GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mechanics II, PG_00039874						
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	Full-time studies		Mode of delivery	at the university			
Year of study	2		Language of instruction	Polish			
Semester of study	3		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. Edmund Wittbrodt					
	Teachers	prof. dr hab. inż. Edmund Wittbrodt mgr inż. Grzegorz Banaszek					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 0.0						
	Mechanika II, C, MiBM, sem. 03, zimowy 21/22, (M:31533W1) - Moodle ID: 18351 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18351 Mechanika II, C, MiBM, sem. 03, zimowy 21/22,(M:31533W1) - Moodle ID: 19626 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19626						
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	60		6.0		84.0	150
Subject objectives	Theoretical lectures and exercises in technical mechanics						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U01] is able to acquire information from specialized literary sources, databases and other resources, essential for solving engineering tasks; is able to compile the obtained information pieces and to interpret them, additionally is able to form conclusions and present justified opinion	The student applies the principles of mechanics: d'Alembert, energy and work, momentum and drive, winding and turning. Student determines: mass, coordinates of the center of mass and mass moments of inertia of a solid. The student uses the Steiner theorem, knows how to determine the parameters of the main inertia system and the main moments of inertia. Student determines the differential equations of translational, rotational and plane motion of a solid. The student applies the basic principles of mechanics in the dynamics of a solid in translational, rotational and plane motion. The student applies the d'Alembert principle to calculate the reaction of rotor bearings. The student determines the gyroscopic forces. Student analyzes straight and oblique central collisions and determines the center of impact. The student applies the principles of analytical mechanics to describe the dynamics of a system of points and solids in constrained systems.	[SU1] Assessment of task fulfilment
	[K6_U06] is able to use mathematical and physical models for analysing the processes and phenomena occurring in mechanical devices within the range of material strength, thermodynamics and fluid mechanics	The student applies the principles of mechanics: d'Alembert, energy and work, momentum and drive, winding and turning. Student determines: mass, coordinates of the center of mass and mass moments of inertia of a solid. The student uses the Steiner theorem, knows how to determine the parameters of the main inertia system and the main moments of inertia. Student determines the differential equations of translational, rotational and plane motion of a solid. The student applies the basic principles of mechanics in the dynamics of a solid in translational, rotational and plane motion. The student applies the d'Alembert principle to calculate the reaction of rotor bearings. The student determines the gyroscopic forces. Student analyzes straight and oblique central collisions and determines the center of impact. The student applies the principles of analytical mechanics to describe the dynamics of a system of points and solids in constrained systems.	[SU1] Assessment of task fulfilment
	[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	The student knows the basic concepts: position of a solid, velocity and angular acceleration of a solid as well as velocity and acceleration of a point belonging to a solid. The student determines the relationships between the speeds of points belonging to a rigid body.	[SW1] Assessment of factual knowledge

Subject contents	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. The dAlembert 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.
Prerequisites and co-requisites	Knowledge of phisics and mathematics on the secondary level school, including in particular: geometry, thrigonometry, analisis of differential equations, vector calculus, and matrix analysis. Complited course of Mechanics I.

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	

Example issues/ example questions/ tasks being completed	
Work placement	Not applicable