Risk and Reliability

Code: MK5KOCKM04MX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 2nd year, 1stsemester

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Fundamentals of risk, uncertainty, and reliability. Methods to analyse and quantify the risk of failures, and the reliability of complex systems, including fault tree analysis, reliability block diagrams, probabilistic risk assessment. Introduction to research methods for risk and reliability analysis during the early design stages.

Literature:

Compulsory:

- Mohammad Modarres: Risk Analysis in Engineering: Techniques, Tools and Trends, Taylor & Francis (2006).
- Terje Aven: Quantitative risk assessment: the scientific platform Cambridge, UK; New York: Cambridge University Press, 2011.

Schedule

1st week Registration week	
2nd week: **Lecture:** Basic concepts and definitions: Risk vs. Reliability, Hazards, Failures, Uncertainty sources **Practice:** Selection of research project topic	**3rd week:** **Lecture:** Traditional design; Safety Factors; Probabilistic Design **Practice:** Safety fastor Measures and reliability block diagram
4th week: **Lecture:** Reliability engineering; Reliability measures; Reliability block diagrams **Practice:** Reliability block diagrams	**5th week:** **Lecture:** Failure: definitions and modelling (HW vs SW failures; component vs system-level failures) **Practice:** Select system, list failures & provide example of a failure or reliability
6th week: **Lecture:** Failure modes and effects analysis (FMEA), Criticality analysis (CA) **Practice:** Generate FMECA for selected system	**7th week:** **Lecture:** Fault Tree Analysis (FTA), Event Tree Analysis (ETA) **Practice:** Generate FTA for selected system and compare to FMECA results
8th week: 1st drawing week	
9th week: **Lecture:** Probabilistic Risk Assessment (PRA) **Practice:** Generate ETA for selected system and compare to FMECA result	**10th week:** **Lecture:** Risk considerations in early design stages **Practice:** Analyses of design states
11th week: **Lecture:** Failure analysis during functional design (FFDM) Design repository	**12th week:** **Lecture:** Functional failure identification and propagation (FFIP) **Practice:** Generate FFIP for selected system

Practice: Use of design repository for selected system	
13th week: **Lecture:** Cost-benefit analysis (CBA) **Practice:** Cost-benefit analysis (CBA)	**14th week:** **Lecture:** Hazard identification methods , Process hazards checklists , Hazards surveys and analysis Hazard and operability in industry **Practice:** Course summary
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at lectures is compulsory. Students must attend lectures and may not miss more than three of them during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures will be recorded by the lecturer. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed lectures must be made up for at a later date, being discussed with the tutor.

The minimum requirement of the mid-term and the end-term test is 60% separately. The first (50 points max) in the 8th, the second (50 points max) in the 14th week. At the end of the semester everybody will get a seminar grade on the basis of the table below: The grade for each test is given according to the following (score/grade): 0-59 % = fail (1); 60-69 % = pass (2); 70-79 % = satisfactory (3); 80-89 % = good (4); 90-100 % = excellent (5).

If the score of any test is below 60 point, the student once can take a retake test of the whole semester material. If somebody fails then he/she has to write both tests in the 1st week of the exam period again. If the result is 50 points (50%) or better, then he can take an exam. If somebody has to repeat his midterm tests then his seminar grade can’t be better than (2).

B, for a grade:

For their exam everybody will get an exam grade. The final grade will be the average of the seminar and the exam grade. If it is for example (3.5) then the lecturer decides if it is (3) or (4).