



Subject card

Subject name and code	Fundamentals of Machine Design I, PG_00040051						
Field of study	Mechanical Engineering, Mechanical 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	Part-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	4	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Michał Wasilczuk					
	Teachers	dr inż. Krzysztof Druet mgr inż. Katarzyna Mazur					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	8.0	8.0	0.0	0.0	31
	E-learning hours included: 0.0 Podstawy konstrukcji maszyn I, st. niestacjonarne MiBM (M:31916WO) - Moodle ID: 23195 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23195						
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	31	9.0		60.0	100	
Subject objectives	To acquaint students with the phenomena occurring in subassemblies or machine elements. To acquaint students with the computational models necessary for the construction of machines. To acquaint students with elements and assemblies commonly used in machine construction, in particular with the structure and principle of operation of: permanent and detachable connections, tenon-hub connections, shafts and axles. The ability to construct basic machine elements and simple mechanical systems.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W04] possesses knowledge on mechanics, including the processes of modelling mechanical systems, statics, kinematics and dynamics of rigid objects and basic knowledge on vibrations	A student has a basic knowledge of statics, kinematics, dynamics and modeling of mechanical systems.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
	[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	A student is able to document a simple design task.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	[K6_U11] is able to analyse the operation of devices and compare the construction solutions applying usage, safety, environmental, economic and legal criteria	A student is able to analyze the operation of the device and evaluate design solutions due to various criteria.	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
	[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	A student is able to design a simple, typical mechanical device.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
[K6_W08] possesses basic knowledge including the methodology of designing machine parts, mechanical devices, selection of construction materials, manufacturing and operation, with the lifetime cycle	A student has a basic knowledge of the design methodology.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge	
Subject contents	<p>The main program content of the lectures Elements of machine science and theory of construction. Shaping machine elements on the basis of the strength criterion - engineering calculations. Safety factor and determination of allowable stresses. Permanent connections (welded, welded, soldered, glued, riveted). Detachable connections - bolted: - a joint loaded with forces acting in the plane of contact of the connected elements - loose bolts, fitted bolts, - a joint loaded with forces acting perpendicular to the contact plane of the connected elements. Movable screw connections (conversion of rotary motion into linear motion). Shaft-hub connections - shape and friction. Shafts and axles - part I. Material fatigue strength.</p> <p>The main program content of the auditorium exercises Strength calculations of an object subjected to a complex state of stresses. Strength calculations of welded joints (butt or fillet welds) subjected to a complex state of stresses. Calculation of a bolt connection loaded with a force acting in the contact plane of connected elements: - bolts loose, load borne by frictional forces, - shoulder bolts. Calculation of a bolt joint loaded with a force perpendicular to the contact plane of the connected elements (bolt-flange joint with preload). Calculation of Trunnion-Hub Connections: - key, - spline, - friction (conical contact surface of the journal and hub).</p> <p>The main content of the laboratory exercises The use of computer technology to support the design process - in particular the development of technical documentation. Introduction to computer graphics. 3D graphics elements. Drawing objects. Modification of objects. Dimensioning. Exercise - making drawings of the indicated elements.</p>		
Prerequisites and co-requisites	<p>Engineering graphics. Mechanics. Strength of materials. Materials Science. Technology.</p>		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exercise tasks	100.0%	30.0%
	Test	60.0%	40.0%
	Computer lab tasks	100.0%	30.0%

Recommended reading	Basic literature	<p>Podstawy konstrukcji maszyn. Praca zbiorowa pod red. M. Dietricha. Warszawa: WN-T 1986.</p> <p>Juvinall R. C., Marshek K. M.: Fundamentals of machine component design. John Wiley & Sons (Asia) Pte Ltd.</p> <p>Reguła J., Ciana W.: Podstawy konstrukcji maszyn. Materiały pomocnicze do projektowania. Olsztyn: WYD. ART 1987.</p>
	Supplementary literature	<p>Podstawy Konstrukcji maszyn. Cykl monografii wydawanych przez PWN.</p> <p>Norton L. R.: Design of machinery. An introduction to the synthesis and analysis of mechanisms and machines. McGraw-Hill Education (Asia) 2004.</p> <p>Deckert K-H., Kabus K.: Maschinenelemente. Gestaltung und Berechnung. Carl Hanser Verlag Munchen Wien 1998.</p>
	eResources addresses	
Example issues/ example questions/ tasks being completed	<p>Strength calculations of welded joints (butt welds or fillet welds) subjected to a complex state of stresses. Calculation of a bolt connection loaded with a force acting in the contact plane of connected elements: - bolts loose, load borne by frictional forces, - shoulder bolts. Calculation of a bolt joint loaded with a force perpendicular to the contact plane of the connected elements (bolt-flange joint with preload). Calculation of pin-hub connections.</p>	
Work placement	Not applicable	