

Title <b>Finite Element Method</b>	Code <b>10102512710102102822</b>
Field <b>Mechanical Engineering</b>	Year / Semester <b>4 / 7</b>
Specialty -	Course <b>core</b>
Hours Lectures: <b>1</b> Classes: -    Laboratory: <b>1</b> Projects / seminars: -	Number of credits <b>3</b>
	Language <b>polish</b>

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**Status of the course in the study program:**

- Obligatory course of the study programs for the branch.

**Assumptions and objectives of the course:**

- The student should gain theoretical knowledge and practice in numerical computation by the Finite Element Method (FEM) for solution of basic linear and non-linear problems in science and engineering, described by partial differential equations.

**Contents of the course (course description):**

- Mathematical fundamentals of FEM. Boundary value problems for ordinary and partial differential equations. Ellipticity condition for a differential operator. Integral form of a boundary value problem. Kinds of boundary conditions. Solving basic 1D and 2D boundary value problems. Introduction to the Comsol Multiphysics simulation software environment. Modeling and solving a conductive heat transfer problem. Modeling and solving a structural mechanics problem. Modeling and solving thermal-structural interaction problems (thermal expansion). Modeling and solving a fluid dynamics problem. Modeling and solving a problem that involves both fluid dynamics and heat transfer (thermal conduction and thermal convection).

**Introductory courses and the required pre-knowledge:**

- Mathematical analysis, ordinary and partial differential equations, vector and matrix calculus. Basic skills in programming and numerical methods.

**Courses form and teaching methods:**

- Lectures aided by presentations of FEM calculations results.  
Laboratory: solving selected engineering problems with use of modern computational systems.

**Form and terms of complete the course - requirements and assessment methods:**

- Project that contains: problem description, theoretical fundamentals ? equations and

conditions, presentation of results and their analysis with conclusions and summary.

**Basic Bibliography:**

**Additional Bibliography:**