COURSE DESCRIPTION CARD - SYLLABUS

Course name

RELIABILITY OF TECHNICAL OBJECTS

Course

Field of study	Year/Semester
Transport	2/3
Area of study (specialization)	Profile of study
--	general academic
Level of study	Course offered in
First-cycle studies	Polish
Form of study	Requirements
part-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
9	0	
Tutorials	Projects/seminars	
18		

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Faculty of Working Machines and Transportation

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Responsible for the course/lecturer:

Prerequisites

Student knows structures of basic types of technical objects and general rules of operation of the same.

Student has basic skills in probability calculus and mathematical statistics.

Student can use basic models relating to skills in probability calculus and mathematical statistics.

Student has fluent skills in computer office software.

Student understands that the further from the design stage of technical objects the high unreliability is detected the greater the costs.

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Student realizes that costs of repairs of technical objects usually constitute a small part of losses caused by damage of the same.

Student can manage his/her own time dedicated to performance of indicated tasks.

Course objective

Acquisition of knowledge skills relating to elementary methods, procedures, models and characteristics connected with reliability of technical objects.

Course-related learning outcomes

Knowledge

The student has an ordered, theoretically founded general knowledge of technology, transport systems and various means of transport

The student has ordered and theoretically founded general knowledge in the field of key issues of technology and detailed knowledge in the field of selected issues in this discipline of transport engineering

The student has knowledge of important development trends and the most important technical achievements and of other related scientific disciplines, in particular transport engineering

Skills

The student is able to take into account in the process of formulating and solving tasks in the field of transport engineering also non-transport aspects, in particular social, legal and economic issues

The student is able to assess the computational complexity of algorithms and transport problems

Student is able to make a critical analysis of the functioning of transport systems and other technical solutions and to evaluate these solutions, including: is able to effectively participate in the technical inspection and assess the transport task from the point of view of non-functional requirements, has the ability to systematically conduct functional tests

Social competences

The student can think and act in an entrepreneurial way, incl. finding commercial applications for the created system, taking into account not only business benefits, but also social benefits of the conducted activity

The student is aware of the social role of a technical university graduate, in particular, he/she understands the need to formulate and transfer to the society, in an appropriate style, information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the transport engineer profession

The student correctly identifies and solves dilemmas related to the profession of a transport engineer

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is tested on the basis of one 45-minute test taking place

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during the last lecture. The test consists of 10-12 questions (test and open-ended), with different scores. The pass mark is 50% of the maximum number of points. The credit issues on the basis of which the questions (test and open-ended) are developed, are submitted to the student representative in an electronic form, no later than after the fourth lecture, and their content is verified after the penultimate lecture

Completion of the content of the exercises is based on the results of two written tests - the first one in the middle of the exercise cycle, and the second one during the last classes. Tests consist of 6-10 questions (test and open-ended), with different scores. The pass mark is 50% of the total maximum number of points from the two tests.

Programme content

Introduction to the topic of the course. The curriculum, hours, literature and crediting. Technical objects as objects of reliability tests. Non-renewable and renewable objects. Damage to a facility. Reliability tests of technical objects. Models of life of non-renewable and renewable objects – probabilistic reliability characteristics. Reliability of non-renewable objects – statistical reliability characteristics. Selected elements of structural reliability. Classification of reliability structures – simple and complex structures. Simple structures: serial, parallel, serial-parallel and parallel-serial structures. An unsuitability tree. Control of reliability of systems with simple structures. A reliability model of operation of technical objects with non-zero renewal time. A bistate model of operation of technical objects. Markov processes. A function of readiness and non-readiness. A coefficient of readiness and non-readiness. The duration of states of exponential type. Markov multistate models of operation of technical objects. A repertory of reliability characteristics of technical non-renewable and renewable objects. Practice in application of methods, processes, procedures and models connected with reliability of technical objects.

Teaching methods

Lecture: credit based on written tests.

Practical classes: credit based on reports prepared and a written test.

Bibliography

Basic

1. Inżynieria niezawodności, Por. pod red. J. Migdalskiego, Wyd. ATR Bydgoszcz i Ośr. Badań Jakości Wyr. "ZETOM", Warszawa, 1992.

2. Kadziński A., Niezawodność obiektów technicznych. E-skrypt Politechniki Poznańskiej, Poznań, 2012, niepublikowany, przekazywany na pierwszym wykładzie.

3. Karpiński J., Korczak E., Metody oceny niezawodności dwustanowych systemów technicznych. Wyd. Omnitech Press, Instytut Badań Systemowych, Warszawa, 1990.

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4. Migdalski J., Podstawy strukturalnej teorii niezawodności. Skrypt Politechniki Świętokrzyskiej, Kielce, 1978.

5. Poradnik niezawodności. Podstawy matematyczne, Wydawnictwa Przemysłu Maszynowego WEMA, Warszawa, 1982.

6. Żółtowski J., Wybrane zagadnienia z podstaw konstrukcji i niezawodności maszyn. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2004.

Additional

1. Bobrowski D., Modele i metody matematyczne teorii niezawodności w przykładach i zadaniach, WNT, Warszawa, 1985.

2. Jaźwiński J., Ważyńska-Fiok K., Niezawodność systemów technicznych. Wyd. Naukowe PWN, Warszawa, 1990.

3. Kadziński A., Niezawodność pojazdów szynowych. Ćwiczenia laboratoryjne, Wyd. Politechniki Poznańskiej, Poznań 1992.

4. Niezawodność autobusów. Pod redakcją Anieli Gołąbek, Wyd. Politechniki Wrocławskiej, Wrocław, 1993.

5. Niezawodność i eksploatacja systemów. Pod redakcją Wojciecha Zamojskiego. Wyd. Politechniki Wrocławskiej, Wrocław, 1981.

6. Radkowski S., Podstawy bezpiecznej techniki. Oficyna Wyd. Politechniki Warszawskiej, Warszawa, 2003.

7. Słowiński B., Podstawy badań i oceny niezawodności obiektów technicznych. Wyd. Uczelniane Wyższej Szkoły Inżynierskiej w Koszalinie, Koszalin, 1992.

8. Żółtowski J., Podstawy niezawodności maszyn. Wyd. Politechniki Warszawskiej, Warszawa, 1985.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	3
Classes requiring direct contact with the teacher	27	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	33	1,5

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[1] delete or add other activities as appropriate