SYLLABUS

Name: ***Computer Methods in Theory of Structure (BudAB>SM2COMETS19)***
Name in Polish:
Name in English: ***Computer Methods in Theory of Structure***

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://platforma.polsl.pl/rb/course/view.php?id=158

Short description:

The aim of the course is a recognition of computer methods in mechanics of structures nad achievement of practical skills in numerical simulations of structures.

Description:

LECTURES: 30 hours
- Numerical modelling: analytical methods and numerical solutions, advantages of numerical methods, the mathematics description of numerical model, the formulation of boundary conditions and solutions possibilities, methods of obtained results verification.
- Selected computer methods: finite element method (FEM), finite difference method (FDM).
- FEM: discretization, FEM algorithm, shape functions, stiffness matrix, formulation of equations, accuracy of this method.
- Selected problems and techniques of complex model in FEM construction.
- Examples.

PROJECT: 5 hours
- Practical learning of plane and shell structures modelling by means of FEM, carry out the calculations and interpret of solution, validity check.
- Results presentation and formulate conclusions of the given engineering problem (work in teams).

LABORATORY: 5 hours
- Practical knowledge of finite element method. Learning of use of the computer software based on the FEM.

Bibliography:

[1] Taylor R.L., Zienkiewicz O.C.: The Finite Element Method (vol. I and II), Butterworth-Heinemann, Oxford 2000.
[2] Liu G.R., Quek S. S.: The Finite Element Method: A Practical Course, Butterworth-Heinemann, Oxford 2003.
[3] Logan D.: A first course in the Finite Element Method, PWS, Boston 1986.
[4] Fung Y.C., Pin Tong.: Classical and computational solid mechanics, Advanced Series in Engineering Science - Vol. 1, World Scientific Publishing 2001.
[5] Jirasek M., Bazant Z.: Inelastic analysis of structures, Willey 2001.

Learning outcomes:

KNOWLEDGE:
(1) Student knows and understands the principles of performing design analyses concerning the statics, stability and dynamics of complex bar, surface and solid structures - [learning outcome K2A_W04],
(2) Student knows and understands advanced material strength issues, material and structural modelling, theoretical basis for Finite Element Methods and general rules for non-linear calculations of engineering structures - [learning outcome K2A_W05].

SKILLS:
(3) Student can perform classical static, dynamic and stability analysis of bar systems and surface structures - [learning outcome K2A_U04],
(4) Student can correctly define the structural model and perform advanced linear analysis of an engineering structures and apply non-linear calculation techniques; student can formulate and solve selected nonlinear problems with numerical methods - [learning outcome K2A_U05],
(5) Student can critically evaluate the results of numerical analysis of engineering structures - [learning outcome K2A_U06].

Assessment methods and assessment criteria:

PRELIMINARY REQUIREMENTS:
No preliminary requirements

CONDITIONS FOR PASSING THE COURSE:
1) attendance at laboratory and project classes,
2) preparation of a technical report of a given practical exercise,
3) passing a theory test.

FINAL GRADE:
50% (test) + 50% (project)

POSSIBILITY OF TRANSFERRING GRADES:
To transfer partial grades, students should contact the lecturer 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-S2-2019-sem2)	2020/2021-L	

Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	2	2020/2021-Z	