

UNIVERSITY OF MARYLAND
College Park Campus
Department of Civil and Environmental Engineering

ENCE 620 – Risk Analysis for Engineering (3 credits)

(Prerequisite: undergraduate or fundamental level probability & statistics, ENCE302 equivalent)

Instructor: Professor Bilal M. Ayyub, Room 0305, Martin Hall, Telephone: 301-405-1956, ba@ud.edu, office hours: MW 12:50 – 1:50 pm and by appointment.

Textbook: Ayyub, Risk Analysis in Engineering and Economics, Second Edition, Chapman-Hall/CRC Press, 2014, ISBN-13: 978-1466518254, <https://www.amazon.com/Analysis-Engineering-Economics-Bilal-Ayyub/dp/1466518251>

Reference (prerequisite): Ayyub and McCuen, Probability, Statistics and Reliability for Engineers and Scientists, Third Edition, Chapman and Hall/ CRC Press, 2011, ISBN 978-1-4398-0951-8. <https://www.amazon.com/Probability-Statistics-Reliability-Engineers-Scientists/dp/1439809518>

Grading (approximate): About every other week assessment and project (75%) and Final (25%).

COURSE OUTLINE

Chapter 1. Introduction: Knowledge and Ignorance, Information Uncertainty in Engineering Systems

Chapter 2. Risk Methods: Risk Terminology, Risk Assessment, Risk Management and Control, Risk Acceptance, Risk Communication

Chapter 3. System Definition and Structure: System Definition Models, Hierarchical Definitions of Systems, System Complexity

Chapter 4. Reliability Assessment: Analytical Reliability Assessment, Empirical Reliability Analysis Using Life Data, Reliability Analysis of Systems

Chapter 5. Consequence Assessment: Types, Cause-Consequence Diagrams, Microeconomic Modeling, Value of Human Life, Flood Damages, Consequence Propagation

Chapter 6. Engineering Economics: Time Value of Money, Interest Models, Equivalence

Chapter 7. Decision Analysis: Risk Aversion, Risk Homeostasis, Influence Diagrams and Decision Trees, Discounting Procedures, Decision Criteria, Tradeoff Analysis, Repair and Maintenance Issues, Maintainability Analysis, Repair Analysis, Warranty Analysis, Insurance Models

Chapter 8. Data Needs for Risk Studies: Elicitation Methods of Expert Opinions, Guidance

Appendix A. Basic Probability and Reliability Mathematics: Set Theory, Boolean Algebra, Mathematics of Probability, Random Variables, Selected Probability Distributions, Joint Random Variables, Statistics

Synchronous Online Learning: This course is offered as synchronous online learning in which students and instructor(s) are in the same session, at the same time, in order for learning to take place at <https://myelms.umd.edu>.

Reading Assignments: Students are expected to read materials in advance to each lectures of materials to be covered in the lecture as specified by the instructors, and to participate in discussion, Q/A and answering questions when called upon. Basically, the lectures are summaries of what the students have already read. All the reading assignments are from the textbook. All PowerPoint slides used during the summary lectures are available at <https://myelms.umd.edu>.

Student Assessments: About every other week, students might be required to take assessments by submitting PDFs or online at <https://myelms.umd.edu> during class time or outside class time. Each assessment covers materials from completed chapters with a primary focus on an immediate, past chapter. The assessments are designed to consist either of multiple-choice questions or regular detailed solutions required. Students are permitted to take the assessment only once. The duration of the assessment varies from 15 to 90 minutes. No exceptions (unless specified in the Course Related Policies) are made for students arriving late or not attending class.

Term Project: Information on the term project is available online at <https://myelms.umd.edu>.

Final Exam: All students must take the final exam (120 min). Missing the exam is handled by UMD policies. Health related excuses require medical reports and the signature of a physician that provided treatment. Academic integrity is an important foundation and required as defined at <http://www.inform.umd.edu/jpo/>. UMD course-related policies: <http://www.ugst.umd.edu/courserelatedpolicies.html>. Final exam is cumulative of all material covered in the semester, and open textbook and notes.