



## Subject card

Subject name and code	Fundamentals of Machine Design I, PG_00061988						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2023/2024		
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	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						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Michał Wasilczuk				
	Teachers		mgr inż. Marek Łubniewski  mgr inż. Katarzyna Mazur  dr inż. Grzegorz Rotta  dr hab. inż. Stefan Dzionk  prof. dr hab. inż. Michał Wasilczuk				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	45.0	15.0	0.0	0.0	105
	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	105		9.0		111.0	225
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_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.	[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_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.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
	[K6_W05] possesses an organized and theoretically grounded knowledge within the range of strength analysis of basic mechanical constructions including stress and relaxation conditions, energetic methods, strength hypotheses	Student has ordered knowledge of the strength analysis of basic mechanical structures.	[SW1] Assessment of factual knowledge
	[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.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
	[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.	[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
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>Welded joints. Compliant elements. Roller element bearings. Slider bearings. Mechanical transmissions. Clutches and couplings. Design methodology.</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
	Test	60.0%	40.0%
	Exercise tasks	100.0%	30.0%
	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 &amp; 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	<p>Adresy na platformie eNauczanie:</p> <p>PKM Michał_Wasilczuk_druga edycja - Moodle ID: 34443  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34443">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34443</a></p>
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	