



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Machine design [S1MiBM2>KoM1]

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

45

Laboratory classes

0

Other

0

Tutorials

30

Projects/seminars

0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

Knowledge: Has basic knowledge of mathematics and physics. Has basic knowledge of engineering graphics, in the field of projection, geometric shaping of technical forms using polyhedra, solids and surfaces. Has structured, theoretically based general knowledge of technical mechanics and strength of materials. Skills: Is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks. Is able to formulate problems and use mathematical methods in the analysis of technical issues. Is able to analyze any system of forces, moments, and balance of plane and spatial systems. Is able to apply the principles of dynamics and determine the energy, work and power of systems. Is able to perform static analysis of beams, columns, frames and trusses. Is able to obtain information from the Internet, library, reading room and other resources. In particular, he is able to properly indicate the sources of necessary information. Is able to determine the quality and usefulness of the retrieved information and data. He is also able to integrate information obtained from various resources, interpret it, draw conclusions and formulate and justify opinions. Social competences: Is able to cooperate and work in a group, taking on various roles in it.

Course objective

1. Providing students with knowledge of machine design, within the scope determined by the program content appropriate for the field of study. 2. Developing students' skills: - calculating and constructing machine elements and assemblies, - documenting and reading technical documentation based on the acquired knowledge of machine engineering graphics, - practical use of knowledge acquired from subjects including: mechanics, strength of materials, machine science, materials science. 3. Developing teamwork skills in students

Course-related learning outcomes

Knowledge:

1. Has knowledge of engineering design of machines and devices in the field of theory of machines and mechanisms, connections in machine construction, methods of analyzing kinematic systems, basics of hydrostatic drive, machine design algorithms, selection of machine elements based on strength and durability criteria, engineering databases under construction machines, technical standards, good practices used in technology and technology. The acquired knowledge allows you to design: machines and mechanical devices, objects and processes, systems from a systemic perspective.
2. Knows the elements of technical drawing, mapping and dimensioning of machine elements, cross-sections, cuts, layouts, presentation of typical elements, standardization in construction records, principles of creating diagrams and assembly drawings, graphic methods of presenting connections of machine elements, marking surface features of elements. Has knowledge of operating CAD systems. This knowledge allows you to create technical drawings of machine elements and read drawings and diagrams of machines, devices and technical systems. It allows you 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, tension, compression, pressure, shear, bending, torsion, complex loads, superposition of load cases, permissible stresses, stress hypotheses, analysis of element stress machines, fatigue strength and fatigue calculations. This knowledge allows you to perform strength analyzes of machine elements.

Skills:

1. Is able to design machines and mechanical devices, taking into account the technology and methods of producing and connecting individual mechanical elements.
2. Is able to present a mechanical structure in a technical drawing using a CAD program. Is able to interpret technical drawings and diagrams of machines, devices and technical systems.
3. Is able to perform strength calculations of mechanical elements, including tension, compression, pressure, shear, bending, torsion and complex loads. Is able to perform basic fatigue calculations.
4. Is able to plan and organize individual and team work

Social competences:

1. Understands the need for lifelong learning; can inspire and organize the learning process of other people.
2. Is able to determine the importance of knowledge in solving cognitive and practical problems and to seek the opinion of experts in case of difficulties in solving the problem independently.
3. Can think and act in a creative and enterprising way.
4. Is aware of the social role of a technical university graduate, understands the need to formulate and provide the public with information and opinions regarding technological achievements.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam from the lecture, final colloquium from exercises.

Ratings: 3.0 <50%;60%), 3.5 <60%;70%), 4.0<70%;80%), 4.5<80%;90%), 5.0 < 90%;100%>.

Programme content

Lecture: Basic principles of the construction process, mechanism elements, characteristics of load types, defining loads and formulating appropriate strength conditions. Connections and their calculation: soldered, welded, welded, glued; riveted, shaped connections: keyway, splined, pin, pin, threaded connections.

Screw mechanisms: examples and applications, structural calculations. Flexible elements: springs, rubber flexible elements. Design of shafts and axles, types of plain and rolling bearings, construction of bearing nodes, cable transmissions: belt, chain, friction transmissions.

Exercises: The process of designing machine nodes. Design of welded joints. Design of riveted joints. Design of hub-shaft connections (keyed, splined and pin). Design of pin connections. Design of threaded connections and screw mechanisms. Design of axles and shafts, selection of bearings, design of cable transmissions: belts, chains, design of friction transmissions.

Course topics

none

Teaching methods

Informative lecture, 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.
6. Wałęsa K., Talaśka K., Wilczyński D., Górecki J., Wojtkowiak D., Experimental approach to modeling of the plasticizing operation in the hot plate welding process. Archives of Civil and Mechanical Engineering, 2022, vol. 22, iss. 1, s. 16-1-16-25.
7. Malujda I., Wilczyński D., Talaśka K., Wojtkowiak D., Szulc M., Study of the prototype mechanism of height adjustment of the bed in hospital bed. MATEC Web of Conferences, 2018, vol. 157, s. 02028-1-02028-11, DOI: 10.1051/mateconf/201815702028.

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. Pahl G., Beitz W., Nauka konstruowania, WNT, Warszawa 1984.
5. Pahl G., Beitz W., Feldhusen J., Grote K.H., Engineering Design, A Systematic Approach, third edition Springer Verlag London Limited 2007.

Breakdown of average student's workload

	Hours	ECTS
Total workload	0	0,00
Classes requiring direct contact with the teacher	0	0,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	0	0,00