GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fundamentals of machine design I for Management and Production Engineering, PG_00050255		
Field of study	Management and Production Engineering, Management and Production Engineering		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2021/2022
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	6.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Machine Design and Vehicles -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Szymon Grymek	
	Teachers	dr hab. inż. Szymon Grymek dr inż. Sebastian Grelik-Urbanowski mgr inż. Katarzyna Mazur	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	15.0	0.0	0.0	60

E-learning hours included: 0.0

Adresy na platformie eNauczanie:

Podstawy konstrukcji maszyn I dla ZiIP, WC, sem. 03, zimowy 21/22 (PG_00050255) - Moodle ID: 13731
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13731

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Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	60	9.0	81.0	150

Subject objectives

Familiarization with graphic editor.
Familiarization with phenomena in technical systems, especially in machine elements or sub-assembles. Familiarization with calculation models for construction of machines - with calculation models for stress in material of elements under continuous or fatigue loading. Familiarization with elements and assembles commonly used in machines - with structure and operation principles of bearings, clutches, brakes, connections journal-hub, shafts, axles and welded connections.
Skill to construct simple machine elements - strut or bar type.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U05	Student is using analitical, simulation and experimental methods for formulating and solving problems in the production engineering.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
K6_K01	Student uses graphic editor. Student analyses phenomena in technical systems, especially in machine elements or sub-assembles. Student explains basics of project methodology.	[SK5] Assessment of ability to solve problems that arise in practice
K6_W02	Student creates and uses calculation models for construction of machines. Student constructs simple machine elements - strut or bar type. Student recognises elements and assembles commonly used in machines. Student recognises materials used in machines. Student explains structure and operation principles of bearings, clutches, brakes, connections journal-hub, shafts and axies.	[SW1] Assessment of factual knowledge

Subject contents

LECTURE
Basic problems of project methodology. Creating of technical projects as main part of engineer activity.Holistic approach to process of project. System approach to technical systems (machines, installations, plants and processing). Formulation and analysis of problem, seeking of solution conception - supporting methods and technics. Formation of selected characteristic of technical systems - engineering calculations. Fullfilment of requirments and limitations. Methods of rating and selection of solution variants. Modelling and optimization during process of design. Immediate and fatigue strength. Safety coefficient. Engineering calculations for immediate and fatigue strength. Knowledge basis for design. Computer aided design. Friction in machines, positive and negative results of friction.Holistic approach to analysis of friction phenomena in tribological system. Methods of changing of external friction of solids to internal friction. Fluid friction. Transmission system as example of knowledge basis use. Construction of bearing systems as examples of fullfilment of requirements and limitations. Selection of rolling bearing - use of information leaflets, folders, catalogues etc. Use of achievements of hydrodynaqmics and material science in sliding bearing design. Starting and stopping of transmission as example of formulation and analysis of problem, and seeking of solution conception. Friction couplings and brakes in transmission system. Other kinds of couplings and joints and them function in transmiission systems. Couplings as illustration of formation of selected characteristics of system. Connections journal-hub as example of modelling and optimization in design. Methods of rating and selection of solution variants - comparaison shape connections to friction connections. Shaft or axle as example of formulation of problem and creation of modell. Formation of selected characteristics of shaft or axle. Rules of creation of geometric form of elements. Engineering calculation - evaluation of dimension of element (shaft or axle) intersections. Modelling and optimization of connections in machine design. Welded connections.
EXERCISE
Fullfilment of requirments and limitations - rules of construction of bearing system (with rolling bearings). Selection of rolling bearing - use of information leaflets, folders, catalogues etc. Starting and stopping of transmission as example of formulation and analysis of problem, and seeking and validation of solution conception. Couplings and brakes as illustration of formation of selected characteristics of system. Modelling and optimization in design. Methods of rating and selection of connection journal-hub. Comparaison between shape connections and friction connections. Shaft or axle as example of formulation of problem and creation of modell. Fullfilling of necessary trajectory of machine elements (wheels for example). Formation of selected characteristics of shaft or axle. Rules of creation of geometric form of elements. Engineering calculation - evaluation of dimension of element (shaft or axle) intersections.

LABORATORY
Use of computer aided design - especially as a tool to production of technical documentation. Basis of computer graphics. SolidWorks - screen, keyboard, mouse, coordinates, snapping, colour, lines, layers. Drawing of obcects. Modyfications of objects. Dimensions. 3D graphics. SolidWorks draft. Exercise - drawing of selected machine elements.

Prerequisites and co-requisites

Knowledge of Technical drawings, Informatics, Material science, Mechanics, Strength of materials, Casting and forming, Machining. Competence for sketching and drawing - efficient to create technical documentation.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	50.0%	25.0%
Written examination	50.0%	50.0%
Practical exercise	100.0%	25.0%

Recommended reading

Basic literature

1. Kochanowski M.: Podstawy konstrukcji maszyn. Wybrane zagadnienia. Gdańsk: P. Gdańska 2002.
2.Pikoń A.: AutoCAD 2002. Pierwsze kroki. Gliwice: Wydawnictwo HELION.2002.
3. Przykłady obliczeń z podstaw konstrukcji maszyn (pod. red. Mazanek E.). Warszawa: Wyd N-T 2008.
4. Tarnowski W.: Podstawy projektowania technicznego. WNT 1997.

	Supplementary literature	1. Beitz G. P. W.: Nauka konstruowania. W-wa: Wyd. N-T 1984 2. Pikoń A.: AutoCAD 2002. Gliwice: Wydawnictwo HELION.2002 3. Pokojski J.: Systemy doradcze w projektowaniu maszyn. Warszawa: Wyd. N-T 2005 4. Podstawy Konstrukcji Maszyn. Cykl monografii wydawanych przez PWN 5. Wykład z Podstaw Konstrukcji Maszyn z ćwiczeniami rachunkowymi. Praca zbiorowa. (Zbiór skryptów opracowanych w Katedrze Konstrukcji i Eksploatacji Maszyn PG) Wyd. Politechniki Gdańskiej
	eResources addresses	Podstawy konstrukcji maszyn I dla ZiIP, WC, sem. 03, zimowy 21/22 (PG_00050255) - Moodle ID: 13731 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13731 Podstawy konstrukcji maszyn I dla ZiIP, WC, sem. 03, zimowy 21/22 (PG_00050255) - Moodle ID: 13731 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=13731
Example issues/ example questions/ tasks being completed	Assortment of roller bearings. Start-up of the driving system with the friction coupling. Calculation of the connections journal-hub. Constructing of the shaft or the axle.	
Work placement	Not applicable	