

# Nuclear Engr (NE)

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## Courses

### **NE 1120 Introduction to Nuclear Engineering: 1 semester hour.**

Introduction to the engineering profession and to nuclear engineering in particular. F, S

### **NE 1199 Experimental Course: 1-6 semester hours.**

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

### **NE 2299 Experimental Course: 1-6 semester hours.**

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

### **NE 3301 Nuclear Engineering I: 3 semester hours.**

Nuclear stability and radioactive decay; types and energies of nuclear reactions; interactions of radiation with matter, including cross sections, attenuation, and scattering. PREREQ: MATH 1170. PREREQ or COREQ: PHYS 2212. S

### **NE 3302 Nuclear Engineering II: 3 semester hours.**

Basics of controlled chain reactions and the design of nuclear power reactors. Fission reactor theory, including neutron moderation, criticality, neutron life cycle and neutron diffusion. Types of reactors, present and future. PREREQ: NE 3301. COREQ: MATH 3360. F

### **NE 3399 Experimental Course: 1-6 semester hours.**

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

### **NE 4419 Energy Systems and Nuclear Power: 3 semester hours.**

Fundamentals of conventional and renewable energy systems. Energy sources, distribution, use and environmental effects. Nuclear power plant "balance of plant" design. PREREQ: ME 3307. PREREQ or COREQ: MATH 3360. F

### **NE 4445 Reactor Physics: 3 semester hours.**

Physical principles underlying neutron interactions. Multi-region and multi-energy diffusion and transport. Beamport and filter concepts and design. PREREQ: NE 3302. PREREQ or COREQ: MATH 4421. S

### **NE 4446 Nuclear Fuel Cycle Systems: 3 semester hours.**

Alternative fuel cycles. Analysis and design of key fuel cycle components (e.g., uranium enrichment, fuel fabrication, reactor fuel management, reprocessing, and waste management). Principles of nuclear criticality safety. Criticality and thermal analysis codes. Design principles of nuclear fuel cycle facilities and equipment. PREREQ: NE 3301 and NE 3302 or equivalent. S

### **NE 4447 Nuclear Systems Laboratory: 1 semester hour.**

Techniques of radiation detection and measurements, flux measurements, neutron activation analysis, approach to criticality, Inhour equation, subcritical experiments. PREREQ: NE 4445 and HPHY 4416. S

### **NE 4450 DS Reactor Operations: 3 semester hours.**

Training course; basic reactor theory and operation; regulations and qualification. PREREQ: Permission of instructor. F, S, Su

### **NE 4451 Nuclear Seminar: 1 semester hour.**

Current topics in nuclear science and engineering. PREREQ: Senior standing or permission of instructor. Graded S/U. F, S

### **NE 4452 Nuclear Criticality Safety: 3 semester hours.**

The course focuses on nuclear criticality safety methods and practices. The course includes development of the physics associated with nuclear criticality, study of criticality accidents and the criticality safety regulatory framework. Application methods will include suitable handbooks, hand calculations, and use of a multidimensional Monte Carlo computer code. Students will also participate in hands-on approach-to-critical experiments demonstrating how varying the properties of a fissionable material system can affect neutron multiplication. F

### **NE 4458 Monte Carlo Methods and Applications: 3 semester hours.**

Basics of the application of stochastic methods to calculate the transport of neutrons, photons, and other sub-atomic particles. Includes introduction to the MCNP code, and sample application problems in both nuclear reactor design and in applications such as radiation beams used for cancer therapy. F

### **NE 4478 Reliability and Risk Assessment: 3 semester hours.**

Methods of evaluating process and equipment reliability. Probabilistic methods applied to analysis and design. Setting probabilistic design objectives and calculating probabilistic performance. PREREQ: MATH 3360 and ECE 4411 or permission of instructor. S

### **NE 4481 Independent Problems: 1-3 semester hours.**

Students are assigned to, or request assignment to, independent problems on the basis of interest and preparation. May be repeated for a maximum of 6 credits. PREREQ: Permission of instructor. D

### **NE 4487 Medical Applications in Engineering and Physics: 3 semester hours.**

Applications of engineering and physics principles, particularly nuclear science, to medicine. Covers radioisotopes, X-ray imaging, magnetic resonance and ultrasound imaging, radiation protection, codes and standards. PREREQ: MATH 3360 and PHYS 2212. S

### **NE 4488 Nonproliferation and Safeguards: 3 semester hours.**

Science and technology-oriented case studies, technical basis, and management of material accountancy and inventory control; technologies and practices for safeguarding special nuclear materials; detection of nuclear proliferation. F

### **NE 4496A Project Design I: 1 semester hour.**

Semester one of two semester senior design course sequence. Planning project for second semester. Special topics on professionalism, ethics, and licensing. PREREQ: Approval of application for admission to course. F

### **NE 4496B Project Design II: 3 semester hours.**

Continuation of design sequence dealing with the design, analysis, implementation, and consequences of senior design project. PREREQ: NE 4496A. S

### **NE 4499 Experimental Course: 1-6 semester hours.**