Instructor: Dr. Swagata Banerjee  
221B Sackett Building  
Phone: (814) 863-2936, Email: swagata@engr.psu.edu; sub28@psu.edu  
Office hours: T 4:00-5:30pm, W 1:30-3:00pm, and by appointments

Text:  

References:  


Course Objective:  
In engineering design and analysis, decisions are frequently made acknowledging the uncertainty associated with these. Uncertainty involved in the decision making process may eventually accumulate, leading to a high risk of failure. Thus quantification of uncertainty is important to determine the reliability of a system and system components. The objective of this course is to develop an understanding of reliability based methods in Civil Engineering. At the end of the semester students should be able to

1. Use different methods to analyze the reliability of a system or its components
2. Identify various types of uncertainty associated with any civil engineering system
3. Quantify uncertainties to determine the level of confidence on system performance under external loading

Grading:  
- Best Midterm: 25%
- Other Midterm: 20%
- Homework: 25%
- Project: 30%
Exams: Midterm 1: Sep 23, 10 (R); During regular class hours
Midterm 2: Oct 28, 10 (R); During regular class hours

NO makeup exam will be arranged other than special circumstances. In case of any emergency, please inform me through e-mail. If no notification is made before the starting of the exam, there would NOT be any opportunity for makeup exams.

Homework: Homework will be assigned weekly or bi-weekly depending on the material covered in the class. Homework should be submitted to me at the beginning of class on the due date mentioned on the homework. Each problem should start on a separate page (use the front of paper only). Late submissions will not be accepted.

Project: Students will select their own project topic and submit a preliminary proposal (one page) by the end of sixth week (by Sep 30, 2010) of class. Project presentation will be on Dec 9 (R), 2010 during regular class hours. A detail project report is to be submitted in 221B Sackett before 4:00 pm, Dec 9 (R), 2010. Late submissions will not be accepted under any circumstances.
Course Outline: Course topics as outlined below are subjected to minor changes. Some additional topics will be discussed if time permits.

Introduction

Probability and statistics:
- Probability distributions
- Joint probability distribution
- Parameter estimation
- Hypothesis testing

Reliability and uncertainty:
- Classical theory of reliability
  ◦ Load and resistance
  ◦ Reliability index
- Methods for reliability analysis
  ◦ First order reliability
  ◦ First order second moment
- Uncertainty evaluation
  ◦ Types of uncertainty
  ◦ Uncertainty modeling
  ◦ Monte Carlo simulation
  ◦ Confidence interval

System reliability:
- Fragility curves
- Analysis of system reliability
**Academic Integrity:**

This course will follow the University Faculty Senate Policy 49-20 on academic integrity. Below are excerpts from the same policy (http://www.psu.edu/ufs/policies).

Definition and expectations: Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University’s Code of Conduct states that all students should act with personal integrity, respect other students’ dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

To protect the rights and maintain the trust of honest students and support appropriate behavior, faculty and administrators should regularly communicate high standards of integrity and reinforce them by taking reasonable steps to anticipate and deter acts of dishonesty in all assignments (Senate Policy 44-40: Proctoring of Examinations). At the beginning of each course, it is the responsibility of the instructor to provide students with a statement clarifying the application of University and College academic integrity policies to that course.

For more information, please go to http://www.psu.edu/ufs/policies