GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fundamentals of Machine Design, PG_00060463						
Field of study	Mechanical and Naval Engineering						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2027/2028			
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	Part-time studies		Mode of delivery	at the university			
Year of study	2		Language of instruction	Polish			
Semester of study	4		ECTS credits	9.0			
Learning profile	general academic profile		Assessment form	exam			
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Janusz Musiał				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	36.0	27.0	9.0	0.0	0.0	72
	E-learning hours included: 0.0						
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	72		15.0	138.0	225	
Subject objectives	To familiarize students with phenomena occurring in assemblies or machine elements. To familiarize students with computational models necessary for constructing machines. To familiarize students with elements and assemblies commonly used in machine construction, in particular with the structure and principles of operation: inseparable and detachable connections, pin-hub connections, shafts and axles. Ability to design and construct basic machine elements and simple mechanical systems. To familiarize students with phenomena arising from the use of machines and devices.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U03] is able to identify, formulate and develop the documentation of a simple design or technological task, including the description of the results of this task in Polish or in a foreign language and to present the results using computer software or other aiding tools	The student is able to document the task design.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K6_U07] is able to design a typical construction of a mechanical device, component or a testing station using appropriate methods and tools, adhering to the set usage criteria	The student is able to design a simple, typical device mechanical.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K6_W08] has a knowledge of the analysis and design of selected technical systems, machines and technical equipment, selection of construction materials, manufacturing and operation, including their life cycle	The student has basic knowledge of methodology designing parts of machines and mechanical devices.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_W05] possesses an organized and theoretically grounded knowledge within the range of strength analysis of mechanical constructions including stress and relaxation conditions, energetic methods, strength hypotheses	The student has basic knowledge of modeling systems mechanical based on strength analysis.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_U04] is able to perform a critical analysis of the existing technical solutions, present the specification of the technology of manufacturing basic construction elements of machines and engineering assemblies	The student is able to analyze and select a solution construction and critical assessment of existing solutions.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Course content – lecture
Main lecture content

Elements of machine science and construction theory. Shaping machine elements based on strength criteria. Permanent connections (welded, welded, soldered, glued, riveted). Detachable screw connections. Shaft-hub connections: form-fitting and friction connections. Shafts and axles. Principles of structural design. Clutches and brakes. Welded joints. Friction/lubrication. Sliding bearings. Rolling bearings. General principles of shaft bearings. Springs. Mechanical transmissions: division, applications, advantages, disadvantages, geometric and kinematic transmission, efficiency. Gears. Cable transmissions - chain, belt. Friction gears, variators, wave gears, precession gears, special gears.

Main exercise content

Tasks regarding: selection of geometric features of shafts; strength calculations of clutches, welded joints, selection of rolling and sliding bearings; gear calculations; calculations of screw and form connections. Completion of a design task (concepts, verification, calculations, drawings).

Main lab content

Research on the start-up time of the drive system of a working machine with a high mass moment of inertia. Determining the characteristics of a helical spring. Testing the preload in screw connectors - estimation of the friction coefficient in threaded connections. Testing the pressure distribution in sliding bearings.

Prerequisites and co-requisites

Engineering graphics,

Strength of materials.

Mechanics.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td></td><td>60.0%</td><td>50.0%</td></tr>
<tr><td></td><td>100.0%</td><td>30.0%</td></tr>
<tr><td></td><td>100.0%</td><td>20.0%</td></tr>
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<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Series of scripts: R. Maciakowski, M. Dietrich and others: Lecture from PKM

A series of textbooks entitled Basics of Machine Design, edited by Z. Osiński PWN

L. Kurmaz: Fundamentals of Machine Design. Projects. PWN.

T. Dobrzański Technical machine drawing. WNT</td></tr>
<tr><td>Supplementary literature</td><td>Juvinall R. C., Marshek K. M.: Fundamentals of macine component design. John Wiley & Sons (Asia) Pte Ltd.

Norton L. R.: Design of machinery. An introduction to the synthesis and analysis of mechanisms and machines. McGraw-Hill Education (Asia) 2004.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Gear calculations - calculation of gears, gear ratios, selection of shafts and bearings.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="2">Not applicable</td></tr>
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