Reliability, Maintainability, and Quality Management
LOGM 634 (ASAM - Winter 2018)

Instructor

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Course Text

- Ebeling, C.
  An Introduction to Reliability and Maintainability Engineering
  2nd Ed., Waveland Press, 2010

Additional References (Optional)

- O'Connor, P. & Kleyner, A.
  Practical Reliability Engineering
  5th Ed., Wiley, 2012

- Meeker, W. & Escobar L.
  Statistical Methods for Reliability Data
  1st Ed., Wiley, 1998

- Rausand, M. & Hoyland, A.
  Systems Reliability Theory – Statistical Methods and Applications
  2nd Ed., Wiley, 2003

- DOD Guide for Achieving Reliability, Availability, and Maintainability, 3 Aug 2005

Course Description

Creating and sustaining military capability is the purpose of military leadership and management. Reliability and maintainability (R&M) are component characteristics, which define the ability of a product to perform its specified functions throughout its operational life. Component R&M of the military system are primary determinants of military capability. This course teaches fundamental R&M concepts. Additionally, probability theory is discussed and employed as a tool to quantitatively define these concepts. Topics to be discussed include the measures, which quantitatively define component R&M, the relationship between R&M, and the prediction of R&M measures.

Course Format

Class material is primarily presented in lecture format.

Course Objectives

Upon completion of this course each student shall be able to:

- Understand and apply the fundamentals of the concepts of reliability, maintainability, and availability.

- Understand the use of probability theory to quantify R&M concepts.

- Understand and apply the measures which quantitatively define component R&M.

Performance Evaluation

Your grade in this course will be calculated according to the following requirements and their respective weights.

- **HOMEWORK (40%):**

  Homework is due at the beginning of class on the day listed in the class schedule. Each student must turn in their own solutions for each problem assigned - Unless other arrangements are approved by the instructor. Solutions will be posted that evening.

- **PROJECT (30%):**

  Students, in teams of 2-4, will prepare an in-class presentation on a topic relevant to reliability, maintainability, and availability. Presentations should be 30 minutes long (including questions). Students may choose a relevant DoD topic or their own topic, approved by the professor. Topics and teams are "first-come, first-served" Topic presentations will include the topic's background and why it is important or relevant, a brief literature review of the research on this topic, a description and assessment of any quantitative reliability tools used, and a managerial assessment of why USAF leaders should know and care about it.

  Project examples: Evaluation of the C-5 re-engining and reliability improvement program, a B-52 life extension program, F-35 software reliability, GM ignition switch failures, automotive airbag failures, the Samsung Galaxy Note 7 failures, or electric car battery failures.

- **FINAL EXAM (30%):**

  The final exam will test your comprehension of the course material and ability to solve problems that are scoped similar to the homework assignments. The final will cover the content presented in the book and during class presentations. The exam will open book and open notes, however students will only have one hour to finish the exam.

  A student's final letter grade will be parsed out according to the table below. This grading profile follows the the standard grading profile established by the institution.

$$(1.00 - 0.93] : A$$
$$(0.93 - 0.90] : A\text{-}$$
$$(0.90 - 0.87] : B\text{+}$$
$$(0.87 - 0.83] : B$$
$$(0.83 - 0.80] : B\text{-}$$
$$(0.80 - 0.77] : C$$

Class Schedule

Class Date	Chapters Covered	Topics	Notes
Day 1	Chapters 1, 2	Course Overview Math/Stat Review Reliability Introduction Distribution Functions	HW #1 Assigned
Day 2	Chapters 2,3	Distribution Functions Conditional Reliability The Constant Failure Rate Model	
Day 3	Chapters 3,4	The Constant Failure Rate Model Time Dependent Failure Models	HW #1 Due HW #2 Assigned
Day 4	Chapters 4,5	Time Dependent Failure Models Reliability of Systems	
Day 5	Chapters 5,6,7	Reliability of Systems State Dependent Systems Physical Reliability Models	HW #2 Due HW #3 Assigned Project Topics Due
Day 6	Chapters 8,9,10	Design for Reliability Design for Maintainability	HW #3 Due HW #4 Assigned
Day 7	Chapters 12, 13	Data Collection Reliability Testing	HW #5 Assigned
Day 8	Chapters 13, 14	Reliability Testing Reliability Growth Testing	HW #4 Due Review For Final
Day 9	N/A	N/A	HW #5 Due Student Presentations Final Exam

Useful Reliabilty Websites

University of Tennessee, Knoxville - Reliability and Maintainability Center	(LINK)
The Reliability Information Analysis Center	(LINK)
Government-Industry Data Exchange Program	(LINK)
The American Society for Quality	(LINK)
Weibull.com	(LINK)
University of Maryland Reliability Engineering	(LINK)

Important Policy Statements

Academic Integrity Policy Statement

All students must adhere to the highest standards of academic integrity. Students are prohibited from engaging in plagiarism, cheating, misrepresentation, or any other act constituting a lack of academic integrity. Failure on the part of any individual to practice academic integrity is not condoned and will not be tolerated. Individuals who violate this policy are subject to adverse administrative action including disenrollment from school and disciplinary action. Individuals subject to the Uniform Code of Military Justice may be prosecuted under the UCMJ. Violations by government civilian employees may result in administrative disciplinary action without regard to otherwise applicable criminal or civil sanctions for violations of related laws. (References: AFIT Student Handbook, ENOI 36-107 - *Academic Integrity*)

Attendance Policy Statement

Attendance at all class sessions and exams is mandatory for military and civilians assigned to AFIT as full-time students except for extenuating circumstances. Part-time students are expected to attend scheduled classes, and absences should be explained to the instructor. The student should provide advance notice, if possible. Scheduled classes and exams are defined by the instructor and they are documented in the course schedule. (References: AFIT Student Handbook, AFIT Graduate School Catalog)

Academic Grievance Policy Statement

AFIT and the Graduate School of Engineering and Management affirm the right of each student to resolve grievances with the Institution. Students are guaranteed the right of fair hearing and appeal in all matters of judgment of academic performance. Procedures are detailed in ENOI 36-138 - *Student Academic Performance Appeals.*