 2007 3 Week Session
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.
Special Topics in Fusion and Plasma Physics: Read More [+]
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.

Special Topics in Fusion and Plasma Physics: Read Less [-]

NUC ENG 295 Nuclear Engineering Colloquium 0.0 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021
Presentations on current topics of interest in nuclear technology by experts from government, industry and universities. Open to the campus community.
Nuclear Engineering Colloquium: Read More [+]
Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: van Bibber

Nuclear Engineering Colloquium: Read Less [-]

NUC ENG 298 Group Research Seminars 1 Unit

Terms offered: Fall 2022, Spring 2022, Fall 2021
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.
Group Research Seminars: Read More [+]
Rules & Requirements

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

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.

Group Research Seminars: Read Less [-]

NUC ENG 299 Individual Research 1 - 12 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021
Investigation of advanced nuclear engineering problems.
Individual Research: Read More [+]
Rules & Requirements

Prerequisites: Graduate standing

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

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.

Individual Research: Read Less [-]

NUC ENG N299 Individual Research 1 - 6 Units

Terms offered: Summer 2022 8 Week Session, Summer 2021 3 Week Session, Summer 2021 8 Week Session
Investigation of advanced nuclear engineering problems.
Individual Research: Read More [+]
Rules & Requirements

Prerequisites: Graduate standing

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

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Individual Research: Read Less [-]

NUC ENG 375 Teaching Techniques in Nuclear Engineering 1 - 3 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016
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.
Teaching Techniques in Nuclear Engineering: Read More [+]
Rules & Requirements

Prerequisites: Graduate standing or ASE status

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

Hours & Format

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

Teaching Techniques in Nuclear Engineering: Read Less [-]

NUC ENG 602 Individual Study for Doctoral Students 1 - 8 Units

Terms offered: Fall 2017, Spring 2017, Fall 2016
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.
Individual Study for Doctoral Students: Read More [+]

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 without restriction.

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.

Individual Study for Doctoral Students: Read Less [-]