MENG424 – Reliability Engineering

Eastern Mediterranean University
Faculty of Engineering

Department: Mechanical Engineering

Program Code: 23	**Program:** Mechanical Engineering	**Year/Semester:** 2020-2021 Spring

Course Code:	**Course Title:**	**Credit hours**		
		Lec.	**Tut/Lab**	**Total**
MENG424	Reliability Engineering	**4**	**1**	**4**

Categorization of Course:

- ☐ Engineering or Area Core
- ☐ Engineering Course offered by other programs
- ☒ Engineering or Area Elective
- ☐ Mathematics and Basic Sciences
- ☐ General Education

Categorization of Credits:

a. Mathematics & Basic Science: -
b. **Engineering Topics:** **2**
c. General Education: -
d. **Major Engineering Design:** **2**

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Course Web Page: https://staff.emu.edu.tr/qasimzeeshan/en/teaching/meng-424

Textbook(s): David J Smith, (2005). Reliability, Maintainability and Risk. Practical methods for engineers, Seventh Edition, Butterworth-Heinemann.

Reading List:

- Singiresu S. Rao, (2014) Reliability Engineering, Pearson.
- Patrick O'Connor and Andre Kleyner, (2012). Practical Reliability Engineering, Wiley.

Catalog Description: Introduction to Reliability. Failure data. Reliability, Availability, Maintenance, and Safety (RAMS). Reliability Prediction & Modelling, Reliability Block Diagrams, Redundancy, Fault tree analysis. Failure Mode and Effect Analysis (FMEA). Risk Management. Design for Reliability. Standards, codes and regulations on reliability.

Prerequisite(s)	MATH322, MENG364 and (MENG375 or MECT375)
Type of Course	☐ Required ☒ Selected Elective ☐ Elective

Student Outcomes		
1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	☒
2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	☒
3	an ability to communicate effectively with a range of audiences	☐
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	☐
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	☐
6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	☒
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	☒

Course Learning Outcomes		Student Outcomes							Assessment Percentages
		1	2	3	4	5	6	7	
1	Understand the fundamental concepts of reliability engineering	X							Midterm Exam: 20% Final Exam: 30% Project: 50% *Quiz: Subject to Face to Face Teaching *Project is individual submission
2	Compute measures of reliability of products and systems	X							
3	Construct and analyze Reliability Block Diagrams	X							
4	Conduct Fault Tree Analysis	X							
5	Perform Failure Modes and Effects Analysis	X							
6	Probable causes and types of failure	X					X		
7	Recognition of the relevant standards, codes and regulations	X						X	
8	Use the techniques and tools learned to solve practical engineering problems. Design for Reliability	X	X				X	X	
	Weight of Student Outcomes	**H**	**H**				**L**	**M**	

Topics Covered and Class Schedule:	
Week 1	Introduction to Reliability Engineering
Week 2	Reliability, Availability, Maintenance, and Safety (RAMS)
Week 3	Measures of Reliability, MTBF, MTTF, MTTR
Week 4	Reliability Prediction & Modelling
Week 5	Reliability Block Diagrams
Week 6	Standards based Reliability Prediction
Week 7	Cause and Effect Analysis
Week 8	**Midterm Examination**
Week 9	**Midterm Examination**
Week 10	Fault Tree Analysis (FTA)
Week 11	Failure Mode and Effect Analysis (FMEA)
Week 12	Reliability of Components and Systems – Mechanical
Week 13	Reliability of Components and Systems – Electronics
Week 14	Reliability Based Design (DFR)
Week 15	Reliability Testing
Week 16	**Final Examination**

Laboratory Work				
No.	**Experiment Title and Equipment Used**	**CLO**	**SO**	**Percentage**
1	**Title**: Modeling and Analysis of RBD **Equipment:** MATLAB Software	3	-	-
2	**Title**: Modeling and Analysis of FTA **Equipment:** MATLAB Software	4	-	-

Important Notes Regarding the Course: University rules and regulations are applied to this course. For details, please see http://mevzuat.emu.edu.tr

Exam and Quiz Policy:
The midterm and final exams are OPEN book in Case of Online Teaching.

Makeups:
1. There is no make-up or resit for the Quiz.
2. A student who fails to sit for an examination for a valid reason is given a make-up exam. Within three working days after the examination, students who wish to take a make-up must submit a **written statement** to the course instructor explaining the reason(s) for his/her request.
3. Eligibility to take a **Make-Up Exam**:
   a. Student must contact the Instructor immediately within "**three working days**" after the examination when (s)he has missed the mid-term exam or final exam and to discuss with the faculty about the date and time to take the make-up exam.
   b. Student must secure a "**Make-Up Exam Form**" from the department Office or from instructor website & fill-out the Form. For each Make-Up Exam, please use separate Form.
   c. Student must secure the approval from the instructor for taking the Make-Up Exam.
   d. Failure to take the Make-Up Exam at the agreed date and time will lead to a "NG" Grade for the Make-Up Exam, midterm or final.

NG Policy:

1. **"NG" Nil Grade/ Failing from Absenteeism:** Students who do not comply with the required level attendance and/or not fulfilling the requirements for the evaluation of the course are given the "NG" grade by the Instructor of the Course based on the criteria determined by the Faculty/School Academic Council. Students are informed about the criteria for receiving the "NG" grade by the related course instructor at the beginning of the semester. "NG" grade is included in the computation of GPA and CGPA.
2. Student attendance is monitored and assessed by the course instructor. A student who fails to meet the requirements of a course or who is absent more than the limit specified by the Faculty is considered to be unsuccessful in that course.
3. Students who do not attend any of the above assessment activities (such as mid-term exam, final exam, lab exam, design project report etc.) will be given NG (Nil Grade).
4. Late Submissions of the Assignments, Lab Reports and Project will be graded as zero.

Appeals:
Any appeal against the marks of any assessment component must be made to the course instructor within one week following the announcement of the marks. Any appeal concerning a semester grade must be made to the course instructor no later than the end of the registration period of the following semester.