GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Mechanics, PG_00060638 | | |
| Field of study | Transport and Logistics | | |
| Date of commencement of studies | October 2024 | Academic year of realisation of subject | 2024/2025 |
| Education level | first-cycle studies | Subject group | Obligatory subject group in the field of study<br>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 | 5.0 |
| Learning profile | general academic profile | Assessment form | exam |
| Conducting unit | Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Tomasz Mikulski | |
| | Teachers | | |

**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

**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**

Knowledge and understanding of the problems of statics, kinematics and dynamics of the material point, the system of particles and rigid bodies.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_W02] has well structured knowledge of physics, including technical mechanics, fluid mechanics, solid state physics, optics and acoustics necessary to understand the basic physical phenomena occurring in transport | The student has knowledge of statics, kinematics and dynamics of a material point and a rigid body, analysis of internal forces and reactions in a structure. | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |
| [K6_U02] can work individually and in a team, communicate using various techniques in a professional environment, as well as document, analyze and present the results of his work; can estimate the time needed to complete a given task | The student identifies, classifies and defines computational tasks illustrating the lecture material in the field of statics, kinematics and dynamics of material points and rigid, non-deformable bodies. | [SU2] Assessment of ability to analyse information<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU5] Assessment of ability to present the results of task |

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| Subject contents | STATICS: Force projection on to an axis. Moment of a force about a point and an axis. Parallel shifting of a force, reduction of a set of forces. Equilibrium conditions and equations for a plane and space rigid body systems. Reactions of a simply supported beam loaded with generalized forces. Centers of gravity of solid, flat and linear systems. Determination of internal forces in flat truss systems. Resistance forces: sliding friction and rubbing of the rope with a roller.<br><br>KINEMATICS: Kinematics of a material point, track of motion, velocity, acceleration, motion along a straight line, circular track, normal and tangential components of acceleration. Compound motion, absolute and relative motion analyses. Description of the motion of a rigid body. Planar kinetics of a rigid body, temporary center of the rotation, planar mechanisms.<br><br>DYNAMICS: Dynamics of a particle, direct and inverse problems, differential equations of motion, integration of a planar motion analytical solutions, dAlambert principle, momentum and angular momentum conservation laws, energy conservation law, constrained motion. Dynamics of a set of particles, equations of motion of the mass center. Dynamics of continuous systems, planar motion of a rigid body, rotation about a fixed axis, moments of inertia, parallel-axis theorem. |
| Prerequisites and co-requisites | |
| Assessment methods and criteria | |

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| exam | 50.0% | 40.0% |
| exercise | 50.0% | 60.0% |

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| Recommended reading | |
| Basic literature | Hibbeler R.C.: Engineering Mechanics Statics, Dynamics. Prentice Hall 2010. |
| Supplementary literature | Hibbeler R.C.: Statics and mechanics of materials. Prentice Hall 2004. |
| eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | 1. Reduce the flat system of forces acting on the rectangular shield.<br><br>2. Determine reactions in a simply supported beam loaded with generalized forces.<br><br>3. Detremine inner forces in flat truss structure.<br><br>4. Determine the magnitudes of $P_{max}$ and $P_{min}$ for the limit equilibrium state of a block on the sloping row including the combination of cases with the sliding friction.<br><br>5. Defined is the equation of movement of a material point. Determine the path, speed and acceleration at a given moment t.<br><br>6. The wheel of radius r is moving with a constant velocity of the center. What is the velocity and acceleration of a circumference point.<br><br>7. Determine the path equation and the flight range of the fired bullet at a given angle and at a predetermined initial velocity. Ignere the air resistance.<br><br>8. Determine the mass moments of inertia of the flat system with respect to the given axes. |
| Work placement | Not applicable |