Seoul National University
Dept. of Civil and Environmental Engineering Instructor: Junho Song (junhosong@snu.ac.kr)

SPRING 2016
457.646 Topics in Structural Reliability (Theory)
MW 11:00-12:15, 317 Bldg. 35
Instructor: Junho Song

Prerequisites: Sophomore-level course on probability and statistics

Course Objectives:

This course offers a comprehensive review of structural reliability assessment methods and their applications to engineering problems in general. Topics include formulation of structural reliability, first-order and second-order reliability methods (FORM and SORM), system reliability analysis, structural reliability analysis under model or statistical uncertainties, simulation methods and uncertainty quantification methods. Students will apply the methods to example problems using available computer codes. As a final term project, each student will review, apply or develop reliability methods for an engineering/science application he/she chooses.

Course Website: http://etl.snu.ac.kr

Important Dates: (See 'Class Schedule' for more details)

- March 2: Classes begin
- April 13: No class (election)
- Business trips (no class): April 25, 27 (Canada), May 18, 23, 25 (USA)
- Make-up classes: April 15, 22, May 6, 13, June 3 (Fridays 4:45-6pm)
- Midterm exam: May 4 – Take-home exam
- Deadline for term project abstracts: May 16
- June 6: Memorial Day (no class)
- June 20: Reliability symposium (Time and location TBA)
- June 22 (5pm): Deadline for final report (by emails)

Credit: 3 hours

Required Reading: Selected readings shown in the 'Class Schedule'

Reference Textbook (NOT required):

Ditlevsen, O., and H.O. Madsen (1996). *Structural Reliability Methods*. J. Wiley & Sons, New York, NY (Internet Edition: http://od-website.dk/books/OD-HOM-StrucRelMeth-Ed2.3.7.pdf).

Melchers, R.E. (1999). *Structural Reliability: Analysis and Prediction*. 2nd Edition, John Wiley, New York, NY.

(**Text for Primer**) Ang, A. H-S., and W.H. Tang, Probability Concepts in Engineering: Emphasis on Applications to Civil and Environmental Engineering, 2nd edition, Wiley, New York, 2006.

Homework:

Weekly assignments will be given on most Wednesdays. Turn them in during class in a week. A solution set will be posted at the course website. Students are encouraged to use computer programs such as Matlab and Mathematica to solve

these problems. Some assignments will require the use of a free Matlab toolbox, FERUM (See below).

Grading:

Homework: 30 %, Midterm Exam: 30 %, Final Term Project and Presentation: 40 %

Computer Program:

Some homework assignments in this class require the use of the reliability code FERUM, which is a Matlab toolbox for general structural reliability analysis and finite element reliability analysis that was developed by Terje Haukaas. The code and a User's guide are downloadable at:

http://www.ce.berkeley.edu/FERUM/

Final Term Project:

Each student is required to perform a final term project and make a 10-minute oral presentation at the 'Reliability Symposium' (time and location to be announced). The term paper describing the results of the project is due on June 22 (5pm by email). It should be in a word-processed format and contain sufficient details of the project.

A one-page abstract of the term project should be submitted until the deadline (TBA). The abstract should state the title, the name of the student, 500-word description of the proposed work, main objectives, technical approach to be used, and the expected results. The student is required to get the instructor's approval before proceeding with the proposed work. No group project is allowed unless the nature of the project requires a collaboration AND the instructor approves the plan.

Possible topics include

1. [Method] Development of new analytical or computational methods of structural reliability
2. [Application] Comprehensive reliability analysis or risk-quantified design of engineering components or systems
3. [Review] Critical review of state-of-the-art papers in the area of structural/system reliability
4. [Programming] Development of a new computer code or module
5. [Risk communication and Decision making] Simulation of the processes of risk assessment, communication and decision-making
6. Any other idea approved by the instructor

Instructor: Junho Song
403 Bldg. 35
E-mail: junhosong@snu.ac.kr
URL: http://systemreliability.wordpress.com/
Office hours: Q&A after each class or by appointments

Teaching Assistant: Byeong-Seong Choi
E-mail: cbs1230@snu.ac.kr