DESCRIPTION OF THE COURSE

Name of the course: **Finite Element Structures Analysis**	Code: BIE69-1	Semester: 8
Type of teaching: Lectures and laboratory work.	Lessons per week: L–2 hours; LW–1,5 hours	Number of credits: 4

COURSE STATUS IN THE CURRICULUM: Optional for the students specialty Industrial Engineering BEng programme of the English Language Faculty of Engineering.

AIMS AND OBJECTIVES OF THE COURSE: To give knowledge about theory and application of Finite Element Method for structural analysis, to gain experience in using finite element software of commercial quality.

DESCRIPTION OF THE COURSE: The main topics concern: Introduction to modeling of structures: hypothesis and assumptions. Elastic models: equations of equilibrium, strain-displacements relationships, stress-strain relationships, plane stress and plane strain problem, axisymmetric problem. Fundamentals of FEM: virtual displacement principle, discretization and approximation of unknown functions, element stiffness matrix and load vector, assembling. FEM for trusses and frames: variational formulation, shape functions, element stiffness matrix, problems. Plane problems: interpolation fields for triangle and quadratic elements, isoparametric formulation. Numerical integration. Axisymmetric problems. 3D problems. Modeling, errors and accuracy of FEM solution. Plates and shells. Plate-bending theory, displacements, strains and stresses, finite elements for plates. Shells and shell theory, assumptions and hypotheses, displacements, strains and stresses. Shell elements. Problems. Dynamic problems: introduction, mass and damping matrixes, natural frequencies.

PREREQUISITES: Mathematics, Physics, Mechanics, Strength of materials.

TEACHING METHODS: Lectures, using slides and laboratory work.

METHOD OF ASSESSMENT: Three written theoretical tests (50%) and three laboratory tests (50%).

INSTRUCTIONAL LANGUAGE: English.

BIBLIOGRAPHY:

1. Cook R., D.Malkus, M.Plesha, Concepts and Application of Finite Element Analysis, John Wiley & Sons. New York, 1989;
2. Cook R. Finite Element Modeling for Stress Analysis, John Wiley & Sons, New York, 1995;
3. Стойчев Г. Метод на крайните елементи. Якостен и деформационен анализ, София, 2000.