COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basics of machines' construction [S1Log2>PKM]

Course

Field of study
Logistics

Year/Semester
2/3

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 (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

The student starting this course should have basic knowledge of technical drawing, strength of materials and technical mechanics. He should also have the ability to obtain information from the indicated sources and be ready to cooperate as part of the team.

Course objective

Providing students with knowledge of the basics of machine design, to the extent specified by the curriculum content appropriate to the field of study. Developing students' skills: calculating and designing machine components and assemblies, documenting and reading technical documentation based on acquired knowledge in the field of machine engineering graphics, practical use of knowledge gained in the subjects of mechanics, strength of materials, machine science, material science. Developing teamwork skills in students.

Course-related learning outcomes

Knowledge:
1. Student knows the basic issues of construction, technology and techniques related to design and production [P6S_WG_01]
2. Student knows the basic issues of mechanics, design and operation of machines [P6S_WG_02]

Skills:
1. Student is able to use appropriate experimental and measurement techniques to solve the problem, including computer simulation within the framework of mechanics, construction and operation of machines [P6S_UW_03]
2. Student is able to select appropriate tools and methods to solve a problem within the framework of construction, technology and technique, as well as use them effectively [P6S_UO_02]
3. Student is able to identify changes in requirements, standards, regulations, technical progress and labor market reality in the context of machine design, and on their basis determine the need to supplement knowledge [P6S_UU_01]

Social competences:
1. Student is aware of initiating activities related to the formulation and transfer of information and cooperation in society in the area of construction and technology [P6S_KO_02]
2. Student is aware of cooperation and team work to solve problems in the construction and operation of machines [P6S_KR_02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: The knowledge acquired during the lecture is verified by one 60-minute test carried out during the 15th lecture. The test consists of 5 open-ended questions with different scores. Passing threshold: 50% of points.
Tutorials: Final test: open questions. Passing threshold: 50% of points.

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
Vulnerable elements
The structure of the machine's drive system
Exercises:
Basics of material strength
An example process of designing a machine node. Preparation of technical documentation. Connection design.

Course topics

Lecture: Basic principles of the design process, elements of the mechanism, characteristics of load types, definition of loads and formulation of appropriate strength conditions. Connections and their calculation: soldered, welded, pressure welded, glued, riveted connections, shaped connections: key, spline, pin, spigot and threaded connections. Screw mechanisms: examples and applications, structural calculations. Flexible components: springs, flexible rubber components. The structure of the machine's propulsion system, gears and clutches functions, basic parameters of the drive, types of drives, kinematic diagrams. Clutch breakdown, design and application overview. System start with clutch. Clutches: permanent, controlled, flexible, overload. Calculation of couplings and selection rules from catalogs. General distribution of gears, kinematic diagrams, structure review, basic parameters. Gear selection rules, calculation of gear ratios and moments Toothed gears: classification, meshing principle, tooth outline. Helical gears: meshing geometry, kinematics, geom parameters. wheels, inter-tooth force, base of structure. Bevel gears, systems, teeth variations, wheel geometrical parameters, inter-tooth force. Stress condition in gear teeth of gears. Design calculations of front gears. Worm gears, geometry, kinematics. Planetary gears, construction examples. General characteristics of belt transmissions, forces and stresses in belt tendons, transmitted power and transmission efficiency. Calculation and selection of design features of belt transmissions. Chain gears. Friction gears, selection of materials for wheels, slips,

efficiency. Helical-ball gears, types, load capacity, efficiency, examples of structures, selection of structural features.
Tutorial: Basics of the strength of materials, determining the allowable stress. Example of design process of the machine assembly. Elaboration of technical documentation. Designing of welded joints. Designing of riveted joints. Designing of pin and spigot connections. Designing of key and splined connections. Designing of threaded joints and screw mechanisms. Designing of the drive shafts along with its bearing and selection of the clutch.

Teaching methods

Lecture: Information lecture, problem lecture, talk.
Tutorial: Practical method - subject exercises.Exercise method (subject exercises, exercises) - in the form of auditorium exercises.

Bibliography

Basic:
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3. Osiński Z., Sprzęgła, PWN, Warszawa, 1998.
4. Dziama A., Michniewicz M., Niedźwiedzki A., Przekładnie zębate, PWN, Warszawa, 1989.
5. Ochęduszko K., Koła zębate, Wydawnictwo Naukowo-Techniczne, Warszawa, 1985.
6. Dudziak M., Przekładnie cięgnowe, PWN, Warszawa, 1997.
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8. Knosala R., Gwiazda A., Baier A., Gendarz P, Podstawy Konstrukcji Maszyn, Wydawnictwo Naukowo-Techniczne, Warszawa, 2000.
9. Dziurski A., Kania L., Kasprzycki A., Mazanek E, Przykłady obliczeń z Podstawy Konstrukcji Maszyn, Tom 1 i 2, Wydawnictwo Naukowo-Techniczne, Warszawa 2005.

Additional:
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4. Niezgodziński M. E., Niezgodziński T., Wzory, wykresy i tablice wytrzymałościowe, Wydawnictwo Naukowo Techniczne, Warszawa, 1996.
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8. Budynas R. G., Keith J Nisbett K. J., Shigley's Mechanical Engineering Design, McGraw-Hill Higher Education; 9 edition, 2011.
9. Collins J. A., Busby H. R., Staab G. H., Mechanical Design of Machine Elements and Machines, John Wiley & Sons; 2nd Edition, 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
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)	30	1,00