



Subject card

| | | | | | | | |
|---|---|--|---|-------------------------------------|--|------------|-----|
| Subject name and code | Strength of Materials I, PG_00039799 | | | | | | |
| Field of study | Materials Engineering, Materials Engineering, Materials Engineering | | | | | | |
| Date of commencement of studies | October 2021 | | Academic year of realisation of subject | | 2022/2023 | | |
| 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 | | 4.0 | | |
| Learning profile | general academic profile | | Assessment form | | exam | | |
| Conducting unit | Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr hab. inż. Mirosław Gerigk | | | | |
| | Teachers | | dr inż. Alicja Stanisławska dr hab. inż. Mirosław Gerigk | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 30.0 | 15.0 | 0.0 | 0.0 | 0.0 | 45 |
| | 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 | 45 | | 5.0 | | 50.0 | 100 |
| Subject objectives | The aim of the course is to familiarize students with the basic issues related to the strength of materials, from the basis of material strength, simple strength cases, complex strength to energy methods in strength and the basics of the FEM method. | | | | | | |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---------------------------------|--|--|---|
| | K6_K01 | The student has the ability to solve basic problems related to the strength of materials, including the performance of simple engineering tasks. A student knows his own limits as well as the assumptions, criteria i limits associated with the project/tasks. | [SK3] Assessment of ability to organize work [SK1] Assessment of group work skills [SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice [SK4] Assessment of communication skills, including language correctness |
| | K6_W05 | The student has the ability to analyze the basics 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, 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, using the numerical methods and computer simulation. | [SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation |
| | K6_U01 | The student has the ability 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 materials engineering. | [SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task |
| Subject contents | 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 |
| | To pass the half-term tests and final exam. | 56.0% | 100.0% |

| | | |
|--|---|--|
| Recommended reading | Basic literature | <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., Orłowski 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. 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 | <p>Adresy na platformie eNauczanie:</p> <p>Wytrzymałość materiałów I, PG_00039799, 2022-2023 - Moodle ID: 28793</p> <p>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=28793</p> |
| 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 Δ. 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. | |
| Work placement | Not applicable | |