COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mechanical Engineering Design

Course

Field of study
Safety engineering

Year/Semester
2/4

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes

Other (e.g. online)

Tutorials
15

Projects/seminars
15

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
Ph.D., Eng., Piotr Kędzia,
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Phone: 61 665 20 64
Faculty of Mechanical Engineering
ul. Jana Pawła II 24, 61-131 Poznań

Responsible for the course/lecturer:

Prerequisites

Basic in the field of mathematics, mechanics, strength of materials, engineering graphics and other areas of education in the field of study. Ordered theoretical knowledge in the field of study. Solving basic tasks from geometry and mathematical analysis. Solving basic issues of solid state mechanics. The ability to search for the necessary information in literature, databases and catalogs. Using information and communication techniques appropriate to the implementation of engineering tasks. Ability to learn independently. Understanding the need for lifelong learning and acquiring new knowledge. Understanding the general social effects of engineering activities. Understanding the need for team collaboration. The student is aware of mutual dependencies between mathematical knowledge, physical knowledge and technical sciences.

Course objective

Understanding the practical principles of designing structures. Mastering the basic principles of mechanics and strength analysis used in the construction process. Getting to know the theoretical and

practical problems related to the design of machines. Presentation of selected strength issues necessary in construction in an understandable form. Indication of the limitations necessary in the construction due to safety and reliability, regulations, standards. Awareness of the complexity of construction: the need to build and test prototypes, formulate the conditions of safe operation, the need for a systemic approach to problems.

Course-related learning outcomes

Knowledge

1. Knowledge in the field of physics, including the basics of classical mechanics, solid state physics, necessary to understand specialist lectures in the field of the theory of construction materials - [P6S_WG_01]
2. Knowledge of the life cycle of products, devices, facilities, systems and technical systems [P6S_WG_06]
3. Knowledge of development trends and best practices in the field of safety engineering [P6S_WK_03]

Skills

1. Ability to see system and non-technical aspects in engineering tasks, as well as socio-technical, organizational and economic aspects [P6S_UW_03]
2. Ability to use analytical, simulation and experimental methods to formulate and solve engineering tasks, also with the use of information and communication methods and tools [P6S_UW_04]
3. Ability to make a critical analysis of the way of functioning and evaluation - in connection with the Safety Engineering of existing technical solutions, in particular machines, devices, facilities, systems, processes and services [P6S_UW_06]
4. Ability to design, using appropriate methods and techniques, facilities, systems or processes that meet the requirements of safety engineering [P6S_UW_07]
5. The ability to identify changes in requirements, standards, regulations and technical progress and the reality of the labor market, and on their basis determine the need to supplement knowledge [P6S_UU_01]

Social competences

1. Ability to see cause-effect relationships in the implementation of the set goals and determining the significance of alternative or competitive tasks [P6S_KK_01]
2. Awareness of the importance and understanding of non-technical aspects and effects of engineering activities, including its impact on the environment, and the related responsibility for decisions made - [P6S_KK_03]
3. Cooperation and group work, taking different roles in it - [P6S_KR_02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Passing exam at the last class of the semester (theoretical and task-related part):
rating 3.0 50.1% -60%
rating 3.5 60.1% -70%
rating 4.0 70.1% -80%

rating 4.5 80.1% -90%
rating 5.0 90.1% -100%
Passing the exercises: current verification of the learning results and the final test at the last class in the semester:
rating 3.0 50.1% -60%
rating 3.5 60.1% -70%
rating 4.0 70.1% -80%
rating 4.5 80.1% -90%
rating 5.0 90.1% -100%
Passing the project: execution of the project during the semester and its defense during the last class

Programme content

Basic concepts of analytical mechanics. Designing connections in mechanical engineering. Basic elements of machines, drive systems, gears, bearings. Design methods, prototyping, experimental research in machine building.

Calculations of joints in machine building (welded joints, riveted joints, bolts). Structural strength calculations. Selection of safety factors. Use of standard elements included in standards and catalogs. Keyed and splined connections.

Designing a subassembly of the drive system - shaft in one of three variants. Determining the shape of the shaft based on the geometric assumptions and the load. Selection of bearings and other gear components. Preparation of technical documentation (detailed drawing of the shaft, assembly drawing of the gear).

Teaching methods

Lecture with multimedia presentation.
Exercises conducted at the blackboard.
Practical construction issues within the project

Bibliography

Basic

1. Magnucki K., Jasion P.: Podstawy konstrukcji maszyn. Wydawnictwo Politechniki Poznańskiej, 2016

2. Mazanek E. (red.), "Przykłady obliczeń z podstaw konstrukcji maszyn" Warszawa, WNT, 2012

3. Osiński Z., "Podstawy konstrukcji maszyn". Warszawa, Wyd. Naukowe PWN, 2002

Additional

1. Bąk R., Burczyński T., "Wytrzymałość materiałów z elementami ujęcia komputerowego" WNT, 2013

2. Beitz P., "Nauka konstruowania" WNT, 1984

3. Cannon jr. R.H., "Dynamika układów fizycznych" WNT, 1973

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for tutorials, preparation for tests, exam) [1]	55	2,0

[1] delete or add other activities as appropriate