



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of machine design [S1MiBM1>PKM1]

### Course

Field of study

Mechanical Engineering

Year/Semester

2/4

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

30

Laboratory classes

0

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

### Number of credit points

5,00

### Coordinators

### Lecturers

### Prerequisites

Knowledge: Basic knowledge of mathematics and physics. Has basic knowledge of engineering graphics, in the field of projection, geometric shaping of technical forms with the use of polyhedra, solids and surfaces. Has an ordered, theoretically founded general knowledge of technical mechanics and strength of materials. Skills: Can use analytical, simulation and experimental methods to formulate and solve engineering tasks, can formulate problems, use mathematical methods in the analysis of technical issues. He can analyze any system of forces, moments, equilibrium of planar and spatial systems. He can apply the principles of dynamics and determine the energy, work and power of systems. Can perform static analysis of beams, columns, frames and trusses. He is able to obtain information from the Internet, library and reading room and other resources. In particular, he can correctly indicate the sources of the necessary information. Can determine the quality and usefulness of the information and data found. He can also integrate information obtained from various resources, interpret them, as well as draw conclusions and formulate and justify opinions. Social competences: Can interact and work in a group, assuming different roles in it.

## Course objective

1. Provide students with knowledge of the basics of machine design, within the scope defined by the program content appropriate for the field of study. 2. Developing students' skills: - calculating and designing elements and assemblies of machines, - documenting and reading technical documentation based on the acquired knowledge in the subject of machine engineering graphics, - practical use of knowledge acquired in the following subjects: mechanics, strength of materials, machine science, materials science. 3. Shaping students' teamwork skills

## Course-related learning outcomes

Knowledge:

1. Has knowledge of engineering design of machines and devices in the field of the theory of machines and mechanisms, elements of tribology, connections in machine construction, drives, shafts and axles, couplings and brakes, mechanical transmissions, methods of analysis of kinematic systems, basics of hydrostatic drive, machine design algorithms, selection machine elements based on strength and durability criteria, engineering databases in machine construction, technical standards, good practices used in technology and technologies. The acquired knowledge allows you to design: machines and mechanical devices, objects and processes and systems.
2. He knows the elements of a technical drawing, mapping and dimensioning of machine elements, sections, lines, presenting typical elements, normalization in the machine design, rules for creating assembly diagrams and drawings, graphic methods of presenting connections of machine elements, marking surface features of elements. Has knowledge of the use of CAD systems. This knowledge allows you to create technical drawings of machine elements and to read drawings and diagrams of machines, devices and technical systems. It allows to describe their structure and principles of operation.
3. Has knowledge of the strength of materials, including physical laws relating to the action of forces on materials, load cases, tensile, compression, pressure, shear, bending, torsion, complex loads, superposition of load cases, allowable stresses, stress hypotheses, analysis of the stress of machine elements, fatigue strength and fatigue calculations. This knowledge allows performing strength analyzes of machine elements.

Skills:

1. He can design machines and mechanical devices, taking into account the technology and methods of manufacturing and connecting individual mechanical elements.
2. He can present a mechanical structure on a technical drawing using a CAD program. Is able to interpret technical drawings and diagrams of machines, devices and technical systems.
3. He is able to perform strength calculations of mechanical elements including tension, compression, pressure, shear, bending, torsion and complex loads. Can perform basic fatigue calculations.

Social competences:

1. Can set priorities for the implementation of a task set by himself or others.
2. Understands the need for lifelong learning; can inspire and organize the learning process of other people.

## 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 exam on the lecture, final test on exercises.

## Programme content

Lecture: Basic principles of the design process, elements of the mechanism, characteristics of the types of loads, defining loads and formulating appropriate strength conditions. Connections and their calculation: soldered, welded, pressure-welded, glued; riveted and shaped connections: key, splined, pin, spigot, bolt, threaded connections. Screw mechanisms: examples and application, design calculations. Flexible elements: springs, rubber flexible elements.

Classes: The process of designing machine nodes. Design of welded joints. Design of riveted joints. Design of hub-shaft connections (key, spline and pin). Design of spigot connections. Design of threaded connections and screw mechanisms.

## Teaching methods

Informative lecture with a multimedia presentation, blackboard exercises using the case study method.

## Bibliography

### Basic

1. Praca zbiorowa pod red. Z. Osińskiego, Podstawy konstrukcji maszyn, PWN, W-wa, 1999
2. Praca zbiorowa pod red. M. Dietricha: Podstawy konstrukcji maszyn. Tom 3, WNT, Wa-wa, 1999.
3. J. Żółtowski, Podstawy Konstrukcji Maszyn, Oficyna Wydawnicza Politechniki Warszawskiej, 2002.
4. R. Knosala, A. Gwiazda, A. Baier, P. Gendarz, Podstawy Konstrukcji Maszyn, WNT, Warszawa 2000.
5. A. Dziurski, L. Kania, A. Kasprzycki, E. Mazanek, Przykłady obliczeń z Podstawy Konstrukcji Maszyn, Tom 1 i 2, WNT, Warszawa 2005.

### Additional

1. Dietrich M., Podstawy konstrukcji maszyn, Wydawnictwo Naukowo Techniczne 1995.
2. Niezgodziński M. E., Niezgodziński T., Wzory, wykresy i tablice wytrzymałościowe, Wydawnictwo Naukowo Techniczne, 1996,
3. Sempruch J., Piątkowski T., Podstawy konstrukcji maszyn z CAD, Piła, Państwowa Wyższa Szkoła zawodowa w Pile, 2006,
4. Bahl G., Beitz W., Nauka konstruowania, WNT, Warszawa 1984.

## Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
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)	80	3,00