

Computer Methods in Civil Engineering

Course objectives

The objective of the course is to explain selected possibilities and limitations of computer methods, especially of the finite element method (FEM), in applications to analysis of complex engineering problems as well as to develop further understanding of the computer modeling. The course outline is as follows: recap of FEM; applications of FEM to elasticity, dynamics, heat transfer, elastic-plastic deformations, plates, shells, buckling analysis; recap of the finite difference method, FDM with irregular meshes, MWLS approximation, basics of the meshless approach. Besides understanding of the presented topics students are expected to code simple algorithms in Matlab language as well as utilize the ABAQUS software to analyze selected 2D problems.

Text

1. R. Cook, Finite Element Method for Stress Analysis, J. Wiley & Sons 1995.
2. E. de Souza Neto, D. Peric, D. Owen, Computational methods for plasticity – theory & applications. J. Wiley & Sons, 2008.
3. O.C. Zienkiewicz, K. Morgan, Finite Elements and Approximations, J Wiley 1983.

Laboratory sessions

Attendance at laboratory sessions is obligatory. Completion of the following laboratory assignments will be required:

- static and dynamic FEM analysis of straight bars (sessions 1-5)
- application of FEM to plane strain elasticity problems (6-9)
- analysis of plates by ABAQUS code (10-14)

Grading

Cumulative grading will be based on passing grades earned in laboratory sessions and in a written test with the following weights:

Laboratory 49%

Written Test 51%

The written test will be given during the last lecture. The make-up test will be given during the make-up session (in September).

Grade Ranges:

A (5.0) (90 – 100] %

B (4.5) (80 – 90] %

C (4.0) (70 – 80] %

D (3.5) (60 – 70] %

E (3.0) (50 – 60] %

F (2.0) [0 – 50] %