THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Introduction to Nuclear Science and Engineering

NUCLREN 4505

Credit Hours:
3.00

Course Levels:
Undergraduate (1000-5000 level)

Course Components:
Lecture

Course Description:
Discussion of nuclear energy and nuclear radiation; sources, methods of utilization, and projections for future engineering uses.

Prerequisites and Co-requisites:
Prereq: Math 2153 or above and Physics 1251, or permission of instructor.

Course Goals / Objectives:
- To enable students to react knowledgeably and critically about connections between nuclear science and technology and their own lives

Course Topics:

- Introduction
- Breadth of Nuclear Applications in our lives
- Brief history of nuclear technology
- Nuclear electrical generation, outlooks and government policy
- Ionizing radiation
- Chart of the nuclides
- De-energization equations
- Radiations exposure, dose, and annual dose experiences
- Radiation protection methods and considerations
- Regulatory and operational aspects of radiation protection
- Radioactive decay
- Nuclear fission
- Nuclear Reactor Tour and Experiments Note: This 3 hour session will be held at the Nuclear Reactor Laboratory in a single time block for groups of students not to exceed 6/ group. Regular class sessions will not be held during this week.
- Course Summary and review for midterm, midterm exam
- Nuclear criticality
- Four factor formula K-eff and reactivity
- Microscopic and macroscopic cross sections, reaction rates
- Modified two-group diffusion theory
- Nuclear criticality, critical size calculations
- Material selection Structures, Coolant, Moderator, Control Impact on reactor design
- Reactor Dynamics Impacts of reactivity Control considerations Power plant examples - impacts of events affecting reactivity
- Breadth of Nuclear Reactor Designs
- Reactor Safety
- High and low-level reactor waste, its storage, and long-term consequences
- Economics
- Nuclear proliferation
- Radiation risk and public perception

Designation:

Required
Elective