PROBABILISTIC ENGINEERING ANALYSIS AND DESIGN
(446.779)

INTRUCTOR: PROF. YOUN, BYENG DONG
OFFICE: BUILDING 301, ROOM 1514

COURSE SYLLABUS

Syllabus

Course ID	446.779	Lecture No.	001	Course Name	Probabilistic Engineering Analysis and Design	Credits	3
Instructor	Professor Youn Byeng Dong				Website: shrm.snu.ac.kr		
	E-mail : bdyoun@snu.ac.kr				Telephone: 880-1919		
	Office hour / office : 301-1514						
TA	Gyu Seok Lee (E-mail: leeguesuk@snu.ac.kr, Tel: 880-1664, Office: 301-215)						
1. Objective	The course covers three important issues encountered in practical engineering fields: uncertainty characterization, probabilistic engineering (or reliability) analysis, design under uncertainty, and system management under uncertainty (or health monitoring). Probabilistic engineering analysis includes advanced topics in statistics, uncertainty characterization, and test-/simulation-based probabilistic engineering (or reliability) analysis. Design under uncertainty includes probability sensitivity anlaysis, surrogate modeling, and advanced methodologies for design under uncertainty. Some health diagnostics and prognostics techniques are briefly introduced for the purpose of system management under uncertainty.						
2. Textbook and References	● Youn, B.D. and Hu, C., *Engineering Analysis and Design under Uncertainty*, SNU Print, 2012. ● Haldar, A., and Mahadevan, S., *Probability, Reliability, and Statistical Methods in Engineering Design*, John Wiley & Sons Inc., 2000. ● Arora, J.S. Introduction to Optimum Design, Second Edition, Elsevier, 2004. ● Myers and Montgomery, Response Surface Methodology, Wiley, 1995. ● G. Vachtsevanos G, et al., *Intelligent Fault Diagnosis and Prognosis for Engineering Systems*, 1st edition. Hoboken, New Jersey, USA: John Wiley & Sons, 2006.						

3. Evaluation method	Homework	Exam I (10.5)	Exam II (11.9)	Project I	Project II		Total
	20%	20%	20%	20%	30%		110%

4. Lecture Plan	Wk	Contents
	1	Course introduction; Concepts of uncertainty, reliability and risk; Basic probability theory
	2	Graphical methods for exploratory data analysis
	3	Uncertainty characterization
	4	Definition of reliability; Reliability analysis (time-independent);
	5	Numerical methods for probabilistic engineering analysis (MCS, FORM methods)
	6	Case studies of reliability analysis (cellular phone, LCD, and others)
	7	Reliability modeling (time-dependent);
	8	Exam I & Project I review
	9	Accelerated life testing; Accelerated life testing;
	10	Bayesian analysis;
	11	Design optimization review;
	12	Design optimization review;
	13	Design under uncertainty (methodology)
	14	Design under uncertainty (formulation; numerical methods); Exam II
	15	Prognostics and Health Management (PHM): reasoning function; Course review

5. Consideration	- Prerequisites : Engineering Statistics, Design Optimization - 2 open-book exams and one individual project
6. Rules	All students are presumed upon enrollment to have an understanding of the Honor System. Academic dishonesty by a student will be treated in accordance with the SNU procedures. A score of "0" can be assigned for the corresponding test/assignment and/or a course grade of 'F' can be assigned.

TABLE OF CONTENTS

