Course title: COMPUTER METHODS

ECTS credit allocation (and other scores): 2.5

Semester: spring

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 60

Course coordinator/ Department and e-mail: Piotr Srokosz / Institute of Building Engineering, psrok@uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES: Proficiency test, which verifies the level of knowledge about the finite element method (FEM) used for linear-elastic rod systems. Synthesis of knowledge about FEM modeling of statically indeterminate systems. Modeling of linear-elastic systems (statically indeterminate) in plane strains and plane stresses. Programming the plasticity criteria: Tresca, Huber-Mises and Mohr-Coulomb. Algorithm for calculations of visco-plastic deformations. Solving plain strains and plane stresses problems using elasto-plastic materials described by the Mohr-Coulomb criterion. Numerical simulations using quadrilateral elements defined by four and eight nodes.

LECTURES: General information on Finite Element Analysis (FEA) used in the construction industry. Overview of the most commonly used advanced FEM-based applications. General concept of mathematical modeling of engineering problems using FEM - kernels, preprocessors and postprocessors. Introduction to the theory of plasticity - Tresca, Huber-Mises and Mohr-Coulomb criteria and their modifications. Constitutive models of caps (Cam-Clay). Methods of using numerical plasticity criteria and the function of plastic potential in calculations. Viscoplastic deformation algorithm. Optimization methods in construction, local and global solutions. Computer simulations of selected problems.

Learning purpose: Understanding FEM algorithms for solving systems with elastic and elasto-plastic materials.

On completion of the study programme the graduate will gain:

Knowledge: knows FEM algorithms for solving problems with elasto-plastic constitutive models

Skills: can correctly choose the numerical constitutive models in computer programs to obtain reliable solutions

Social Competencies: is responsible and prudent regarding the reliability of the results of the calculations made

Basic literature: I. Smith, D.V. Griffiths, "Programming the Finite Element Method", Wiley, 2004, p. 440;

Supplementary literature: P.I. Kattan, "Matlab guide to finite elements. An interactive approach", Springer, 2002, p. 479; O.C. Zienkiewicz, R.L.Taylor, "Finite Element Method", vol.1. "The Basis", 5th edition, Butterworth & Heinemann, 2000, p. 689.

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 62

Student's independent work: 0.5