



Subject card

Subject name and code	Mechanics, PG_00060473						
Field of study	Mechatronics						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2026/2027	
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	1	Language of instruction				Polish	
Semester of study	2	ECTS credits				7.0	
Learning profile	general academic profile	Assessment form				exam	
Conducting unit	Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Marek Krawczuk					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	30.0	15.0	0.0	0.0	90
	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	90	11.0	74.0	175		
Subject objectives	Theoretical and exercises in technical mechanics						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_U01] is able to acquire information from literature, databases and other, properly chosen sources, integrate these information, interpret them, draw conclusions and formulate opinions	Has the ability to self-educate			[SU1] Assessment of task fulfilment		
	[K6_W04] has organized and theoretically supported, advanced knowledge in the field of general mechanics, strength of materials, theory of mechanisms and machine dynamics, fluid dynamics, hydraulics and pneumatics, machine construction and engineering graphics	Has knowledge of solid mechanics			[SW1] Assessment of factual knowledge		
	[K6_W02] has a knowledge in term of physics that includes mechanics, thermodynamics, optics, electricity, magnetism, atomic physics, nuclear physics, solid state physics, including the knowledge necessary to understand basic phenomena occurring in mechatronic elements and systems and its surroundings	Understands the basic laws of statics, kinematics and dynamics			[SW1] Assessment of factual knowledge		
[K6_U03] has self-learning skills	Is able to acquire knowledge independently			[SU3] Assessment of ability to use knowledge gained from the subject			

