COURSE DESCRIPTION CARD - SYLLABUS

Course name
System Reliability and Safety [S2Trans1>NiBS]

Course

Field of study
Transport

Year/Semester
1/2

Area of study (specialization)
Road Transport

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr hab. inż. Adrian Gill
adrian.gill@put.poznan.pl

Lecturers

Prerequisites

Student understands the notion of a system. Student has basic knowledge in probability calculus and mathematical statistics. Student has basic knowledge relating to reliability of technical facilities. Student can use basic models relating to probability calculus and mathematical statistics. Student can apply elementary reliability models of technical facilities. Student has fluent skills in computer Office software. Student understands and accepts that it is necessary to introduce appropriate social, industrial and transport system limitations that improve functioning of the systems. Student can manage his/her own time dedicated to performance of indicated tasks.

Course objective

Learning about elementary and advanced methods, processes, procedures and models relating to problems of reliability and safety of systems and learning the skills to apply them.

Course-related learning outcomes

Knowledge:
Student has ordered and theoretically founded general knowledge related to key issues in the field of transport engineering

Student has advanced detailed knowledge of selected issues in the field of transport engineering
Student knows advanced methods, techniques and tools used in solving complex engineering tasks and conducting research in a selected area of transport

Skills:
Student is able to use information and communication techniques used in the implementation of projects in the field of transport
Student is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks and simple research problems
Student is able to assess the usefulness and the possibility of using new achievements (methods and tools) and new products of transport technology
Student is able to make a critical analysis of existing technical solutions and propose their improvements (improvements)

Social competences:
Student understands that in the field of transport engineering, knowledge and skills very quickly become obsolete
Student understands the importance of using the latest knowledge in the field of transport engineering in solving research and practical problems

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is checked on the basis of a written exam.
Passing the content of the exercises is based on the results of one written test taking place during the last exercise classes.

Programme content

Introduction to the course issue. Program, hourly structure, literature, way to pass the course. Technical objects and their systems as subjects of reliability assessments. Repertoire of elementary reliability models of objects and systems. Advanced reliability models of objects and systems. Prognostic models of damage and replacement of non-renewable objects of means of transport. Advanced components of structural reliability. General reliability formula and its application to determine the reliability of systems with simple and complex reliability structures. The principle of maximum sensitivity and its application to control the reliability of systems with simple and complex structures. Reliability models of renewable objects with zero renewal time. Simulation modeling in reliability assessments of means of transport systems. Problems of optimizing the reliability of transport systems.
Basic information about safety systems and ways of modeling them. The concept of ensuring safety using safety systems and systems. Methods of system safety analysis at the design stage (FMEA, HAZOP, FTA). Fundamentals of functional safety. Risk graphs.

Teaching methods

Lecture: with the use of multimedia presentations and computer applications.
Exercises: electronic presentations in the stages of formulating problems to be solved and presenting the final results, solving fragments of problems on the board by the teacher and / or students.

Bibliography

Basic:
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2. Kadziński A., Niezawodność obiektów technicznych. E-skrypt Politechniki Poznańskiej, Poznań, 2019, niepublikowany.
3. Kadziński A., Niezawodność i bezpieczeństwo systemów. E-skrypt Politechniki Poznańskiej, Poznań, 2019, niepublikowane.
4. Kadziński A., Studium wybranych aspektów niezawodności systemów oraz obiektów pojazdów szynowych. Seria rozprawy, nr 511, Wyd. Politechniki Poznańskiej. Poznań, 2013.
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6. NPOIK – tekst jednolity, Rządowe Centrum Bezpieczeństwa, 2015.
7. Nuclear Security Series, Risk Informed Approach for Nuclear Security Measures for Nuclear and other Radioactive Material out of Regulatory Control, IAEA, 2015.
Additional:
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2. Gucma L., Wytyczne do zarządzania ryzykiem morskim. Wyd. Naukowe Akademii Morskiej, Szczecin, 2009.
3. Jamroz K., Metoda zarządzania ryzykiem w inżynierii drogowej. Wyd. Politechniki Gdańskiej, Gdańsk, 2011.
4. Kaczmarek T.T., Ryzyko i zarządzanie ryzykiem. Ujęcie interdyscyplinarne. Wyd. Difin, Warszawa, 2006.
5. Klich E., Bezpieczeństwo lotów. Wydawnictwo Naukowe Instytutu Technologii Eksploatacji – PIB, Radom, 2011.
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7. Migdalski J., Podstawy strukturalnej teorii niezawodności. Skrypt Politechniki Świętokrzyskiej, Kielce, 1978.
8. Poradnik niezawodności. Podstawy matematyczne. Wyd. Przemysłu Maszynowego „WEMA”, Warszawa, 1982.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00