Reliability Theory Course

Name of the subject: **Reliability Theory** - BSc	*SUBJECT code:*	*Weekly hours:* 2 lectures + 2 indoor practice	*Credit*: 4
Subject leader: Ivan Jovanović (Andjelka Stojanović)	*Academic Degree:* Associate Professor (Teaching assistant)	Prerequisites: The acquired knowledge from the Statistics and the Production Management	

Purpose: Through constant improvement of the curriculum, students are trained on procedures for determining reliability in production systems and using the obtained data on the reliability of elements and systems.

Course description: After this course, students will be able to: calculate the reliability of system elements based on collected data; to determine the reliability of systems based on defined/determined reliability of the system elements and defined block diagram for the reliability of the observed system. On this course, students gain necessary knowledge that will be the starting points for mastering programs of vocational subjects in the coming semesters: Quality Management Course, Operations research.

Schedule

LECTURE

Weeks	Topics
1.	The object of reliability; The failure and efficiency of system; Classification of failures; Causes of failures.
2.	Basic statistical background.
3.	Statistical indicators.
4.	Discrete distributions.
5.	Continuous distributions.
6.	Reliability examination.
7.	Estimation of the parameters of distributions by probability plotting.
8.	Confidence intervals; Confidence bounds.
9.	Analytical estimation of Weibull distribution parameters: Least squares method (Regression analysis).
10.	Statistical tests: Kolmogorov-Smirnov test; Pearson's chi-squared test.
11.	Reliability Block Diagrams: Series structure; Parallel structure; Mix of the structures; k-out-of n redundancy structure; Standby redundancy structure; Complex structures.
12.	Reliability methods for solving complex systems.
13.	Methods for reliability analysis of the system: FMEA; FMECA; FTA.
14.	Reliability allocations: ARINC, AGREE, EFTES.

PRACTICAL CLASSES

Weeks	Topics
1.	Basic of probability theory and statistics.
2.	System reliability indicators.
3.	Basic analytical and statistical functions in reliability.
4.	Estimation of the parameters of distributions by probability plotting.
5.	Estimation of the parameters of distributions by probability plotting.
6.	Confidence intervals; Confidence bounds.
7.	Analytical estimation of Weibull distribution parameters.

8.	Statistical tests: Kolmogorov-Smirnov test; Pearson's chi-squared test.
9.	Reliability Block Diagrams: Series structure; Parallel structure; Mix of the structures.
10.	Reliability Block Diagrams: k-out-of n redundancy structure; Standby redundancy structure; Complex structures.
11.	Reliability methods for solving complex systems.
12.	Methods for reliability analysis of the system: FMEA; FMECA.
13.	Fault tree analysis –FTA.
14.	Reliability allocations: ARINC, AGREE, EFTES.

Final grade: On the pre-exam obligations students can conquer 50 points. Structure points are: 5 - presence at the classes; 5 - presence in practical work; 20 - colloquiums; 20 - defended seminar paper. At the exam students can conquer another 50 points (30 tasks and 20 - theory). Method of knowledge testing can be: a written examination, oral examination, the test exam, project presentations, seminars, etc.

The evaluations, based on the results are as follows: 0-50 fail (5); 51-60 pass (6); 61-70 good (7); 71-80 very good (8); 81-90 excellent (9); 91-100 exceptional (10).

Compulsory literature:
1. Milčić D., Reliability of mechanical systems, Faculty of Mechanical Engineering in Niš, 2005.
2. Zelenović D., Todorović, J., The theory of reliability of technical systems, Faculty of Technical Sciences in Novi Sad, 2004.
3. Vujanović N., Theory of Reliability of Technical Systems, Military Publishing and Press Center, Belgrade, 1987.

Supplemental literature:
1. Rausand M.,Hoyland A., System Reliability Theory: Models, Statistical Methods, and Applications, second edition, Wiley ynd sons, Inc., 2008.