COURSE DESCRIPTION CARD - SYLLABUS

Course name
Machine and their components [S1IMe1E>MiIK]

Course

Field of study
Mechanical Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

Lecturers

Prerequisites

Knowledge: Basic knowledge of technical drawing. Basic knowledge of machine science and machine components. Skills: Ability to solve problems based on acquired knowledge; ability to retrieve information from indicated sources. Social competences: Understanding the necessity of expanding one's knowledge and developing skills, as well as independence and consistency in completing tasks and solving problems. Willingness to engage in teamwork.

Course objective

The aim of the course is to present to students the structure, operating principles, and functions of machines, their assemblies, and components. During the lecture classes, definitions, classifications, operating principles, and functions will be discussed, supported by visual materials such as drawings and photographs of machines, their assemblies, and components. During the laboratory classes, students will have the opportunity to practically explore the content presented during the lectures.

Course-related learning outcomes

Knowledge:
Has knowledge in the field of machine construction and operation.
Has knowledge in the field of machine design.

Skills:
Is able to use basic tools for assembling and disassembling machine components and assemblies.
Is able to perform critical analysis and evaluation of the functioning of existing technical solutions at the stages of machine design, operation, and production processes.

Social competences:
Understanding the importance of continuously expanding knowledge and developing skills, as well as demonstrating independence and consistency in completing tasks and solving problems. Willingness to actively engage in teamwork.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written assessment of theory from lectures in the form of a test in electronic and conventional form consisting of 5-10 questions. Ratings: 3.0 <50%;60%), 3.5 <60%;70%), 4.0<70%;80%), 4.5<80%;90%), 5.0 < 90%;100%). Ongoing monitoring of preparation for laboratories, optional final laboratory test in written form. Ratings: 3.0 <50%;60%), 3.5 <60%;70%), 4.0<70%;80%), 4.5<80%;90%), 5.0 < 90%;100%).

Programme content

Lecture: machines, machine components, construction and functions of machine components and assemblies, axles, shafts, connections - functions, applications, loads on machine components, flexible components, bearings, gearboxes, gears, pulleys, transmission cables.
Laboratory: assembly and disassembly of machine components using the required tools, providing an understanding of the construction of assemblies and machine elements, their functions, and operating principles. Practical experience with the behavior of machine elements under specific loads.

Course topics

Lecture 1: Machines - classification, construction, and basic functions with examples.
Lecture 2: Shafts and axles - construction, functions, and loads with examples.
Lecture 3: Detachable connections - construction, functions, and basic elements used in detachable connections.
Lecture 4: Non-detachable connections - construction, functions, and basic elements used in non-detachable connections.
Lecture 5: Flexible elements - construction and functions with examples.
Lecture 6: Bearings - types, construction, and functions with examples.
Lecture 7: Gear transmissions - construction and functions with examples.
Lecture 8: Belt and screw transmissions.
Laboratories 1 & 2: Assembly and disassembly of transmissions.
Laboratories 3 & 4: Assembly and disassembly of a belt feeder, including proposals for design modifications.
Laboratories 5 & 6: Assembly and disassembly of a cable-driven positioning device.
Laboratories 7 & 8: Assembly and disassembly of a Cartesian kinematic positioning device with screw drive.
Laboratories 9 & 10: Assembly and disassembly of a Cartesian kinematic positioning device with cable drive.
Laboratories 11 & 12: Familiarization with the construction, startup, and operational testing of a welding machine.
Laboratory 13: Threaded connections - elements of the connection, load testing, internal and external thread geometry, exercises in tightening and loosening connections.
Laboratory 14: Buckling phenomenon - familiarization with the phenomenon in a laboratory setup.
Laboratory 15: Bearings - construction, bearing mounting, and fits.
Laboratory 16: Shaft resonance - familiarization with the phenomenon in a laboratory setup.

Teaching methods

Lecture: Lecture delivered using a traditional board method, supported by a multimedia presentation covering the program content.
Laboratory: Practical exercises and teamwork.

Bibliography

Basic:
1. Bhandari V. B.: Design of Machine Elements, 3rd Edition 2010, published by TATA McGraw-Hill Publishing Company Limited
2. Bhandari V. B.: Introduction to Machine Design, 2nd Edition 2013, published by TATA McGraw-Hill Publishing Company Limited
3. Budynas R. G., Keith J Nisbett K. J.: Shigley's Mechanical Engineering Design, McGraw-Hill Higher Education; 9 edition, 2011
4. Collins J. A., Busby H. R., Staab G. H.: Mechanical Design of Machine Elements and Machines, John Wiley & Sons; 2nd Edition, 2009
5. Collins J. A.: Mechanical Design of Machine Elements and Machines, John Wiley & Sons, Inc. 2003
6. Juvinall R.C., Marshek K. M.: Machine Component Design, John Wiley & Sons; 5th Edition International Student Version edition, 2012
7. Norton R. L.: Machine Design: An Integrated Approach, 2nd Edition, Pearson 2002
8. Norton R. L.: Machine Design: International Version, Pearson; 4 edition, 2010
9. 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.
10. 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/matecconf/201815702028.

Additional:
1. Creamer R. H.: Machine Design, Addison-Wesley, 1976
2. Deutschman A. D., Michels W. J., Wilson Ch. E.: Machine design: theory and practice, Macmillan Publ. London: Collier Macmillan Publ.,1975
3. Dudley D.W.: Handbook of Practical Gear Design, CRC Press, 2004
4. Marshek K. M.: Design of Machine and Structural Parts, John Wiley, 1987
5. Khurmi R. S., Gupta J. K.: A Textbook of Machine Design, S. Chand, 1980
6. Hicks Tyler G. E.: Machine Design Calculations Reference Guide, McGraw-Hill, 1987

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	47	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	53	2,00