



**THE OHIO STATE UNIVERSITY**  
COLLEGE OF ENGINEERING

# Nuclear Reactor Dynamics

## NUCLREN 6725

**Credit Hours:**

2.00 - 2.00

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**Course Levels:**

Graduate

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**Course Components:**

Lecture

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**Course Description:**

Nuclear reactor system transient operation, control mechanisms.

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**Prerequisites and Co-requisites:**

Prereq: 6708 (705), or Grad standing; or permission of instructor.

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**Course Goals / Objectives:**

- Become familiar with the basic physical and engineering concepts important to the dynamic performance assessment of nuclear reactors
  - Become familiar with the mathematical models and numerical techniques used for the approximate studies of dynamic performance of nuclear reactor cores
  - Develop the capability of applying these models to practical situations and working skills with the relevant mathematical techniques
  - Prepare for more advanced courses in nuclear engineering
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### **Course Topics:**

- Derivation of the time-dependent one group diffusion equation
  - Solution of the time-dependent one group diffusion equation using separation of variables
  - Prompt and delayed neutrons, derivation of the point reactor kinetics equations
  - Elements of Laplace transforms, solution of point reactor kinetics equations for step reactivity insertions, one delayed group approximation
  - Estimation of reactivity worth
  - Temperature feedback, linearization of dynamics equations
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  - Xenon poisoning
  - Introduction to feedback and control: Block diagrams, transfer functions
  - Transient response and stability analysis
  - Root locus analysis and design and application to transient analysis
  - Frequency response analysis and design
  - Transfer functions of the PRK model with single path and two path temperature feedback and their application to transient analysis
  - Root locus and frequency response analysis of the PRK model with temperature and xenon feedback
  - Reactor plant dynamics and control
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### **Designation:**

Elective