IE Technical Elective – Reliability Engineering
Spring 2025
Course Syllabus

Instructor
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Office: SCUPI Building N403/N407
Office Hours: Wednesday 12:00-15:00

Teaching Assistant
TBD
QQ Group (769139902)

Lecture
Wednesday 8:15-11:00; Room: SCUPI Building N210

Course Description
Reliability introduction, System Reliability Evaluation, Time and Failure dependent Reliability, Estimation Methods of the parameters, 3 credit hours.

Course Prerequisites
IE 1070, MATH 0220, MATH 0235, MATH 0240

Course Objectives
1. Learn the basic definitions of reliability, basics of failure-time distributions, reliability metrics and methods for its calculations.
2. Learn to estimate the reliability of a variety of engineering systems using mathematical models.
3. Learn to use programming languages such as MATLAB to fit the failure data and estimate the parameters of the failure-time distributions.
4. Learn to understand failure causes and properly determine the optimal maintenance schedules in the real applications.

Applicable ABET Outcomes
Students will build
1. An understanding of the concept of reliability engineering and its applications.
2. An overview of simple failure-time distributions and the basics of reliability statistics such as mean time to failure (MTTF), mean residual life, median life, etc.
3. An understanding of good practices of reliability, and conversely recognizing failures and why.
4. Skills in the use of tools such as MATLAB to fit the data and estimate parameters of real cases in Industrial Engineering.

Textbook
Elsayed A. Elsayed, Reliability Engineering, Third Edition. Wiley, (Wiley Series in Systems Engineering and Management), 2021, ISBN: 978-1-119-66592-2

Dhillon B S., Engineering systems reliability, safety, and maintenance: an integrated approach [M]. CRC Press, 2017. ISBN 9781498781633

References

Elsayed, A. Elsayed, 可靠性工程(第 2 版), 出版社: 电子工业出版社, 2013 年 8 月, ISBN:9787121210211

Grading

Attendance, Quizzes & Assignment, projects, and exam questions related specifically to the objectives above.

Attendance, Quizzes	20%
Assignment:	30%
Project:	25%
Final Examination:	25%
	100%

Score	Letter Grade
90.00-100.00	A
85.00-89.99	A-
80.00-84.99	B+
76.00-79.99	B
73.00-75.99	B-
70.00-72.99	C+
66.00-69.99	C
63.00-65.99	C-
61.00-62.99	D+
60.00-60.99	D
0.00-59.99	F

Exams

There will be one final exam. The exam is OPEN BOOK, OPEN NOTES. You are allowed to bring any material you need in the exam.

Assignments and Quizzes

Homework will be assigned weekly and needed to be finished before the next class. You are encouraged to work on these assignments with your classmates. Late submission will not be accepted. Homework solutions must be submitted to the Blackboard system.

Quizzes may be assigned during the classes. There is a time limit on the quiz. Late submissions will not be accepted. No make-up quizzes or in-class activities are allowable except under extenuating circumstances.

Course Project

The project topic will be given later in the course.

Avoiding Plagiarism

1. Unacknowledged direct copying from the work of another person, or the close paraphrasing of somebody else's work, is called plagiarism and is a serious offence, equated with cheating in examinations. This applies to copying both from other students' work and from published sources such as books, reports or journal articles.

2. Paraphrasing, when the original statement is still identifiable and has no acknowledgement, is plagiarism. A close paraphrase of another person's work must have an acknowledgement to the source. It is not acceptable for you to put together unacknowledged passages from the same or from different sources linking these together with a few words or sentences of your own and changing a few words from the original text: this is regarded as over-dependence on other sources, which is a form of plagiarism.

Tentative Course Schedule

Lecture	Week	Dates	Topics	Chapter
1	1	Feb 26	Course Introduction and Review of Syllabus, Introduction to Reliability Engineering, Reliability Definition	1
2	2	March 5	Probability Distributions Review, Mean time to failure, Mean residual life, Time of first failure	1
3	3	March 12	Introduction to System Reliability Evaluation, Reliability Block Diagrams	2
4	4	March 19	Experiments	2
5	5	March 26	Series Systems, Parallel Systems, Series-Parallel Systems, Parallel-Series Systems, Mixed Systems	2
6	6	April 2	Reliability Evaluation of k-out-of-n Systems	2
7	7	April 9	Complex System Reliability Analysis	2
8	8	April 16	Redundancy, Importance measures of components	1,2
9	9	April 23	Time-Dependent Reliability	3
10	10	April 30	Degradation Models	3
11	11	May 7	Project Mid-term/Proposal Presentation	
12	12	May 14	Degradation Models Failure-Dependent Reliability	4
13	13	May 21	Parameters Estimation 1: Method of Moments, Parameters Estimation 2: The Likelihood Function	4
14	14	May 28	Parameters Estimation 3: Method of Least Squares, Bayesian Approach	4
	15	June 4	Project Presentation	
15	16	June 11	Final Exam Review	1,2,3,4
	17	June 18	Final Exam	1,2,3,4