# GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

| Subject name and code | Strength of Materials II, PG_00050281 | | | | | |
|---|---|---|---|---|---|---|
| Field of study | Mechanical Engineering | | | | | |
| Date of commencement of studies | October 2022 | | Academic year of realisation of subject | | 2023/2024 | |
| 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 | | English | |
| Semester of study | 4 | | ECTS credits | | 5.0 | |
| 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. Wiktoria Wojnicz | | | | |
| | Teachers | dr hab. inż. Wiktoria Wojnicz | | | | |
| | | mgr inż. Grzegorz Banaszek | | | | |

| Lesson types and methods of instruction | 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 | 8.0 | 57.0 | 125 |

| Subject objectives | The aim of the subject is to acquire knowledge to conduct engineering calculation of systems under the complex load |
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| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---|---|---|---|
| | K6_W05 | A student can formulate an engineering problem for the given mechanical construction and solve this problem by applying energetic methods and failure criteria | [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge |
| | K6_U06 | A student can formulate a mathematical model that considers mechanical loading and thermal influence, apply engineering tools to solve this engineering problem | [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information |
| | K6_U01 | A student can formulate the engineering problem for the given system subjected to the load, solve this problem and explain obtained results | [SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment |

| Subject contents | **Lectures (30h, Wiktoria Wojnicz)**

Energy theorems: Clapeyrons theorem, Bettis theorem, Maxwells theorem (Maxwell-Mohrs method), Castigliano theorem, Menabreas theorem (Menabrea-Castiglianos method).

Complex loading problems.

Frames: Force method.

Unsymmetric beam bending.

Axial and flexural stresses.

Curved beams. Curved bars

Pressure vessels. Thin walled structure. Thick walled structure

Bending of circular plates loaded symmetrically with respect to the centre

**Tutorials (15h, Grzegorz Banaszek)**

Beams and frames: Maxwells theorem (Maxwell-Mohrs method) and Castigliano theorem.

Frames: Menabrea-Castiglianos method.

Frames: Force method.

Unsymmetric beam bending.

Axial and flexural stresses.

Curved beams. Curved bars

Pressure vessels. Thin walled structure. Thick walled structure

Test 1

Test 2

Repeat Test

**Laboratory (15h, Grzegorz Banaszek)**

Tensile static test. Compressive static test.

Impact test. |
|---|---|

| | Torsion test. |
| --- | --- |
| | Fatigue test. |
| | Test |
| | Repeat Test |
| Prerequisites and co-requisites | Knowledge of the Mechanics (Theoretical Mechanics) and Strength of Materials I |

| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| --- | --- | --- | --- |
| | laboratory's test passing | 56.0% | 20.0% |
| | tutorials' tests passing | 56.0% | 30.0% |
| | lectures' test passing | 56.0% | 50.0% |

| Recommended reading | Basic literature | 1. Hibbeler R.C. Mechanics of materials,8th edition, Pearson Prentice Hall, USA, 2011<br>2. Muvdi B.B., McNabb J.W.: Engineering Mechanics of Materials. Third edition. Springer-Verlag 1991.<br>3. Da Silva, Vitor Dias: Mechanics and Strength of Materials. Springer 2006.<br>4. Timoshenko S.: Strength of Materials. Part I. Elementary Theory and Problems. USA 1940.<br>5. Timoshenko S.: Strength of Materials. Part II. Advanced Theory and Problems. USA 1940. |
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| | Supplementary literature | Literature from the "Strength of Materials" |
| | eResources addresses | Adresy na platformie eNauczanie:<br><br>Strength of materials II, T, DaPE, sem. 01, summer 23/24, full time, (PG_00050281) - Moodle ID: 38448<br>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38448 |

| Example issues/ example questions/ tasks being completed | 1.Analysis a behaviour of the given mechanical system composed of simple beam and curved beam connected by one hinge joint.<br><br>2. Determine equal stresses in the beam subjected to the influence of torque, bending moments, shear forces and normal forces. |
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| Work placement | Not applicable |