**Nazwa przedmiotu:**

Strength of Materials I

**Koordynator przedmiotu:**

Prof. Krzysztof Gołoś PhD, DSc

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Electric and Hybrid Vehicles Engineering

**Grupa przedmiotów:**

Wytrzymałość materiałów

**Kod przedmiotu:**

1150-00000-ISA-0202

**Semestr nominalny:**

3 / rok ak. 2022/2023

**Liczba punktów ECTS:**

5

**Liczba godzin pracy studenta związanych z osiągnięciem efektów uczenia się:**

1) Number of contact hours - 65., including:
a) lecture - 30 hours;
b) exercises - 30 hours;
c) consultations: (lecture - 1 hour + classes -1 hours) - 2 hours;
d) exam - 3 hours;
2) Own work of the student - 75 hours, including:
a) 30 hours - current preparation for exercises and lectures (analysis of literature);
b) 30 hours - preparing for 4 colloids,
c) 15 hours - preparing for the exam.
3) TOTAL - 140 hours

**Liczba punktów ECTS na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich:**

2.6 ECTS - number of contact hours - 65., including:
a) lecture - 30 hours;
b) exercises - 30. hours;
c) consultations -: (lecture - 1 hour + exercises -1 hour) - 2 hours;
d) exam - 3 hours

**Język prowadzenia zajęć:**

angielski

**Liczba punktów ECTS, którą student uzyskuje w ramach zajęć o charakterze praktycznym:**

Brak

**Formy zajęć i ich wymiar w semestrze:**

|  |  |
| --- | --- |
| Wykład: | 30h |
| Ćwiczenia: | 30h |
| Laboratorium: | 0h |
| Projekt: | 0h |
| Lekcje komputerowe: | 0h |

**Wymagania wstępne:**

Basic knowledge in mathematics, construction materials and mechanics (listening to the lecture Mathematics, Materials, Mechanics I)

**Limit liczby studentów:**

According to the order of the Rector of the Uninersity

**Cel przedmiotu:**

Understanding the fundamentals of material mechanics, including the state of stresses and deformations in mechanical construction elements, necessary for conducting strength analyzes.

**Treści kształcenia:**

Lecture. Preliminary information. / Basic assumptions. Internal forces in constructions. Classification of simple strength problems. Basic concepts - stress, strains. Basic relationships - Hooke's Law. Prin de Saint Venant principle. Mechanical properties of materials. Static tensile test. Safety factor. Available stress. Axially loaded rods (tension/compression). / Internal forces. Stress. Displacement. Statically indetermined axially loaded systems of rods. Thermal stresses. Assembly stresses./ Moments of inertia./ Steiner's Theorem. Mohr’s circle for moment of inertia. / Problem of twisting (torsion) of circular cross section shafts. /Internal forces. Stress state. Tangential stresses. Equilibrium equation. Displacement in twisted shafts. Torsion of statically and statically indetermined systems. Strength calculations of twisted shafts./ Bending of beams / Internal forces in straight and curved beams. Equilibrium equations. Normal and shear stresses./ Non parallel bending. /Stress analysis. Neutral axis./ Displacement in bending. /Differential equation of deflected line (The Euler–Bernoulli equation). Boundary conditions. Clebsch's method. Superposition method. Statically indetermined bending problems. / Plane stress state and plane strain state. / Transformation of stress state components. Principle directions for plane state stress. Principal stresses. Mohr’s circle for stress state. Transformation of plane strain state components. Principle directions for plane state of strains. Principle strains. Mohr’s circle for plane strain state. Generalized Hooke's Law for plane stress state./ Yield hypothesis. Equivalent stress. /Galilean hypothesis. Mariott's hypothesis. Coulomb-Tresca-Guest hypothesis. Huber-Mises-Hencky hypothesis. Principles of strength calculations for constructional elements under complex plane loading./
Exercises. Tension/compression/ One-dimensional problems of loaded rods - calculation of deformations and stresses in straight rods. Simple statically determined and indetermined systems. Thermal stresses. Assembly stresses. Moments of inertia of cross-sections. One-dimensional problems of circular cross section bars: calculation of deformation and stresses in twisted shafts (torsion). Simple cases of not statistically determined systems. Bending of beams. Calculation of internal forces in beam systems - straight and curved rods. Flat frames. Normal and shear stresses. Deflection line. Determination of displacements by the Clebsch's method. Analysis of the general plane stress state. Mohr's circele for plane stress /strain/ state. Yield hypothesis for plane stress. Examples of strength calculations for elements under complex loading.

**Metody oceny:**

Exercise: To complete /pass/ the exercises, you need to get a positive scores from all 4 colloquia. Passing the exercises is a prerequisite for taking the final exam.
Lecture: The Strength of materials I course is summarised by a written exam. Exam consists of two parts (both sat at the same day –approximately 2,5 hours): part A- problems solving /~1,5 h/ part B- test /~0,5 h/.
Mark 4 or higher, grants automatical pass of part A of the Exam – this students will write only part B.
Final grade from the course of Strength of Materials I is based on a positive assessment from the exercises and the exam.

**Egzamin:**

tak

**Literatura:**

1. John Gere, J. Mechanics of materials, Brooks/Cole Thomson Learning, Inc.. USA, London 2004. ISBN 0-534-41793-0
2. Dietmar Gross, Werner Hauger, Jörg Schröder, Wolfgang A. Wall, Javier Bonet, Engineering Mechanics 2, /Mechanics of Materials/, Springer Heidelberg Dordrecht London New York, ISBN 978-3-642-12885-1.

**Witryna www przedmiotu:**

Brak

**Uwagi:**

Brak

## Efekty przedmiotowe