

NUCE 597K

Spring 2008

NucE 597K – Nuclear Kinetics and Dynamics

M W F 10:10 AM - 11:00 AM	327 Sackett Building
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INSTRUCTOR

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TEXTBOOK

Class notes and handouts

Additional references:

- 1) K. Ott and R. Neuhold, "Nuclear Reactor Dynamics", ANS, 1985.
- 2) D. Hettrics, "Dynamics of Nuclear Reactors", Chicago, IL, 1971.
- 3) T. Sutton and B. Aviles, "Diffusion Theory for Spatial Kinetics Calculations", Progress of Nuclear Energy, Vol. 30, No. 2, pp.119-182, 1996.

COURSE DESCRIPTION

This graduate level course is focused on reactor kinetics and dynamics methods and techniques for multi-dimensional safety and transient analysis. It consists of five major topics – review of point reactor kinetics theory; reactivity feedback and reactor dynamics; methods for spatial kinetics; coupled multi-dimensional thermal-hydraulics/neutron kinetics; and experimental determination of reactor dynamics parameters. The course computer project provides students with knowledge about state of the art methods used to model reactor transients for safety evaluations.

EVALUATION METHODS

The grading distributions are as follows:

Homework problems	20%
First Exam	25%
Second Exam	25%
Computer Project	30%

COURSE OUTLINE

Lecture 1	Introduction to the course, course objectives Grading, homework, projects, Attendance
Lecture 2	Delayed neutrons – part 1
Lecture 3	Delayed neutrons – part 2
Lecture 4	Delayed neutrons – part 3
Lecture 5	Delayed neutrons – part 3
Lecture 6	Point kinetics model – part 1
Lecture 7	Point kinetics model – part 2
Lecture 8	Point kinetics model – part 3
Lecture 9	Point kinetics model – part 4
Lecture 10	Point kinetics model – part 5
Lecture 11	Point kinetics model – part 6
Lecture 12	Reactivity Feedback Effects – part 1
Lecture 13	Reactivity Feedback effects – part 2
Lecture 14	Reactivity Feedback effects – part 3
Lecture 15	Reactivity Feedback effects – part 4
Lecture 16	Reactivity Feedback effects – part 5

Lecture 17	Reactivity Feedback effects – part 6
Lecture/Class 18	Exam 1
Lecture/Class 19	Review of Exam 1
Lecture/Class 20	Discussion and Assignment of Computer Projects
Lecture 21	Spatial Kinetics Methods – part 1
Lecture 22	Spatial Kinetics Methods – part 2
Lecture 23	Spatial Kinetics Methods – part 3
Lecture 24	Spatial Kinetics Methods – part 4
Lecture 25	Spatial Kinetics Methods – part 5
Lecture 26	Spatial Kinetics Methods – part 6
Lecture 27	Spatial Kinetics Methods – part 7
Lecture 28	Spatial Kinetics Methods – part 8
Lecture 29	Space-Energy Dependent Dynamics – part 1
Lecture 30	Space-Energy Dependent Dynamics – part 2
Lecture 31	Space-Energy Dependent Dynamics – part 3
Lecture 32	Issues of Coupled Kinetics/Thermal-Hydraulics – part 1
Lecture 33	Issues of Coupled Kinetics/Thermal-Hydraulics – part 2
Lecture 34	Issues of Coupled Kinetics/Thermal-Hydraulics – part 3
Lecture 35	Reactivity Transients – part 1
Lecture 36	Reactivity Transients – part 2
Lecture 37	Reactivity Transients – part 3
Lecture/Class 38	Second Exam
Lecture/Class 39	Review of the Second Exam

Lecture 40	BWR Stability Analysis – part 1
Lecture 41	BWR Stability Analysis – part 2
Lecture 42	Measurements of Reactivity – part 1
Lecture 43	Measurements of Reactivity – part 2
Lecture/Class 44	Presentation of Computer Projects