COURSE DESCRIPTION CARD - SYLLABUS

Course name

Computer aided design

Course

Field of study

Enginnering Management

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

12

Laboratory classes

Other (e.g. online)

Tutorials

16

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

MSc., Eng. Krzysztof Wałęsa

Mail to: krzysztof.walesa@put.poznan.pl

Phone: 61 665 2318

Faculty of Mechanical Engineering

ul. Piotrowo 3, 61-138 Poznań

Responsible for the course/lecturer:

Ph.D., Eng. Dominik Wilczyński

Mail to: dominik.wilczynski@put.poznan.pl

Phone: 61 665 4512

Faculty of Mechanical Engineering

ul. Piotrowo 3, 61-138 Poznań

Prerequisites

Knowledge of physics (mechanics in the field of: statics, kinematics and dynamics), mathematics, engineering graphics and strength ogf the materials after passing as part of the study program.

Ability to solve problems with the basics of machine design based on knowledge and the ability to obtain information from specified sources.

Awareness of the need to expand their competences, readiness to cooperate within a team.

Course objective

1. Providing knowledge and developing of the student's skills about the basics of machine design and computer aided design in the field of:

- 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.

2. Developing teamwork skills in students.

Course-related learning outcomes

Knowledge

The student describes the basic principles of the design process and elements of the construction mechanism. [P6S_WG_16]

The student defines types of loads and formulates appropriate strength conditions. [P6S_WG_16]

The student names different types of connections, such as soldered, welded, brazed, glued, riveted, keyed, pinned, and threaded, and explains their applications and structural calculations. [P6S_WG_16]

The student characterizes compliant elements, such as springs and rubber compliant elements, and explains their role in constructions. [P6S_WG_16]

The student recognizes the structure of a machine's drive system, functions of transmissions, couplings, and basic drive parameters. [P6S_WG_14]

The student names various types of gearings, such as spur gears, bevel gears, worm gears, planetary gears, and others, and explains their operating principles, parameters, and applications. [P6S_WG_14]

Skills

The student plans and conducts experiments, including measurements and computer simulations, interpreting the results and drawing conclusions in the context of structural design. [P6S_UW_09]

The student uses analytical, simulation, and experimental methods to formulate and solve engineering tasks related to constructions. [P6S_UW_10]

Social competences

The student seeks and selects educational and training centers to supplement and improve knowledge and skills in the field of structural design. [P6S_KK_01]

The student is aware that creating products that satisfy user needs requires a systemic approach considering technical, economic, marketing, legal, organizational, and financial issues. [P6S_KO_02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam from lecture, test from classes.

Programme content

Lecture:

1. Basic principles of the design process, elements of the mechanism, characteristics of load types, definition of loads and formulation of appropriate strength conditions. Tolerances and fittings.

2. Using of the Computer Aided Design methods for machine design problems: basic principles of 3D modelling, drawings preparation and capabilities of CAD software in terms of simulations.

3. Joints 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.

4. The structure of the propulsion system of the machines; transmissions and clutches functions, basic parameters of the drive, types of drives, kinematic diagrams. Clutch breakdown, design and application overview. Bearings: classification, design and features.

5. General classification of transmissions, kinematic diagrams, structure review, basic parameters. Transmissions selection rules, calculation of gear ratios and moments.

6. Gear transmissions: classification, teeth outline, characteristical features, design briefs. General characteristics of the strand transmissions: with belts and chains - forces and stresses in belt tendons, transmitted power and transmission efficiency. Friction transmission - general information and characteristical features.

Tutorials:

Basics of the strength of materials, determining the allowable stress. Calculations of example machine inseparable and separable connections: welded, riveted, pin and spigot joints, key, splined and threaded joints. Designing of the drive shafts along with its bearing and selection of the clutch.

Teaching methods

Informative lecture, problem lecture.

Exercise method - in the form of auditorium exercises.

Bibliography

Basic

1. Przykłady obliczeń z podstaw konstrukcji maszyn cz. 1 i 2, Eugeniusz Mazanek, WNT, Warszawa 2005.

2. Części maszyn, Andrzej Rutkowski, WSiP, Warszawa 2008.

3. Zbiór zadań z części maszyn, Andrzej Rutkowski, WSiP, Warszawa 1984.

4. Części maszyn t. 1 i 2, Zbigniew Orlik, Wiktor Surowiak, WSiP, Warszawa 1980.

5. Podstawy konstrukcji maszyn, praca zbiorowa pod redakcją Zbigniewa Osińskiego, PWN, Warszawa 2010.

6. Podstawy konstrukcji maszyn – zbiór zadań, Bonisław Malik, PWN, Warszawa 2000.

7. Podstawy konstrukcji maszyn, praca zbiorowa pod redakcją Marka Dietricha, WNT, Warszawa 1999.

8. Podstawy Konstrukcji Maszyn, Jan Żółtowski, Oficyna Wydawnicza Politechniki Warszawskiej, 2002.

Additional

1. Poradnik mechanika, wyd. REA, Warszawa 2008.

2. Dudziak M.: Przekładnie cięgnowe. PWN, Warszawa, 1997.

3. Osiński Zbigniew, Sprzęgła, PWN, Warszawa 1998.

4. Ochęduszko K.: Koła zębate, WNT 1985.

5. Müller L., Przekładnie obiegowe, PWN, Warszawa, 1983.

6. Niezgodziński M. E., Niezgodziński T., Wzory, wykresy i tablice wytrzymałościowe, Wydawnictwo Naukowo Techniczne, 1996.

7. Bahl G., Beitz W., Nauka konstruowania, WNT, Warszawa 1984.

8. Sempruch J., Piątkowski T., Podstawy konstrukcji maszyn z CAD, Piła, Państwowa Wyższa Szkoła zawodowa w Pile, 2006.

9. Bhandari V. B.: Design of Machine Elements, 3rd Edition 2010, published by TATA McGraw-Hill Publishing Company Limited.

10. Bhandari V. B.: Introduction to Machine Design, 2nd Edition 2013, published by TATA McGraw-Hill Publishing Company Limited.

11. Budynas R. G., Keith J Nisbett K. J.: Shigley's Mechanical Engineering Design, McGraw-Hill Higher Education; 9 edition, 2011.

12. Collins J. A., Busby H. R., Staab G. H.: Mechanical Design of Machine Elements and Machines, John Wiley & Sons; 2nd Edition, 2009.

13. Katalogi firmowe producentów łożysk i innych części maszynowych.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	30	1,5
Student's own work (literature studies, preparation for classes, preparation for tests) [1]	70	2,5

[1] delete or add other activities as appropriate