COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basics of Machine Design II [S1Lot2-SLiPL>PKM2]

Course

Field of study
Aviation

Year/Semester
2/3

Area of study (specialization)
Aircraft Engines and Airframes

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

The student has knowledge of physics (mechanics in the scope of: statics, kinematics and dynamics), mathematics, basics of machine design, after passing the course within the framework of the study program. The student has the ability to solve problems based on the knowledge they have (basics of machine design, mechanics, mathematics, materials science, strength of materials) and the ability to obtain information from indicated sources. The student understands the need to expand their competences, shows readiness to cooperate within the team.

Course objective

1. Providing 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 constructing machine elements and assemblies, - documenting and reading technical documentation based on knowledge acquired in the subject of engineering machine graphics, - practical use of knowledge acquired in the subjects: mechanics, strength of materials, machine science, materials science. 3. Shaping students' teamwork skills

Course-related learning outcomes

Knowledge:
1. has an ordered, theoretically founded knowledge in the field of engineering graphics and machine construction: technical drawing, object projection, basic principles of engineering graphics, the use of CAD (Computer Aided Design) graphic programs in the construction of machines
2. has an extensive knowledge of the strength of materials, including the theory of elasticity and plasticity, stress hypotheses, methods of calculating beams, membranes, shafts, joints and other structural elements, as well as methods of testing the strength of materials and the state of deformation and stress in structures

Skills:
1 can obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret and critically evaluate them, draw conclusions and exhaustively justify their opinions
2. can solve tasks using the rules of air traffic and design the runway in accordance with the applicable ICAO requirements
3. is able to properly select materials for simple aviation constructions, to indicate the differences between fuels used in aviation

Social competences:
1. understands that in technology, knowledge and skills very quickly become obsolete
2. can think and act in an entrepreneurial way, incl. finding commercial applications for the created system, taking into account not only the business benefits, but also the social benefits of the conducted activity
3. is aware of the social role of a graduate of a technical university, in particular understands the need to formulate and convey to the society, in an appropriate form, information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

credit: self-completed project

Programme content

Basic principles of the design process, mechanism elements, characteristics of load types, defining loads and formulating appropriate strength conditions. Screw mechanisms: examples and application, design calculations.
PART - 66 (THEORY - 22.5 hrs.) MODULE 6. MATERIALS AND EQUIPMENT
6.9 Gearbox
Types of gears and their application;
Ratios, reduction and multiplication systems, passive and active gears, tooth patterns; Belts and pulleys, chains and chain wheel teeth. [2]
MODULE 7A. TECHNICAL SERVICE ACTIVITIES
7.15 Welding, brazing, soldering and gluing
a) Soldering methods, testing of soldered joints. [2]
b) Welding and brazing methods; Testing of welded and hard-soldered joints; Joining methods and testing of glued joints. [2]

Course topics

Introduction to the Design Process
Basic Design Principles
• Design Process Stages
• Criteria for Correct Design
• Mechanism Elements and Their Functions
• Motion and Immobile Connections
• Types of Mechanisms and Their Applications
• Materials Used in Machine Design
• Characteristics of Load Types

• Static and Dynamic Loads
• Variable and Impact Loads
• Analysis of Practical Cases
• Defining Loads and Strength Conditions
• Determining Forces Acting on Structure Elements
• Strength Criteria: Stresses, Deformations, Structure Safety
• Influence of Operating Conditions on the Durability of Elements
• Screw Mechanisms - Theory and Practice
• Principle of Operation and Classification of Screw Mechanisms
• Examples of Applications in Technology and Industry
• Advantages and Limitations of Screw Mechanisms
• Design Calculations of Screw Mechanisms
• Forces Acting in Screw Mechanisms
• Friction Coefficient and Mechanism Efficiency
• Examples of Practical Calculations

Teaching methods

Presentation illustrated with sample projects.

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. Osiński Zbigniew, Sprzęgła, PWN, Warszawa 1998
4. Dziama A., Michniewicz M., Niedźwiedzki A.: Przekładnie zębate. PWN, Wa-wa, 1989.
5. Ochęduszko K.: Koła zębate, WNT 1985.
6. Dudziak M.: Przekładnie cięgnowe. PWN, Warszawa, 1997.

Additional:
1. Niemann G., Maschinenelemente t. I, II, III, Springer ? Verlag Berlin, 1965
2. Müller L., Przekładnie obiegowe, PWN, Warszawa, 1983
3. Bahl G., Beitz W., Nauka konstruowania, WNT, Warszawa 1984

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
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)	55	2,00