

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Strength of Materials II</b>		Code <b>1010604241010214572</b>
Field of study <b>Mechanical Engineering</b>	Profile of study (general academic, practical) <b>general academic</b>	Year /Semester <b>2 / 4</b>
Elective path/specialty <b>-</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>part-time</b>	
No. of hours Lecture: <b>18</b> Classes: <b>9</b> Laboratory: <b>9</b> Project/seminars: <b>-</b>		No. of credits <b>5</b>
Status of the course in the study program (Basic, major, other) <b>other</b>		(university-wide, from another field) <b>university-wide</b>
Education areas and fields of science and art <b>technical sciences</b> <b>Technical sciences</b>		ECTS distribution (number and %) <b>100 5%</b> <b>100 5%</b>
<b>Responsible for subject / lecturer:</b>  Piotr Kędzia email: piotr.kedzia@put.poznan.pl tel. +48 61 665 20 44 Faculty of Mechanical Engineering and Management <a href="https://www.dmfef.put.poznan.pl/">https://www.dmfef.put.poznan.pl/</a>		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
<b>1</b>	<b>Knowledge</b>	Basic in the field of mathematics, strength of materials, engineering graphics and other areas of education in the field of study. Ordered theoretical knowledge in the field of study.
<b>2</b>	<b>Skills</b>	Solving basic tasks from geometry and mathematical analysis. Solving basic issues of solid state mechanics. The ability to search for the necessary information in literature, databases and catalogs. Using information and communication techniques appropriate to the implementation of engineering tasks. Ability to learn independently.
<b>3</b>	<b>Social competencies</b>	Understanding the need for lifelong learning and acquiring new knowledge. Understanding the general social effects of engineering activities. Understanding the need for team collaboration. The student is aware of mutual dependencies between mathematical knowledge, physical knowledge and technical sciences.
<b>Assumptions and objectives of the course:</b> Understanding the methods of testing the strength of materials and checking the strength of a structure. Mastering basic principles in the field of mechanics and strength analysis. Understanding the theoretical and practical problems related to strength analysis based on the mechanical properties of materials as the basis for the proper design of the structure. Passing in a simple form selected endurance issues, i.e. modeling statically indeterminate systems or solving complexity problems. Indication of limitations necessary in constructing due to safety and reliability, regulations, standards. Indication of the areas of acceptable solutions and effective solutions to the problem. Awareness of the complexity of construction: the need to build and test prototypes, formulate the conditions for safe operation, the need for a systematic approach to problems.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
1. has knowledge in the field of physics, covering the basics of classical mechanics, solid state physics, necessary to understand specialized lectures in the theory of construction materials - [K1A_W02]		
2. has basic knowledge in technical mechanics: statics and strength of materials, including the basis of the theory of elasticity and plasticity, performance hypotheses, methods for calculating beams, shafts, joints and other simple structural elements, as well as methods for testing the strength of materials and the state of deformation and stresses in structures - [K1A_W04]		
3. has basic knowledge of metal, non-metallic and composite materials used in machine construction, in particular their structure, properties - [K1A_W06]		

<b>Skills:</b>
1. can obtain information from literature, the Internet, databases and other sources. Can integrate the information obtained and interpret conclusions and create and justify opinions - [K1A_U04]
2. can use formulas and tables, technical and economic calculations using a spreadsheet and running a simple relational database - [K1A_U05]
<b>Social competencies:</b>
1. understands the need to learn throughout life; can inspire and organize the learning process of other people - [K1A_K01]
2. is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment, and the related responsibility for decisions - [K1A_K02]
3. can interact and work in a group, taking on different roles in it - [K1A_K03]

<b>Assessment methods of study outcomes</b>
Exam - 5 theoretical issues, 2 computational problems: <50% - ndst, >51-60% - dst, >61-70% - dst plus, >71-80% - db, >81-90% - db plus, >91% - bdb
Passing of the calculation exercises (test in the last classes): - <50% - ndst, >51-60% - dst, >61-70% - dst plus, >71-80% - db, >81-90% - db plus, >91% - bdb
Passing the laboratory - execution of the exercises and submission of reports, oral response.

<b>Course description</b>
Lecture: Twisting of shafts and rods with a rectangular section, thin-walled open and closed. Bending of fixed and variable stiffness beams. Diagrams of bending moments and lateral forces in bending beams. Normal and shear stresses in bending beams. Beam deformation (deflection and angle of rotation): two-integral analytical method, Clebsch method. Solving statically indeterminate beams: analytical methods, Clebsch method. Composite strength: compression (tensile) with bending. Laboratory: Static tensile test, Hardness measurements by the following methods: Brinell, Vickers and Poldi, Rockwell hardness measurement and Vickers hardness measurement by Vickers method, Fatigue of materials (Locati test), Static tensometer measurements: Stress measurement in a thin-walled vessel, Spring characteristics, Impact bending test.

<b>Basic bibliography:</b>
1. Zielnica J., Wytrzymałość Materiałów, WPP, wyd. III, Poznań 2000.
2. Ostwald M., Podstawy wytrzymałości materiałów, Wydawnictwo PP, Poznań, 2007.
3. Magnucki K., Szyc W., Wytrzymałość materiałów w zadaniach: pręty, płyty i powłoki obrotowe, Wydawnictwo Naukowe PWN, 2000.
4. Leyko J., Mechanika ogólna t.1, PWN, Warszawa, 1997
5. Jakubowicz A., Orłóś Z., Wytrzymałość materiałów, WNT, Warszawa, 1984

<b>Additional bibliography:</b>
1. Banasik M., Grossman K., Trombski M., Zbiór zadań z wytrzymałości materiałów. PWN 1992
2. Osiński Z., Mechanika ogólna, PWN, Warszawa, 1994
3. Ostwald M., Wytrzymałość materiałów. Zbiór zadań. Wydawnictwo PP, Poznań, 2008
4. Dyląg Z., Jakubowicz A., Orłóś Z., Wytrzymałość materiałów t.1 i 2, WNT, Warszawa, 2000
5. Niezgodziński M. E., Niezgodziński T., Wzory, wykresy i tablice wytrzymałościowe, Wydawnictwo Naukowo-Techniczne Warszawa 2004.
6. Willems N., Easley T. J., Rolfe S. T., Strength of Materials, Mc GrawHill Book Company, 1981
7. Gere M., Timoshenko S., Mechanics of Materials, PWS-Kent Publishing Company, Boston, 1984.

<b>Result of average student's workload</b>	
<b>Activity</b>	<b>Time (working hours)</b>
1. Lectures	18
2. Classes	9
3. Laboratory	9
4. Consultations	2
5. Preparation for classes	10
6. Preparation for tests	10
7. Preparation for laboratory	10
8. Preparation for exam	20

<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	88	5
Contact hours	38	2
Practical activities	50	3