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| Module Number: MIEG 6572 Module Title: Reliability Engineering  | ECTS: 7   |
| Module Objectives: The course covers principles of reliability, failure rate and its relation to reliability, probability distribution of the time to failure, exponential and weibull distributions, reliability of systems, series and parallel systems, stand by redundancy, systems mean time to failure, mean residual life, reliability in design. It also includes failure mode effect analysis, failure tree analysis, reliability testing and analysis, and warranty problems.  |
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|  **Chapter One Introduction to Reliability Engineering*** What is RE?
* Why Reliability?
* Reactive Management Technique
* Concept of Probability & Reliability Distributions

**Chapter Two Reliability Function*** Unreliability Function
* Reliability Function
* Reliability Function Derivation Process

 **Chapter Three Reliability Models and System Safety Analysis*** Reliability block diagram
* Reliability of component and system
* Reliability evaluation of redundant systems (series, parallel, series-parallel, bridge network, etc.)
* Fault Tree Analysis
* Hazard analysis

**Chapter Four Failure Data and Goodness of Fit Analysis*** Failure data analysis
* Trend analysis
* Goodness of fit test (Kolmogorov/Smirnov test)
* Statistical type 1 and type 2 error
* Introduction of stress-strength modeling
* Homogeneous Markov models
* Reliability evaluation of cold, warm, and failure interactions and Markov analysis

**Chapter Five Reliability Testing*** Understanding systems life-cycle
* Phases in reliability testing
* Reliability sequential testing
* Reliability testing at component, subsystem and system levels

**Chapter Six Reliability Analysis Software** * Use of software in system reliability analysis
* BlockSim
* Weibull++
* The Synthesis Platform
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| Pre-requisites: N/A  |
| References: 1. Filippo De Carlo. 2015. Reliability and Maintainability in Operations Management. Open Science
2. F.Farahmand. 2004. System development life cycle
3. Lecture No: 3 System Development Life Cycle, University of Al-Qadisiya College of Computer Science and information Technology
4. P E. Tcirkcan. 1999. Sequential Decision Reliability Concept And Failure Rate Assessment: Application To Nuclear Power Plant S(Irveillance Instrumentation. Istanbul Technical University
5. Practical Reliability Engineering, 4th Edition, by Patrick D. T. O'Connor, Published 2002
6. Effective FMEAs: Achieving Safe, Reliable and Economical Products and Process Using Failure Mode and Effects Analysis), by Carl Carlson, Published 2012
7. Accelerated Testing: Statistical Models, Test Plans and Data Analyses (Wiley Series in Probability and Mathematical Statistics-Applied Probability), by Wayne Nelson, Published 1990
8. Analysis of Failure and Survival Data, by Peter J. Smith, Published 2002
9. Applied Reliability (Second Edition) by Paul A. Tobias and David C. Trindade, Published 1995
10. Burn-In Testing: Its Quantification and Optimization (Reliability Engineering), by Dimitri Kececioglu and Feng-Bin Sun, Published 1997
11. Environmental Stress Screening: Its Quantification, Optimization and Management, by Dimitri Kececioglu and Feng-Bin Sun, Published 1995
12. Handbook of Reliability Engineering and Management, 2nd Edition, by William Grant Ireson, Clyde F. Coombs and Richard Y. Moss, Published 1995
13. Maintainability, Availability and Operational Readiness Engineering Handbook, by Dimitri Kececioglu, Published 1995
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| Teaching methods: Lecture supported by group discussions, assignment, case and article review and mini project.  |
| Evaluation: Assignments 25%, Case and article review 25%, Final exam 50%  |
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