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
practical

Level of study
First-cycle studies

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
0

Other (e.g. online)
0

Tutorials
10

Projects/seminars
10

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
dr inż. Maciej OBST

Responsible for the course/lecturer:
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Prerequisites

Beginner student of Mechanical Engineering Design course should have mechanics, mathematics, physics and strength of materials knowledge. The student should have also creative thinking skills, should be able to find and obtain useful information from source materials, should also be ready to cooperate as student’s team member.

Course objective

Learning the practical application of the principles of machine design. Getting to know the problems typical of the construction process and the practice of the constructor's work. Learning to make decisions, solve technical problems and learn to work as a team member. Acquiring skills to use machine standards, producer’s catalogs and the ability to correctly develop a mechanical project.

Course-related learning outcomes

Knowledge

The student getting knowledge about the basics of mechanical systems modeling, principles of operation and design of connections in mechanical engineering, bearings, clutchesm shafts and axles, basics of machine exploitation, principles of operation of mechanical gears and design methods, modern

research methods used in the process of machine and structure design, principles of operation of flexible mechanical elements and design methods, basis of dynamic loads in mechanical systems. The student also gains knowledge about the practical approach to the problem of material fatigue and safety factors chosing.

Skills

The student has the ability to design machine mechanical connections, is able to use catalogs and industry standards, is able to design bearing nodes and basic mechanical constructions. The implementation of the shaft design includes dedicated calculations, selection of bearings, check calculations, fatigue calculations, design of shaft spline and splines connections, selection of seals and shaft technological parameters. The student has the ability to prepare technical documentation - executive and assembly documentation.

The student have ability to think creatively and learn independently.

Social competences

Understanding the need for lifelong learning.

Understanding the social effects of engineering activities.

Understanding the need for team cooperation.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired as part of the lecture is verified during the exam. The exam consists of an analytical problems and theoretical part. Passing threshold: 50%.

The knowledge and skills acquired during the analytical exercises are verified based on a final test during the last activities in the semester. The test consists of 2 calculation analytical problems. Passing threshold 50%.

Knowledge and skills acquired as part of the project classes will be systematically verified during meetings. During the last class in the semester there will be a discussion to act as a defense of the self-made project.

Programme content

Modeling of mechanical systems, basics of analytical mechanics, joints in machine design, bearings in machine design, basics of machine exploitation, basics of powertrain systems, gears - construction, principle of operation, design methods, flexible components in machine construction, experimental research in machine construction, basics of dynamics.

Calculation of welding joints, calculation of riveted and pin connections, calculation of bolted connections, strength calculation of selected construction nodes, selection of safety factors and standard connectors parts based on product catalogs. Calculation of welded, bolt and bolted by screws construction nodes for various load cases, also complex loads. Calculation of key and spline connections.

Selection of standard elements. Assessment of strength safety of a selected welded structure, bolted and assembled using various joining techniques.

Preparation of the design of propulsion system subassembly – shaft design. The design includes determining the loads on the designed shaft, determination of the theoretical shaft outline, carrying out verification calculations, assessment of the stiffness of the designed shaft, selection of bearings, designing shaft journals and free segments, calculation of key or spline connections, design of bearings mounting seat, design of the spacer sleeve and methods of seating parts on the shaft. The selection of seals is also part of the project and checking calculations of the fatigue strength of the shaft are performing. The final stage is the preparation of the report with technical documentation.

Teaching methods

Lecture: multimedia presentation illustrated with examples given on a board, practical problem solving.

Analytical exercices: solving technical problems, practical exercises, discussion

Project: solving practical problems, searching for sources of knowledge, teamwork, discussion

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
Classes requiring direct contact with the teacher	30	1,2
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	70	2,8

[1] delete or add other activities as appropriate