STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Reliability of Technical Objects	**1010601231010622071**

Field of study	Profile of study (general academic, practical)	Year /Semester
Transport	**(brak)**	**2 / 3**
Elective path/specialty	**Subject offered in:**	**Course (compulsory, elective)**
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours	No. of credits
Lecture: **1** Classes: **2** Laboratory: **-** Project/seminars: **-**	**3**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student knows structures of basic types of technical facilities and general rules of operation of the same. Student has basic skills in probability calculus and mathematical statistics.
2	**Skills**	Student can use basic models relating to skills in probability calculus and mathematical statistics. Student has fluent skills in computer office software.
3	**Social competencies**	Student understands that the further from the design stage of technical facilities the high unreliability is detected the greater the costs. Student realizes that costs of repairs of technical facilities 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.

Assumptions and objectives of the course:

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

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Students have general knowledge about law provisions and regulations referring to questions of environment protection in transport. - [K1A_W22, K1A_W15]
2. Students have general knowledge about law provisions and regulations referring to questions of environment protection in transport. - [K1A_W22, K1A_W15]
3. Student knows elementary reliability models and basic reliability characteristics of renewable technical facilities. - [K1A_W22, K1A_W15]
4. Student knows simple reliability structures and principles of reliability control of technical facilities with such reliability structures. - [K1A_W22]
5. Student knows principles of planning and preparation of information originating from reliability tests of technical facilities and has knowledge relating to conclusions drawn based on results of reliability tests. - [K1A_W22]

Skills:

1. Student is skilful at use of basic terms relating to reliability of technical facilities. - [K1A _U02]
2. Student can apply elementary reliability models of renewable and non-renewable facilities. - [K1A _U07, K1A _U18]
3. Student can control reliability of technical facilities with simple reliability structures. - [K1A _U18]
4. Student can edit reports with results of reliability tests of technical facilities. - [K1A _U17]

Social competencies:
1. Student is convinced that high reliability of technical facilities is desired and there are theoretical and practical opportunities of fulfillment of this demand. - [K1A _K06]
2. Student notices that many irregularities connected with reliability of technical facilities may apply to reliability of (human) elements of social systems. - [K1A_K08]
3. Improves systemic thinking skills. - [K1A_K07]

Assessment methods of study outcomes
Lecture: credit based on written tests.
Practical classes: credit based on reports prepared and a written test.

Course description
Introduction to the topic of the course. The curriculum, hours, literature and crediting. Technical facilities as objects of reliability tests. Non-renewable and renewable facilities. Damage to a facility. Reliability tests of technical facilities. Models of life of non-renewable and renewable facilities ? probabilistic reliability characteristics. Reliability of non-renewable facilities ? 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 facilities with non-zero renewal time. A bistate model of operation of technical facilities. 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 facilities. A repertory of reliability characteristics of technical non-renewable and renewable facilities. Practice in application of methods, processes, procedures and models connected with reliability of technical facilities.

Basic bibliography:

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.

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 bibliography:

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.

Result of average student's workload

Activity	Time (working hours)
1. Preparation to the lecture	5
2. Participation in the lecture	15
3. Consolidation of the lecture content	5
4. Consultation about the lecture	1
5. Preparation to the classes	10
6. Participation in the classes	30
7. Consolidation of the classes content	5
8. Consultation about the classes	1

Student’s workload

Source of workload	hours	ECTS
Total workload	72	3
Contact hours	47	2
Practical activities	0	0