



Subject card

| | | | | | | | |
|---|--|--|-------------------------------------|------------|--|---------|-----|
| Subject name and code | Strength of materials, PG_00055882 | | | | | | |
| Field of study | Power Engineering | | | | | | |
| Date of commencement of studies | October 2026 | Academic year of realisation of subject | | | 2027/2028 | | |
| 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 | | | 5.0 | | |
| Learning profile | general academic profile | Assessment form | | | exam | | |
| Conducting unit | Department of Mechanics, Strength and Control of Complex Technical Objects - None (Existed Previously) -> 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 | dr hab. inż. Bogdan Rozmarynowski | | | | | |
| | Teachers | | | | | | |
| Lesson types | 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 | The aim of the course is to familiarize students with the basic issues related to the strength of materials: the basis of material strength, the compressive / tensile strength of a straight bar, analysis for statically indeterminate bar systems, torsional strength of bars, beam strength - bending and deformation, bar shear, stress states and deformations, methods of determining stresses and deformations for statically indeterminate bar systems, determination of elastic energy, stresses and deformations by energy methods. | | | | | | |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---------------------------------|--|---|---|
| | [K6_W04] has structured knowledge of mechanics, including the issues of material strength and general principles of shaping structures, necessary to conduct basic strength analyzes and design simple mechanical or construction systems for power industry or environmental engineering; knows the basics of machine construction and the most commonly used construction and operating materials | The student has the ability to solve basic problems related to the strength of materials, including the performance of simple engineering tasks, taking into account the existing regulations and standards concerning the structures including the energy structures. | [SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge |
| | [K6_K01] is aware of the need for training and self-improvement in the profession of energy and the possibility of further education; can think and act in a creative and entrepreneurial manner; can define priorities for the implementation of an individual or group task | The student has the ability to self educate and to analyze basic issues related to the strength of materials in the field of theory and solving simple tasks and practical problems. This applies to the topics mentioned in the purpose of the subject. Many of these topics relate to mechanical and medical engineering. | [SK5] Assessment of ability to solve problems that arise in practice [SK4] Assessment of communication skills, including language correctness [SK3] Assessment of ability to organize work [SK2] Assessment of progress of work [SK1] Assessment of group work skills |
| | [K6_U11] Can design and properly dimension basic foundations in hydrotechnical construction facilities; can evaluate and list the loads acting on constructions, knows the codes of modern geotechnical investigations and technologies, knows the principles of foundations and safe design of foundations of typical buildings | The student has the ability to analyze basic issues related to the applied mechanics and strength of materials in the field of theory and solving simple tasks and practical problems. This includes the topics mentioned in the subject purpose and later. The student has the ability to assess the usefulness of the presented content both from the point of view of designing technical objects and their operation in the broadly understood technology, energy and environmental protection. | [SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment |
| | [K6_W16] has an elementary knowledge about energy and environmental construction including building materials, their strength, construction mechanics and building physics, moisture migration in buildings, heat transfer through building partitions, has a basic knowledge of marine and inland hydrotechnical structures; has knowledge of the hydraulic and hydrological conditions of designing facilities and building structures, photogrammetry, remote sensing, hydrography, and spatial analysis. | The student has the ability to analyze the basics of energy construction and strength of materials, the compressive / tensile strength of a straight bar, strength analysis for statically indeterminate bar systems, torsional strength of bars, beam strength - bending, deformation of a bent beam, bar shear (shear bar), stress states, stress state and deformations, methods of determining stresses (shear forces, bending moments) and deformations for statically indeterminate bar systems, determination of elastic energy, stresses and deformations of bars and bar systems - energy methods, determination of elastic energy, stresses and deformations of beams and frames using the Maxwell method -Mohra, bar buckling, basics of the finite element method FEM. The student has the ability to model issues related to the strength of materials in the field of rigid bodies, biomechanics, mechanical systems, vibrations and basic mechanical structures. | [SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge |
| Subject contents | Course content – lecture The lectures concern, in turn: the basis of material strength, the compressive / tensile strength of a straight bar, strength analysis for statically indeterminate bar systems, torsional strength of bars, beam strength - bending, deformation of a bent beam, bar shear (shear bar), stress states, state of stress and deformations, methods of determining stresses (shear forces, bending moments) and deformations for statically indeterminate bar systems, determination of elastic energy, stresses and deformations of bars and bar systems - energy methods, determination of elastic energy, stresses and deformations of beams and frames using the Maxwell method -Mohra, bar buckling, basics of the finite element method FEM. | | |
| Prerequisites and co-requisites | The student should have basic information in the field of applied physics and mathematics, mathematical analysis, numerical methods, solid state mechanics, including kinetics and dynamics, technical drawing and the basics of programming. | | |

| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
|--|--|--|-------------------------------|
| | | final exam | 56.0% |
| Recommended reading | Basic literature | Bibliography: <ol style="list-style-type: none"> 1. Bąk R., Burczyński T.: Wytrzymałość materiałów z elementami ujęcia komputerowego. WNT, Warszawa 2001. 2. Dyląg Z., Jakubowicz A., Orłóś Z.: Wytrzymałość materiałów. WNT, Warszawa, t. I 1996, t. II 1997. 3. Misiak J.: Mechanika techniczna. Statyka i wytrzymałość materiałów. WNT, Warszawa 1996. 4. Kaliński K. J.: Nadzorowanie procesów dynamicznych w układach mechanicznych. Gdańsk: Wydaw. PG 2012. 5. Gallagher R. H.: Finite element analysis fundamentals. New Jersey: Prentice Hall 1975. 6. Niezgodziński M.E., Niezgodziński T.: Wzory, wykresy i tablice wytrzymałościowe. Warszawa: WNT 1996. 7. Walczyk Z.: Wytrzymałość materiałów. Wyd. PG, Gdańsk t. I 2000, t. II 2001. 8. Żmuda J.: Projektowanie konstrukcji stalowych. Wydawnictwo Naukowe PWN, 2016. | |
| | Supplementary literature | <ol style="list-style-type: none"> 1. Ship Construction by D. J. Eyres, Butterworth-Heinemann, 2001. 2. Elements of Modern Ship Construction by David J. House, 2010. 3. Ship Construction 7th Edition, by George J Bruce, Butterworth-Heinemann, May 2012. 4. Ship Construction and Welding by Mandal, Nisith Ranjan, Springer Series on Naval Architecture, Marine Engineering, Shipbuilding and Shipping. | |
| | eResources addresses | | |
| Example issues/ example questions/ tasks being completed | <ol style="list-style-type: none"> 1. Assembly stresses - arise as a result of correcting dimensional differences of the connected elements of the structure. Example. To install a bar of length l between two vertical walls, increase its length by D. A tensile force N appears in the cross-section of the bar, which causes assembly stresses. 2. Example. A beam with a length of $2l$ and stiffness EI, pinned at its ends, is loaded with a uniformly distributed load q acting on length l. Formulate the equation of deflection angles and deflection axis and determine the deflection angle and deflection at point B. | | |
| Practical activities within the subject | Not applicable | | |

Document generated electronically. Does not require a seal or signature.