SYLLABUS

Name: ***Structural Mechanics (BudAB>SI3STMECH19)***
Name in Polish:
Name in English: ***Structural Mechanics***

Information on course:

Course offered by department: Faculty of Civil Engineering
Course for department: Silesian University of Technology

Default type of course examination report:

ZAL

Language:

English

Course homepage:

https://platforma2.polsl.pl/rb/course/view.php?id=522

Short description:

Structural Mechanics for statically determinate structures.
Takiking into account different knowledge, experience nad background of students taking the course of structural Mechanics at 3rd semester it is necessary to do either:
- revise basis such as kinematical analysis and reactions evaluation, mas geometry
- revise and practice internal forces diagrams evaluation and drawing
- introducing new material,
- appropriate at this stage of engineering education.

Main part of this semester Structural Mechnics education covers area of displacement evaluation using Maxwell-Mohr formula as well as envelopes of internal forces for statically determined structures.
Some numerical methods as facilitation for engineering calculation are also introduced.

Description:

LECTURES: 25 hours
Kinematical stability and Statical Determinancy of Build Structures.
Static equilibrium equations for evaluation of reactions and internal forces diagrams.
Introduction to Betti's Reciprocity Theorem and its utilization in Maxwell-Mohre Formula for evaluation of structural displacements.
Influence lines for prediction of impact of a load location on reactions and internal forces diagrams. Envelopes as tool for assessing impact of live and moving loads on internal forces in built structures.
Application of numerical tools to facilitate engineering calculations.

EXERCISES: 2 hours
Examples of kinematical analysis.
Examples of reactions evaluation and drawing internal forces diagrams.
Examples of displacements evaluation using Maxwell-Mohr formula and Wereszczagnin's method graphical engineering to evaluation of integrals.

PROJECTS: 28 hours
Two project tasks are being carried out in the areas of:
- displacement evaluation using Maxwell-Mohre Formula
- influence Lines and Envelopes for Reactions and Internal forces.

Students are preparing reports from the projects consulted during those hours.

LABORATORIES: 5 hours
Tools for facilitation of numerical engineering calculations are introduced.

Bibliography:

[1] Ghali Amin, Neville Adam: Structural Analysis: A Unified Classical and Matrix Approach. CRC Press Taylor & Francis Group, Boca Raton 2017. ISBN 9781351971553, 1351971557, 9781498725064, 1498725066; any edition appropriate. https://doi.org/10.1201/b22004
[2] Karnovsky Igor A., Lebed Olga: Advanced Methods of Structural Analysis. Springer C.H, 2021. ISBN: 3030443930; 9783030443931; 9783030443948; 3030443949; any edition appropriate. https://link.springer.com/book/10.1007/978-3-030-44394-8
[3] Norris Charles Head, Wilbur John Benson, Utku Senol: Elementary Structural Analysis. McGraw Hill Inc., 1976. https://archive.org/search.php?query=external-identifier%3A%22urn%3Aoclc%3Arecord%3A1148935624%22

Any handbook of Structural Analysis and particularly Structural Statics for statically determined structures, for 2D frames, beams and trusses will be appropriate, especially if it covers problems discussed on this course. Each time compare table of contents with course syllabus to asses suitability of any book considered.

Learning outcomes:

KNOWLEDGE: theoretical models of materials and principles of modelling and analysis of bar structures in the field of statics and stability, and knows selected software supporting engineering calculations - [learning outcome K1A_W04]

SKILLS:
(1) define computational models of computer analysis of structures, simulate
various construction variants, perform static analysis as well as critically evaluate the results of these analyzes - [learning outcome K1A_U03]
(2) present, assess and discuss various opinions and positions concerning
structural, material and technological solutions, taking into account the costeffectiveness and durability of the analysed solution - [learning outcome K1A_U12]

Student knows:
principles of structural analysis of statically determinate rod structures

Student have skills in:
• selected computer programs of structural analysis
• solving statically determinate structures (internal forces and displacements)
• finding influence lines and envelopes of simple statically determinate structures

Assessment methods and assessment criteria:

Subject of evaluation and impact on final grade have:
1. Reliability: attendance on non-lecture classes is obligatory.
Two absences during course are allowed.
More unexcused absences results in failing the course.
2. Punctuality - sticking to the set deadlines for control work.
Violation of final deadlines set results in failing the course.
3. Final grade is average of control works:
- from Tests (50% weignt)
- from Project tasks (50% weignt)
4. Problems with attendance on class works, with timelines and lack of consultations can raise doubt about student's self-performance of the control works and be subject of additional knowledge/skills and competence check.

Prerequisite: completion of the course Strength of Materials and Structural Mechanics.

In order to transfer partial grades, the student should contact the instructor within the first two weeks of the semester.

The syllabus is valid from the summer semester of the 2025/2026 academic year, and its content is not subject to change during the semester.

Element of course groups in various terms:

Course group description	First term	Last term
missing group description in English (BudAB-S1-2019-sem3)	2020/2021-Z	

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	5	2020/2021-Z	