GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Engineering Mechanics, PG_00059035
Field of study	Materials Engineering, Materials Engineering, Materials 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	5.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Zakład Mechaniki Stosowanej i Biomechaniki -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Krzysztof Lipiński
	Teachers	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	15.0	0.0	0.0	60
	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	60	5.0	60.0	125

Subject objectives	Familiarizing students with the non-negligible knowledge about modeling methods in mechanics, the main concepts and theorems of statics. The introduction of methods for modeling sliding friction and rolling resistance. Introduction of the fundamental concepts, definitions and theorems of kinematics and dynamics of mechanical systems of rigid bodies.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_W05	has knowledge from the area of mechanics,	[SW1] Assessment of factual knowledge
	K6_K01	is aware of the limits resulting from the use of modeling methods presented to him, and thus understands the need to improve professional and personal competences; is aware of their own limitations and knows when to turn to experts, is able to properly define priorities for the implementation of tasks specified by themselves or others	[SK5] Assessment of ability to solve problems that arise in practice
	K6_U01	is able to use properly selected analytical methods to estimate loads acting on materials	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools

Subject contents	Information on the organization of the course. Bibliography. Historical overview. Mechanics and its main topics. Modeling in mechanics. Concepts of real object, physical model, mathematical model, algorithm. Concepts of rigid body, material particle, concentrated force. Newtons laws. Primitive notions and axioms. Equivalent systems of forces. Net force for a concurrent et of forces. Torque about a point and about an axis. Net force for a set of two parallel forces. A couple of forces and its torque. Net torque for a concurrent and general set of forces. Principal net force and principal net torque. Degrees of freedom, constraints, reactions. Statically determinable system of forces, statically undeterminable system of forces, mechanisms. Statics. Basic concepts. Equilibrium conditions for planar systems. Particular cases of systems and their equilibrium conditions: concurrent system so forces parallel system of forces. Equilibrium conditions for spatial systems. Particular cases of systems and their equilibrium conditions: concurrent system so forces parallel system of forces. Alternative equilibrium conditions. Principle of independent actions of forces (principle of superposition). Origins of the forces: internal and external forces. Gravity forces and coordinates of the gravity centers. Static momentum of inertia. Sliding friction, belt friction, rolling resistance. Kinematics of a point: basic concepts and principles: position velocity acceleration, motion equations, trajectory. Description of the motion equations with Cartesian coordinates, polar coordinates, cylindrical coordinates, spherical coordinates, natural coordinates. Tangent and normal acceleration. Particular cases of motion of the point: rectilinear uniform motion. Rectilinear motion with constant acceleration, harmonic motion, slider-crank motion, rotational motion. Kinematics of a rigid body. Basic concepts and principles. Position of a body. Its rotational velocity and acceleration. Velocities and acceleration for a point of a body. Particular cases of motion: translational motion, rotational motion, planar motion. General motion of a body as a combination of translational and rotational motions. Temporal centre of rotation. Kinematics of gears, gear transmission ratio. Relative motion and Coriolis acceleration. Basic concepts, principia and laws of dynamics. Practical problems referring to dynamics of particles. Work, power, kinematical energy and potential energy of particles. Inertia parameters of rigid bodies(statical moment, moments of inertia, inertia products). Linear momentum and angular momentum of bodies. Practical problems referring to dynamics of planar motion of bodies. Dynamical reactions at supporting point of rotating body. Kinetic energy and potential energy of bodies
Prerequisites and co-requisites	Completed course of Mathematics Completed course of Physics Main attention set on basic knowledge about geometry, trigonometry, vector calculus (analysis), matrix calculus, abilities in integrations and derivation of basic mathematical formulas

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	qualifying test of the theory	56.0%	34.0%
	Midterm colloquium	56.0%	66.0%

Recommended reading	Basic literature	1. Wittbrodt E., Sawiak S.: Mechanika ogólna. Teoria i zadania. Wyd. PG, Gdańsk 2005 2. Sawiak S., Wittbrodt E.: Mechanika. Wybrane zagadnienia. Skrypt PG, Gdańsk 2003 3. Leyko J.: Mechanika ogólna, t. I i 2, PWN, Warszawa 1980 4. Niezgodziński M.E., Niezgodziński T.: Zbiór zadań z mechaniki ogólnej, PWN, Warszawa 1997 5. Dyląg Z.,Jakubowicz A., Orłoś Z.: Wytrzymałość materiałów, Warszawa WNT, t.I 1996, t.II 1997
	Supplementary literature	1. Osiński Z.: Mechanika ogólna, t. I i 2, PWN, Warszawa 1987 2. Leyko J., Szmelter J.: Zbiór zadań z mechaniki ogólnej, t. I i 2, PWN, Warszawa 1976 3. Mieszczerski I. W.: Zbiór Zadań z mechaniki, PWN, Warszawa 4. Niezgodziński T.: Mechanika ogólna. WNT, Warszawa 1999 5. Nizioł J.:Metodyka rozwiązywania zadań z mechaniki. WNT, Warszawa 2002
	eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	Determination of reaction forces for the system of known geometrical structure and known structure of load Determination of speed of some selected points at a given mechanism Balance between the kinetic and potential energy of the mechanical system
Work placement	Not applicable