GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	General Mechanics, PG_00064116						
Field of study	Mechanical and Medical Engineering						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2024/2025			
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	8.0			
Learning profile	general academic profile		Assessment form	exam			
Conducting unit	Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Marek Krawczuk				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	45.0	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		14.0	96.0	200	
Subject objectives	Lectures and exercises in technical mechanics						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W03] has knowledge in rigid body mechanics, biomechanics, modelling of mechanical system, vibration and strength analysis of mechanical structures or knowledge in the use of computer programs for analyzing and simulating mechanical systems, and the design process	Student describes real systems using physical and mathematical models. Student recognizes meanings: ideal rigid body, dimension-less point, concentrated force. Student presents basic Newton's principles, primitive notions and axiom's of mechanics. Student differentiates equilibrant forces'; systems. Student characterizes the resultant force and the resultant momentum systems of forces. Student describes degrees of freedom, strengths and their reactions, and also statically determinate and indeterminate of systems. Student characterizes conditions of equilibrium of spatial force system, and particular systems: coplanar, concurrent, and parallel. Student defines substitute conditions of equilibrium. Student characterizes types of forces, and their sources, describes active and reactivity forces, as well as external and internal forces. Student characterizes gravity force and coordinates of the centre of gravity. Student describes friction forces, rolling resistance, and belt drive friction. Student characterizes forces in bars of truss. Student recognizes basic meanings of kinematics of point: position coordinates, velocity and acceleration. Student recognizes: vector, Cartesian, normal, and polar co-ordinates of point kinematics. Student characterizes parameters of kinematics of particular systems: linear track motion, circle and ellipse track motion, uniform and uniformly accelerated motion, harmonic motion, crank-shaft system motion	[SW1] Assessment of factual knowledge
	[K6_U04] is able to utilize empirical, analytical, simulation, and computer-based methods to formulate and solve engineering tasks in the field of medical and mechanical engineering	Student describes real systems using physical and mathematical models. Student recognizes meanings: ideal rigid body, dimension-less point, concentrated force	[SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>Lectures/Tutorials

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: dAlembert, 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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Phisics and mathematics on the secondary level school, including in particular: geometry, thrigonometry, and also vector calculus.</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written exam</td><td>56.0%</td><td>50.0%</td></tr>
<tr><td>Practical exercise</td><td>56.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Wittbrodt E., Sawiak S.: Mechanika ogólna. Teoria i zadania. Wyd. PG, Gdańsk 2012</td></tr>
<tr><td>Supplementary literature</td><td>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>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Give the axioms of mechanicsDescribe the motion of a point in natural coordinates</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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