



Nuclear Reactor Thermal Hydraulics

NUCLREN 6537

Credit Hours:

3.00 - 3.00

Course Levels:

Graduate

Course Components:

Lecture

Course Description:

Focuses on heat transfer and fluid flow applications in nuclear power reactor systems, including heat transfer in LWR fuel rods, coolant, and reactor internals.

Prerequisites and Co-requisites:

Prereq: 6536 (736) or MechEng 6536 (736), or equiv, or permission of instructor.

Course Goals / Objectives:

- Provide a systematic treatment of reactor thermal hydraulics for LWRs, with a focus on one-dimensional analysis
 - Understand the fundamentals of single-phase fluid flow and heat transfer
 - Understand the fundamentals of two-phase fluid flow and heat transfer, including two-phase pressure drop, boiling heat transfer, and condensation
 - Be aware of various two-phase flow models and understand their application domains and limitations
 - Perform steady-state and transient analysis for a nuclear reactor fuel assembly
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Course Topics:

- General balance equation
 - Single-phase flow conservation equations and constitutive equations
 - One-dimensional single-phase flow formulation and closure relations
 - Basic concepts and parameters in two-phase flow
 - Separate flow: Surface wave (Rayleigh-Taylor instability and Kelvin-Helmholtz instability)
 - Two-phase flow models
 - Closure relations and correlations for two-phase flow
 - One-dimensional two-phase flow formulations and closure relations
 - Two-phase pressure drop
 - Boiling heat transfer
 - Condensation heat transfer
 - Single heated channel transient analysis
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Designation:

Elective