Subject contents	<p>Course content – lecture Lectures/Tutorials</p> <p>Modeling in mechanics: real system, physical and mathematical models, and also meanings of: ideal rigid body, dimension-less point, concentrated force. The basic Newtons principles, and primitive notions and axioms of mechanics. Equilibrant systems of forces. Resultant force of concurrent system of forces. Momentum of pair of forces. Resultant force and resultant momentum of spatial system of forces. Degrees of freedom, strains and their reaction forces. Statically determinate and in determinate systems. Conditions of equilibrium of system of forces, and particular systems: coplanar, concurrent, and parallel. Substitute conditions of equilibrium. Formulas of superposition, and independence of force acting. Forces, and their sources. Division of forces: reactive and active, external and internal. Gravity force and coordinates of centre of gravity. Friction forces, rolling resistance and belt drive friction. Analysis of forces in bars of truss. Basic meanings in kinematics of point: position coordinates, velocity, acceleration, and equations of motion. Description of motion of point in: vector, Cartesian, normal, and polar coordinates. Analysis of kinematics parameters of particular systems: linear track motion, circle and ellipse track motion, uniform and uniformly accelerated motion, harmonic motion, crank-shaft system motion. Kinematics of the rigid body. Basic definitions: angular coordinates, velocities and accelerations of the body, and linear velocity and acceleration of the point of the body. Dependency in-between velocities and accelerations of points of the body. Particular cases of the rigid body kinematics: transitional, rotational and coplanar motion. Description of coplanar motion as transitional and rotational motion superposition, and as rotational motion around contemporary center of velocity and center of acceleration. Analysis of kinematics parameters of planar and planetary toothed transmit boxes. Relative motion and Coriolis acceleration. Dynamics of inertial point in: Cartesian, polar, and normal coordinates. Particular cases of dynamics of point motion of: linear track motion, oblique projection motion, free motion in gravity field including resistance forces, harmonic motion, mathematical pendulum. Dynamics of the inertial points system. Dynamic analysis of the inertial point using principles of mechanics: d'Alembert, conservation of energy, conservation of momentum and impulse, conservation of moment of momentum. Inertia parameters of the rigid body: mass, coordinates of centre of mass, mass moments of inertia. Parameters of the principal moments of inertia and principal axes of inertia of the body. Differential equation of motion and dynamic principles in analysis of transitional, rotational and coplanar motion of the body. The d'Alembert principle in calculation of bearings reaction forces of rotor, and to balance it dynamically. Gyroscopes effect. Analysis of strait and diagonal central collision, and calculation of the centre of percussion. Basis principles of analytical mechanics in analysis of dynamics of inertial points and bodies systems. Virtual displacement. Principle of virtual work. Generalized coordinates and forces. The Lagrange equation of the second kind.</p>														
Prerequisites and co-requisites	Physics and mathematics on the secondary level school, including in particular: geometry, trigonometry, and also vector calculus.														
Assessment methods and criteria	<table border="1" data-bbox="448 1032 1487 1173"> <thead> <tr> <th data-bbox="448 1032 794 1070">Subject passing criteria</th> <th data-bbox="794 1032 1141 1070">Passing threshold</th> <th data-bbox="1141 1032 1487 1070">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 1070 794 1104">Practical exercise</td> <td data-bbox="794 1070 1141 1104">56.0%</td> <td data-bbox="1141 1070 1487 1104">40.0%</td> </tr> <tr> <td data-bbox="448 1104 794 1137">Written exam</td> <td data-bbox="794 1104 1141 1137">56.0%</td> <td data-bbox="1141 1104 1487 1137">40.0%</td> </tr> <tr> <td data-bbox="448 1137 794 1173">Laboratory</td> <td data-bbox="794 1137 1141 1173">56.0%</td> <td data-bbox="1141 1137 1487 1173">20.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Practical exercise	56.0%	40.0%	Written exam	56.0%	40.0%	Laboratory	56.0%	20.0%
Subject passing criteria	Passing threshold	Percentage of the final grade													
Practical exercise	56.0%	40.0%													
Written exam	56.0%	40.0%													
Laboratory	56.0%	20.0%													
Recommended reading	<table border="1" data-bbox="448 1180 1487 1554"> <tbody> <tr> <td data-bbox="448 1180 794 1234">Basic literature</td> <td colspan="2" data-bbox="794 1180 1487 1234">Wittbrodt E., Sawiak S.: General Mechanics. Theory and exercises. Published by GUT 2020 (in Polish)</td> </tr> <tr> <td data-bbox="448 1234 794 1525">Supplementary literature</td> <td colspan="2" data-bbox="794 1234 1487 1525"> Osiński Z.: Mechanika ogólna. T. I i 2, PWN, Warszawa 1987 Nizioł J.: Metodyka rozwiązywania zadań z mechaniki. WNT, Warszawa 2002 Sawiak S., Wittbrodt E.: Mechanika. Wybrane zagadnienia. Teoria i zadania. Wyd. PG, Gdańsk 2007 </td> </tr> <tr> <td data-bbox="448 1525 794 1554">eResources addresses</td> <td colspan="2" data-bbox="794 1525 1487 1554"></td> </tr> </tbody> </table>			Basic literature	Wittbrodt E., Sawiak S.: General Mechanics. Theory and exercises. Published by GUT 2020 (in Polish)		Supplementary literature	Osiński Z.: Mechanika ogólna. T. I i 2, PWN, Warszawa 1987 Nizioł J.: Metodyka rozwiązywania zadań z mechaniki. WNT, Warszawa 2002 Sawiak S., Wittbrodt E.: Mechanika. Wybrane zagadnienia. Teoria i zadania. Wyd. PG, Gdańsk 2007		eResources addresses					
Basic literature	Wittbrodt E., Sawiak S.: General Mechanics. Theory and exercises. Published by GUT 2020 (in Polish)														
Supplementary literature	Osiński Z.: Mechanika ogólna. T. I i 2, PWN, Warszawa 1987 Nizioł J.: Metodyka rozwiązywania zadań z mechaniki. WNT, Warszawa 2002 Sawiak S., Wittbrodt E.: Mechanika. Wybrane zagadnienia. Teoria i zadania. Wyd. PG, Gdańsk 2007														
eResources addresses															
Example issues/ example questions/ tasks being completed	<p>Principles of static</p> <p>Kinematics of plane motion</p> <p>Dynamics of a material point in polar coordinates</p>														
Practical activities within the subject	Not applicable														

Document generated electronically. Does not require a seal or signature.