NE 468/568 Syllabus
Nuclear Reactor Safety

Instructor
Wade Marcum, Assistant Professor

Teaching Assistant
TBA

Class Credits
Three (3)

Prerequisites
1. Neutronic Analysis I (NE 451/551)
2. Nuclear Reactor Thermal Hydraulics (NE 467/567)

Class Meeting Information
Monday/Wednesday/Friday (one hour sessions)

Description
The Nuclear Reactor Safety class is focused on probability risk assessment and system reliability analysis techniques applied to nuclear reactor safety. Application of these methods will be performed specifically through examination of neutronics and thermal hydraulic transients, effectiveness of emergency systems, accident prevention and mitigation, and assessment of radioactive release to the environment.

Textbook
Required

References
1. Instructor’s handouts and notes.

Blackboard
1. Blackboard will contain a copy of the syllabus, schedule, course announcements, problem sets, problem set solutions, midterm solutions, and any other material pertinent to this course.
**Learning Objectives**
This course will focus on the analysis of the safety characteristics of nuclear reactors. Probabilistic safety analysis techniques will be explored that allow for the estimation of the probability of occurrence of various severe reactor accidents. These analysis techniques will be discussed in the wider context of societal risk and the public’s perception of this risk.

In this course students will learn and demonstrate the ability to:
1. Discuss the evolution of probabilistic safety techniques in relation to their use in the nuclear power industry,
2. Distinguish between a design basis accident and a severe accident,
3. Calculate the reliability of various nuclear power plant components,
4. Perform event tree and fault tree analyses in order to calculate the availability of various reactor systems, and
5. Discuss and analyze the progression of core and vessel damage during a severe accident.

**Course Topics**
The learning objectives outlined above with the met through the discussion on the topics outlined below.

1. Introduction to Reactor Safety (Week 1)
   a. Overview of Nuclear Safety Practices
   b. Overview of Other Disciplinarian Safety Practices
2. Risk (Week 2 through 3)
   a. History
   b. Current Practices
3. Probability and Statistics (Week 4 through 6)
   a. Component Reliability
   b. System Reliability
   c. Dependent Failures
4. Three Mile Island (Week 7)
   a. Core Melt Thermal Hydraulics
   b. Behavior of Molten Corium Region
   c. Coolant Boil-off
5. Fukushima(Week 8 through 9)
   a. Risk assessment and oversight
   b. Severe accident assessment
6. Advanced Safety Concepts (Week 9)
   a. The Up-and-Coming Reactor Safety Methods
Undergraduate Grading
20% In-Class Quizzes (4)
40% Problem Sets (4)
15% Midterm Exam (1)
25% Final Exam (1)

Graduate Grading
20% In-Class Quizzes (4)
35% Problem Sets (4)
10% Class Project (1)
15% Midterm Exam (1)
25% Final Exam (1)

Grades will be determined using the following distribution:
A 100 — 93  C  75 — 73
A- 92 — 90  C-  72 — 70
B+ 89 — 86  D+  69 — 66
B  85 — 83  D   65 — 63
B- 82 — 80  D-  62 — 60
C+ 79 — 76  F   59 — 0

Expectations
1. Attend all classes unless prior permission is granted. If a class is missed, the student is responsible for acquiring all notes, handouts, or announcements from the missed class.
2. Listen attentively.
4. Complete all assignments on time. Assignments are due at the beginning of class on the due date. NO CREDIT WILL BE GIVEN FOR A LATE ASSIGNMENT.
5. Complete assignments in a professional manner: make them neat, organized, legible and grammatically correct. EACH STUDENT'S ASSIGNMENT WILL BE GRADED on the professionalism of your work. Treat each assignment as if it were a project assigned by your employer.

Academic Dishonesty
Academic dishonesty such as plagiarism and cheating will not be tolerated. Students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:
• cheating- use or attempted use of unauthorized materials, information or study aids,
• fabrication- falsification or invention of any information,
• assisting- helping another commit an act of academic dishonesty,
• tampering- altering or interfering with evaluation instruments and documents, or
• plagiarism- representing the words or ideas of another person as one's own.

For more information about academic integrity and the University's policies and procedures in this area, please refer to the Student Conduct web site at http://oregonstate.edu/admin/stucon/achon.htm and the section on academic regulations in the OSU schedule of classes.
Statement Regarding Students with Disabilities
Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098.

Graduate Student Expectations
Graduate students shall be responsible for meeting the learning objectives outlined above and shall also be required to perform a course project in addition to all course assignments distributed. This project will require the application of methods learned in class as it applies to specific nuclear reactor systems under various postulated accident scenarios. Each graduate student shall culminate their project work with a report and present this to the class.