



## Subject card

Subject name and code	Mechanics , PG_00055738						
Field of study	Mechanical and Medical Engineering						
Date of commencement of studies	October 2023		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	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		6.0		
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		mgr inż. Grzegorz Banaszek prof. dr hab. inż. Marek Krawczuk mgr inż. Kornel Piłat				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	45.0	0.0	0.0	0.0	75
	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	75		8.0		67.0	150
Subject objectives	Lectures and exercises in technical mechanics						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U05] he/she is able to use analytic and modelling methods to formulate and solve engineering tasks related to the mechanical-medical area	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	[SU1] Assessment of task fulfilment
	[K6_W09] he/she has basic knowledge related to numerical methods and engineering software used to analyze, model and design a given mechanical system	Student defines substitute conditions of equilibrium.	[SW1] Assessment of factual knowledge
	[K6_W05] he/she has skills in the field mechanics of rigid body, modelling of mechanical system, vibration and fundamental of strength of materials	Student describes real systems using physical and mathematical models. Student recognizes meanings: ideal rigid body, dimension-less point, concentrated force	[SW1] Assessment of factual knowledge

Subject contents	<b>Lectures/Tutorials</b>  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.		
Prerequisites and co-requisites	Phisics and mathematics on the secondary level school, including in particular: geometry, thrigonometry, and also vector calculus.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	56.0%	50.0%
	Practical exercise	56.0%	50.0%
Recommended reading	Basic literature	Wittbrodt E., Sawiak S.: Mechanika ogólna. Teoria i zadania. Wyd. PG, Gdańsk 2012	
	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	Adresy na platformie eNauczanie: Mechanika (PG_00055738) wykład 2023/24 IMM - Moodle ID: 35090 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35090">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35090</a> Mechanika (PG_00055738) wykład 2023/24 IMM - Moodle ID: 35090 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35090">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35090</a>	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		