

# NUCLEAR & RADIOLOGICAL ENGR (NRE)

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## **NRE 2120. Elements of Nuclear and Radiological Engineering. 3 Credit Hours.**

Introduction to nuclear and radiological engineering concepts and applications.

## **NRE 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.**

Independent research conducted under the guidance of a faculty member.

## **NRE 2699. Undergraduate Research. 1-12 Credit Hours.**

Independent research conducted under the guidance of a faculty member.

## **NRE 3026. Experimental Nuclear Reactor Physics. 3 Credit Hours.**

Introduction to experimental nuclear reactor physics techniques including criticality, flux mapping, buckling measurements, subcritical assembly measurements, diffusion length measurement, neutron spectral measurements, and foil activation methods.

## **NRE 3112. Nuclear Radiation Detection. 3 Credit Hours.**

An introduction to the principles and characteristics of basic detectors for nuclear radiation and the pulse processing electronics associated with them.

## **NRE 3208. Nuclear Reactor Phys I. 3 Credit Hours.**

Intermediate treatment of reactor physics and associated advanced mathematics topics.

## **NRE 3301. Radiation Physics. 3 Credit Hours.**

Characteristics of atomic and nuclear radiations, transition probabilities, radioactivity, classical and quantum-mechanical derivations of cross sections, interactions of photon, neutron, and charged particles with matter.

## **NRE 3316. Radiation Protection Engineering. 3 Credit Hours.**

Covers radiation dosimetry, biological effects of radiation, radiation-protection criteria and exposure limits, external radiation protection, internal radiation protection, and sources of human exposure.

## **NRE 3XXX. Nuclear & Radiological Engineering Elective. 1-21 Credit Hours.**

## **NRE 4210. Nuclear Reactor Theory. 3 Credit Hours.**

Students will learn physical nuclear reactor concepts, nuclear data and computational methodology required to understand the design process of nuclear fission reactors.

## **NRE 4214. Reactor Engineering. 3 Credit Hours.**

Nuclear heat generation; fuel elements' thermal analysis; single and two-phase flow and heat transfer in reactor systems; core thermal design and treatment of uncertainties.

## **NRE 4234. Nuclear Criticality Safety Engineering. 3 Credit Hours.**

This course covers the theoretical concepts, the computational techniques, and the principal methods of criticality safety.

## **NRE 4266. Light Water Reactor Technology. 3 Credit Hours.**

A systematic survey of the technology of both pressurized and boiling water reactors with emphasis on the nuclear steam supply system and its associated safety and control systems.

## **NRE 4328. Radiation Sources and Applications. 3 Credit Hours.**

Radiation Sources. Radioisotope production. Application of radiation and radioisotope technology in industry and medicine.

## **NRE 4350. Design Methods & Tools. 3 Credit Hours.**

Introduction to selected methods and nuclear engineering analytic tools (computer codes) with tutorials.

## **NRE 4351. Design of Nuclear and Radiological Systems. 3 Credit Hours.**

NRE Capstone Design course - an open-minded design project, performed by students organized in design teams, that integrates all relevant nuclear and radiological engineering aspects.

## **NRE 4404. Radiological Assessment and Waste Management. 3 Credit Hours.**

Mathematical models for movement in the environment. Scenario development for release, environmental transport, and exposure. Radioactive waste disposal facilities and waste disposal technology.

## **NRE 4407. Introduction to Radiobiology and Oncology. 3 Credit Hours.**

This course will provide the student with a basic knowledge of radiation biology as it pertains to oncology and radiotherapy.

## **NRE 4430. Nuclear Regulatory Requirements. 2 Credit Hours.**

This course introduces regulatory organizations and delineates their jurisdictions. It covers the fundamentals of regulations, the impacts on occupational workers, the public, and the environment.

## **NRE 4610. Introduction to Plasma Physics and Fusion Engineering. 3 Credit Hours.**

A first course in plasma physics and magnetic confinement fusion: basic plasma physics, magnetic confinement concepts, fusion engineering, and a review of the current status of fusion research.

## **NRE 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.**

Independent research conducted under the guidance of a faculty member.

## **NRE 4699. Undergraduate Research. 1-12 Credit Hours.**

Independent research conducted under the guidance of a faculty member.

## **NRE 4725. Probabilistic Risk Assessment. 3 Credit Hours.**

Introduction to a wide range of probabilistic risk analysis and probabilistic design methods for mechanical systems. Topics covered are probabilistic description, sampling methods, risk assessment, and reliability-based design.

## **NRE 4750. Diagnostic Imaging Physics. 3 Credit Hours.**

Physics and image formation methods for conventional X-ray CT, nuclear medicine, and magnetic resonance and ultrasound imaging.

## **NRE 4770. Nuclear Chemical Engineering. 3 Credit Hours.**

This course surveys the chemical engineering aspects of nuclear power. Topics include nuclear reactions, fuel cycles, solvent extraction of metals, the properties of actinides and other irradiated fuel materials, fuel reprocessing, and radioactive waste management. Crosslisted with CHE 4770.

## **NRE 4795. Fundamental Elements of Nuclear Reactor Materials. 3 Credit Hours.**

Introduction to fundamentals of nuclear reactor materials. Topics covered are basics of radiation damage, defect creation and evolution, microstructure-property correlations in cladding and fuel of nuclear materials.

## **NRE 4801. Special Topics. 1 Credit Hour.**

Special topic offerings of current interest not included in regular courses.

## **NRE 4802. Special Topics. 2 Credit Hours.**

Special topic offerings of current interest not included in regular courses.

## **NRE 4803. Special Topics. 3 Credit Hours.**

Special topic offerings of current interest not included in regular courses.

**NRE 4804. Special Topics. 4 Credit Hours.**

Special topics offerings of current interest not included in regular courses.

**NRE 4805. Special Topics. 5 Credit Hours.**

Special topic offerings of current interest not included in regular courses.

**NRE 4901. Special Problems. 1-21 Credit Hours.**

**NRE 4902. Special Problems. 1-21 Credit Hours.**

**NRE 4903. Special Problems. 1-21 Credit Hours.**

**NRE 4XXX. Nuclear & Radiological Engineering Elective. 1-21 Credit Hours.**