



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of reliability [S1MiBP1>PN]

### Course

Field of study

Mechanical and Automotive Engineering

Year/Semester

4/7

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

0

Other

0

Tutorials

15

Projects/seminars

0

### Number of credit points

2,00

### Coordinators

dr inż. Kasper Górny  
kasper.gorny@put.poznan.pl

### Lecturers

### Prerequisites

He has knowledge of mechanics, strength, probability calculus and mathematical statistics. Can make basic calculations in the field of probability calculus and mathematical statistics.

### Course objective

Getting to know the basic methods of reliability design at the stage of construction and testing and evaluation of reliability in the course of operation of machines and technological processes, as well as the methods used to control it.

### Course-related learning outcomes

Knowledge:

Has knowledge in the field of mathematics, including algebra, analysis, theory of differential equations, probability, analytical geometry necessary to: describe the operation of discrete mechanical systems, understand computer graphics methods, describe the operation of electrical and mechatronic systems. Has ordered basic knowledge of the main divisions of technical mechanics: statics, kinematics and dynamics of a material point and a rigid body. Has elementary knowledge of the life cycle of machinery, recycling of machine elements and

construction and consumables.

#### Skills:

Can obtain information from literature, the Internet, databases and other sources. Can integrate the obtained information, interpret and draw conclusions from it, and create and justify opinions.

Can develop a manual and repair a simple machine from the group of machines covered by the selected certification path.

Can perform strength calculations of simple frames and load-bearing structures of machines using elementary strength theories.

#### Social competences:

Is ready to critically assess his knowledge and received content

Is ready to fulfill social obligations and co-organize activities for the benefit of the social environment.

Is ready to initiate actions for the public interest.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Written, individual solution of tasks concerning the assessment and forecasting of reliability of elements of technical objects and complex systems using specialized IT techniques.

### Programme content

The module program covers the following topics:

- 1) definition of reliability of technical objects,
- 2) organization of the use of technical facilities,
- 3) description of the destruction processes of technical objects,
- 4) mathematical models for describing changes in reliability.

### Course topics

The lecture program covers the following topics:

Reliability as a measure of product quality. Basic descriptive and value-adding definitions. The development of reliability science.

Characteristics of the ways of organising the use of technical facilities (renewable and non-renewable facilities).

Description of destruction processes of elements, objects and technical systems.

Definitions of physical damage (catastrophic) and contractual damage (parametric).

The concept of damage intensity. Mathematical models to describe the intensity of reliability changes during use - population coverage. Selected probabilistic and statistical methods for estimating indicators for evaluating changes in reliability of technical objects.

Introduction to the description of structural reliability of complex objects - systems. Examples of estimating reliability of real technical objects.

### Teaching methods

Lecture, use of available IT systems to develop and evaluate reliability test results

### Bibliography

#### Basic

1. Poradnik niezawodności. T 1. pod red. J. Migdalskiego, Wyd. WEMA, Warszawa 1982r.
2. Warszyński M., Niezawodność w obliczeniach konstrukcyjnych. PWN. Warszawa 1988r.
3. Poradnik niezawodności. T 2. pod red. J. Migdalskiego, Wyd. WEMA, Warszawa 1996r.
4. Radkowski S., Podstawy bezpiecznej techniki. Oficyna Wydawnicza Pol. Warszawskiej, Warszawa 2003r
5. Szopa T., Niezawodność i bezpieczeństwo. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2009..

#### Additional

1. Bobrowski D., Modele i metody matematyczne teorii niezawodności w przykładach i zadaniach, WNT, Warszawa, 1985.
2. Karpiński J., Korczak E., Metody oceny niezawodności dwustanowych systemów technicznych. Wyd. Omnitech Press, Instytut Badań Systemowych, Warszawa, 1990.
3. Słowiński B., Podstawy badań i oceny niezawodności obiektów technicznych. Wyd. Uczelniane Wyższej Szkoły Inżynierskiej w Koszalinie, Koszalin 1992.
4. Żółtowski J., Podstawy niezawodności maszyn. Wyd. Politechniki Warszawskiej, Warszawa 1985.
5. Żółtowski J., Wybrane zagadnienia z podstaw konstrukcji i niezawodności maszyn. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2004

### Breakdown of average student's workload

|                                                                                                                                         | Hours | ECTS |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------|------|
| Total workload                                                                                                                          | 50    | 2,00 |
| Classes requiring direct contact with the teacher                                                                                       | 30    | 1,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 20    | 1,00 |