COURSE DESCRIPTION CARD - SYLLABUS

Course name
Manufacturing-oriented design [S1ZiIP2>PWZnP]

Course

Field of study
Management and Production Engineering

Year/Semester
3/5

Area of study (specialization)
–

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
0

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Knowledge: the student should have a synthetic knowledge of the various branches of physics necessary for the physical interpretation of technical issues. They should have basic knowledge including types of materials used in engineering, engineering calculations from the areas of technical mechanics and strength of materials, and detailed knowledge of engineering graphics. Skills: the student is able to apply mathematical apparatus to describe and calculate the parameters of the elements of mechanical structures, evaluate the selection of properties of the structural material, perform strength analysis of the basic parts of machinery and equipment (beams, shafts, axles), performing the necessary strength calculations. Social competence: the student should understand the technical and non-technical aspects involved in the development of structures and demonstrate responsibility for decisions.

Course objective

Practical familiarisation of students with the use of current tools in the design process, such as 3D CAD (Computer Aided Design) and CAS (Computer Algebra System) systems for obtaining functional solutions and CAS software for optimising solutions, as well as with the integrated solution in 3D systems, using MBD (Model Based Definition) as an example, for creating 3D technical documentation for production without technical drawings.

Course-related learning outcomes

Knowledge:
The student knows the basic techniques of creating parts and assemblies in 3D CAD.
The student knows the scope of possibilities and ways of automating the 3D modelling process.
The student knows the purpose and field of application of CAS systems.
The student is familiar with the functioning and application of techniques of creating 3D technical documentation.

Skills:
The student is able to use the CAS system to determine the structural features of the designed component based on mathematical apparatus.
The student is able to create models of parts and assemblies in 3D CAD, using adequate techniques and operations that automate the process of their creation.
The student is able to use integrated solutions in 3D systems to create three-dimensional technical documentation.

Social competences:
The student is aware of the role of the individual in the design process. They are able to interact and work in a group and tries to transfer, in an understandable way, their knowledge and skills in order to improve and thus shorten the execution of specific tasks.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratories: knowledge and skills verified through ongoing assessment of completed assignments. A maximum of 100 points can be obtained for an assignment. Threshold 50%.
Design: knowledge and skills verified through ongoing assessment of completed stages of the design task. A maximum of 100 points can be obtained for each stage. Threshold 50%.
Assignment of grades to percentage ranges of results: <90-100> very good; <80-90) good plus; <70-80) good; <60-70) satisfactory plus; <50-60) satisfactory; <0-50) unsatisfactory.

Programme content

Basic issues of the design process. Characteristics and selection of selected types of connections. Determination of design features of selected machine drive components. Characteristics and use of 3D CAD and CAS systems in design. Characteristics and use of integrated solutions in 3D systems for the creation of 3D technical documentation intended directly for production.

Course topics

Laboratory:
1. Use of CAS systems to determine the design features of products.
2. Use of 3D CAD systems in design.
3. Use and creation of library operations in 3D CAD.
4. Techniques for creating assembly models.
5. 3D technical documentation using MBD - assemblies.
6. 3D technical documentation using MBD - parts.
Design:
1. Preliminary evaluation of theoretical and determination of actual geometrical features of the designed product and selection of required standardised and catalogue parts using CAS system.
2. Modelling of the geometric form of the designed part using library operations.
3. Generation or acquisition of required standardised and catalogue parts - creation of a 3D model of the assembly.
4 "Production model" of the assembly using MBD.
5. "Production model" of the part using MBD.

Teaching methods

Laboratory: presentation including theoretical background and a practical example of the topic pursued. Laboratory tasks.

Design: presentation including a practical example of the design stage being carried out. Design tasks.

Bibliography

Basic:
1. Białoń T.: Mathcad. Zbiór zadań dla inżynierów, Wydawnictwo Helion 2021
2. Domański J.: SolidWorks 2022 Projektowanie maszyn i konstrukcji, Wydawnictwo Helion 2022
3. Skoć A., Spałek J.: Podstawy konstrukcji maszyn 1, WNT, 2006, 2012
4. Branowski B. (red.), Głowala S, Mostowski R., Pohl P., Sydor M., Torzyński D., Wieloch G., Zabłocki M.: Podstawy konstrukcji napędów maszyn, Wyd. Politechniki Poznańskiej, Poznań 2007
5. https://help.solidworks.com/2025/polish/SolidWorks/sldworks/c_solidworks_mbd.htm

Additional:
1. Decker K-H.: Meschinenelemente Fuktion, Gestaltung und Berechnung, Carl Hanser Verlag, München 2009

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00