THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Nuclear Materials and Irradiation Effects in Materials

NUCLREN 6750

Credit Hours:
2.00 - 2.00

Course Levels:
Graduate

Course Components:
Lecture

Course Description:
Develop an understanding of the interactions of materials with radiation and the resulting changes in materials properties. Discussion of common materials in nuclear materials.

Prerequisites and Co-requisites:
Prereq: Grad standing, or permission of instructor.

Course Goals / Objectives:
- Review materials issues in nuclear environments. Specifically discuss materials degradation in light water reactors (nuclear fuels, structural steels and the reactor pressure vessel)

Course Topics:

- Review materials issues in nuclear environments. Specifically discuss materials degradation in light water reactors (nuclear fuels, structural steels and the reactor pressure vessel).
- Ion beam processing of materials and materials for Generation IV reactor concepts and nuclear fusion.
- The fundamentals of radiation damage: Interactions between energetic particles and solids, elastic collisions and scattering cross sections.
- Binary collision dynamics, electronic energy losses, lattice displacements and crystal structure effects, neutron vs. ion vs. electron irradiation.
- Numerical simulations of ion and neutron damage by Monte Carlo (TRIM code), SPECTER-code, molecular dynamics, and/or continuum modelling for damage recovery.
- Characteristics of point and extended defects in crystalline solids and the interactions between them.
- Point defect balance equations and the kinetics of defect transport required to understand and model radiation damage.
- Irradiation treatment of materials: ion implantation, sputtering & focused ion beam electron irradiation, gamma irradiation.

Designation:

Elective