

## **NRE 4328 Radiation Sources and Applications (Required)**

**Catalog Description:** NRE 4328 Radiation Sources and Applications (3-0-3)

Prerequisite: NRE 3301, NRE 3316

Radiation Sources, Radioisotope Production, Application of Radiation and Radioisotope technology in industry and medicine.

**Textbook:** None

### **Topics Covered:**

1. Review of Isotope Buildup and Depletion
2. Fundamentals of Isotope Enrichment
3. Actinide Properties
4. Neutron Sources
  - a. Radioisotope-based sources
  - b. Accelerator based sources
  - c. Reactor based sources
  - d. Plasma based sources
  - e. Neutron multipliers
  - f. Applications of Neutrons
5. Photon Sources and Uses
6. Electron and Beta Sources and Uses
7. Accelerator Basics
  - a. Circular Systems
  - b. Linacs
8. Positron Sources and Uses
9. Radiation Interrogation of Materials
10. Industrial Radiation Processes
11. Radiation Instruments
12. Medical Applications

### **Course Outcomes:**

- Outcome 1: Students will understand various sources of neutrons, their properties and the related build-up and depletion of isotopes encountered in their uses and production.
2. Students will demonstrate an understanding of radioisotope-, accelerator-, reactor- and plasma-based neutron sources as well as other radiation sources.
  3. Students will demonstrate the ability to select radiation sources for nuclear applications
  4. Students will demonstrate the ability to select detection systems for nuclear applications
  5. Students will demonstrate the ability to model the responses of source and detection systems for nuclear applications using course projects.
  6. Students will demonstrate that they can combine their detector system and source knowledge and their modeling skills to create nuclear-based instruments for applications.

**Correlation between Course Outcomes and Program Educational Outcomes:**

NRE 4328 Radiation Sources and Applications	Outcome a			Outcome b	Outcome c	Outcome d	Outcome e	Outcome f	Outcome g	Outcome h	Outcome i	Outcome j	Outcome k
	i	ii	iii										
Course Outcome 1										x			
Course Outcome 2		x											
Course Outcome 3		x											
Course Outcome 4		x											
Course Outcome 5		x					x		x			x	x
Course Outcome 6							x						x

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