GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mechanics, PG_00038082		
Field of study	Automation, Robotics and Control Systems		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Biomechatronics -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Łukasz Doliński	
	Teachers		

Lesson types

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

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	4.0	36.0	100

Subject objectives

To learn the basic principles of solid mechanics and their practical applications

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U02] can work individually and in a team, can communicate using various techniques in a professional environment, as well as document and analyze the results of their work, can estimate the time needed to perform the entrusted task can prepare and present a presentation on the problems and results of an engineering task	Can independently solve simple statics and strength of materials tasks.	[SU4] Assessment of ability to use methods and tools
[K6_W02] has basic knowledge of physics including electrostatics, electromagnetism, electrodynamics, wave motion, acoustics, mechanics, thermodynamics, optics, solid state physics; including knowledge necessary to understand the basic physical phenomena occurring in devices of systems and systems of automation and robotics	Can identify the equilibrium conditions of basic force systems and the types of stresses.	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture

Lecture: Basic concepts. The axioms of statics. Original concepts: force as a vector, zero two, the theorem on moving the vector along the acting line, resultant of two non-parallel forces in the plane, decomposition of force to the two components of given directions. The principle of action and reaction, types of bonds, equilibrium of convergent set of forces, different sets of forces. Analytical representation of force. Main vector. Conditions of equilibrium of convergent flat and spatial set of forces. Three forces theorem. A pair of forces. Moment of pair of forces. Concatenation of two parallel forces. Pair of forces theorem. Concatenation of pair of forces in one plane. Moment of force with respect to the point and axis. Moment of a force with respect to the point (pole) and axis. Parallel moving forces theorem. Equilibrium of free, planar and spatial set of forces. Reduction of planar and spatial set of forces typical cases. Condition of equilibrium of planar and spatial set of forces. Centre of gravity. Centre of parallel forces. Centre of gravity of solids, plane figures and lines. Friction, static friction, the force of static friction, kinetic friction, string friction, rolling friction. Basic assumptions and hypotheses of the strength of materials, types of loads, deformations and stresses. Elements of elasticity theory. Loads classification. The de Saint-Venant principle. Fundamentals of designing structures. Moments of inertia of planar figures. Tension and compression of straight bars. Technological Shear. Torsion of rods. Bending. Strength. Bending with tension or compression. Bending and torsion. Fatigue strength. Basic concepts of fatigue strength, fatigue strength the cycles of symmetrical and asymmetrical. Factors influencing the change of fatigue strength. Basic principles of Computer-Aided Design Analysis.

Course content – exercises

Tutorial: Basic concepts. Force as a vector. Distribution of force into two components with given directions of action. Principle of action and reaction. Types of constraints. Conditions of equilibrium for a convergent planar system of forces. Determining reactions for a planar convergent system of forces. Conditions of equilibrium for a convergent spatial system of forces. Determining reactions for a spatial convergent system of forces. Conditions for equilibrium of a flat arbitrary system of forces. Determining reactions for a flat arbitrary system of forces. Conditions for equilibrium of a spatial arbitrary system of forces. Determining reactions for a spatial arbitrary system of forces. Determining the geometric center of gravity of solids, flat figures, and lines. Types of loads and deformations. Determining stresses and deformations for cases of tension and compression of straight bars. Determining stresses for cases of technological shearing.Determining internal forces for twisted bars. Drawing graphs of bending moments, torsional stresses, and torsion angles for axially symmetric bars. Determination of internal forces for bent beams. Drawing graphs of bending moments and bending stresses for beams. Composite strength. Determination of internal forces for simple cases of composite strength.

Prerequisites and co-requisites

Knowledge of basic algebra and trigonometry

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Theory knowledge test	50.0%	50.0%
Colloquia during the semester	50.0%	50.0%

Recommended reading

Basic literature	1. Krawczuk M.: Mechanika ciała stałego wybrane zagadnienia. Wydawnictwo PG, Gdańsk, 2005. 2. Niezgodziński T.: Mechaniak ogólna. WNT, Warszawa, 2008. 3. Misiak J.: Mechanika techniczna. Statyka i wytrzymałość materiałów. WNT, Warszawa, 2006.
Supplementary literature	1. Bąk.R,.Stawinoga.A.: Mechanika dla niemechaników. WNT, Warszawa 2009. 2. Niezgodziński M.E., Niezgodziński T.: Wytrzymałość materiałów. WNT, Warszawa, 2010. 3. Osiński Z.: Mechanika ogólna. PWN, Warszawa, 1994.
eResources addresses	

Example issues/ example questions/ tasks being completed

- Solids
- Systems of forces
- Stresses/strains
- Constitutive equations
- Torsion Bending
- Fatigue strength

Practical activites within the subject

Not applicable

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