GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mechanics I, PG_00050273		
Field of study	Mechanical Engineering		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
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	English
Semester of study	2	ECTS credits	6.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Division of Mechatronics -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Krzysztof Kaliński	
	Teachers	mgr inż. Grzegorz Banaszek prof. dr hab. inż. Krzysztof Kaliński	

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

eNauczanie source addresses:

Moodle ID: 4308 Mechanics I, W, MiBM(ang), Ist, sem. 02, lato, 2025/265, (PG_00050273)
https://enauczanie.pg.edu.pl/2025/course/view.php?id=4308

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	8.0	82.0	150

Subject objectives

The course provides students with basic knowledge of Classical Mechanics. Terms, assumptions, principles and methods of Statics and Kinematics are treated. The main emphasis is on the development of skills to efficiently schematise, solve and analyse typical problems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W04	Knowledge of mechanics, including the process of modeling mechanical systems of statics and kinematics	[SW1] Assessment of factual knowledge
K6_U01	Ability to obtain information from professional literature, databases and other resources necessary to solve engineering tasks; ability to integrate the obtained information and make their interpretation, as well as draw conclusions and present opinions with justification	[SU4] Assessment of ability to use methods and tools
K6_U06	Ability to use mathematical and physical models to analyze the processes and phenomena occurring in mechanical devices in the field of mechanics and selected issues of strength of materials	[SU4] Assessment of ability to use methods and tools

Subject contents

Course content – lecture

General knowledge on mechanics. Importance of the subject. Mechanics of rigid body. Short history. Modelling in mechanics. Primary terms . **Force representation**. Some kinds of forces. Equivalent systems of forces. Resultant force of concurrent force system. Moment of a force about a point. Moment of a force about an axis. Resultant force of two parallel forces. Couple and its moment. Moment of a resultant force of concurrent and parallel system of forces. Reduction of arbitrary system of forces to principal force and principal moment. **Statics.** Basic concept and principles. Basic conditions of static equilibrium under action of arbitrary system of forces. Basic conditions of a state of equilibrium under action of particular cases of forces. Substitutive conditions of a state of equilibrium. Three-forces theorem. **Degrees of freedom, constraints and their reactions**. Third Newton's law. Principle of independent action of forces. External and internal forces. Systems statically determinable and indeterminable.
Friction problems. Sliding friction. Friction of the strands. Rolling resistance.
Mass geometry. Gravity, mass, volume. Static moments. Centre of gravity, mass and geometry.
Kinematics of a point. Basic terms. Motion with a use of a radius vector. Motion in Cartesian system. Motion in polar system. Motion in cylindrical system. Motion in natural co-ordinate system. Particular cases of a motion. .

Course content – exercises
Scalar and vector quantities, vector calculus. Resultant of a system of forces, moment of force about a point, moment of force about an axis. Reduction of a system of forces to a principal force and a principal moment. Constraints and their reactions, static determinacy of systems. Static equilibrium of a plane and a spatial force systems: arbitrary, concurrent, and parallel. Application of the three-force theorem. Calculating the center of gravity. Problems involving: sliding friction, strand friction and rolling resistance. Determining forces in truss members - the node balancing method and the Ritter method. Calculating the path, velocity and acceleration of a point in: Cartesian coordinate system, natural coordinate system, and polar coordinates. Special cases of motion: circular motion, ellipse motion, crank-and-slider mechanism, oblique, horizontal, and vertical projections.

Prerequisites and co-requisites

Basics of elementary and linear algebra, geometry, trigonometry, vector calculus, differential calculus, integral calculus.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Exam	50.0%	60.0%
Auditorium classes	50.0%	40.0%

Recommended reading

Basic literature

1. Beer F.P. et al.: Vector Mechanics for Engineers: Statics and Dynamics, McGraw Hill 2012.
2. Leyko J.: Mechanika ogólna. Tom I i II. Warszawa: PWN 1995.
3. Misiak J., Mechanika ogólna. Tom I: Statyka i kinematyka. Warszawa: WNT 1993.
4. Wittbrodt E., Sawiak S.: Mechanika ogólna. Teoria i zadania. Gdańsk: Wyd. Politechniki Gdańskiej 2012.

Supplementary literature

1. Gregory R.D.: Classical Mechanics, Cambridge University Press, 2006.
2. Raven F. H.: Engineering mechanics. McGraw-Hill 1973.
3. Pratap R., Ruina A.: Introduction to Statics and Dynamic. Spring 2001.
4. Nouri J. M.: School of Engineering and Mathematical Science. Part I Mechanics of Solids City University London UK.
5. Essen H.: 21st Century Mechanics. Royal Institute of Technology Stockholm, Sweden.

eResources addresses

Example issues/ example questions/ tasks being completed

1. Reduction of an arbitrary system of forces to the wrench.
2. Conditions of static equilibrium of an arbitrary plane system of forces.
3. Friction of strands and ropes.
4. Classification of constraints. Selected examples.
5. Motion of a point in natural coordinates.

Practical activites within the subject

Not applicable

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