THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Materials in Nuclear Systems

NUCLREN 5004

Credit Hours:
3.00 - 3.00

Course Levels:
Undergraduate (1000-5000 level)
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 of nuclear energy systems, safety requirements, and material property needs
- Crystal structure of materials and their impact on physical properties
- Irradiation induced defects, including dislocation loops, voids, inert gas bubbles, and other extended defects
- Interaction of energetic particles with matter, ionization effects, and displacement damage
- Defect diffusion and reaction rate theory
- Radiation induced dimensional changes
- Nuclear fuel performance, fission product behavior, and heat conduction
- Thermomechanical analysis of reactor systems
- Impact of radiation damage on mechanical properties of structural materials
- Physical properties of materials for nuclear sensors
- Materials need for Generation – IV reactors, small modular reactors, microreactors and fission batteries

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Designation:

Elective
Required