

Title Mathematics, engineering applications	Code 10102552110102101567
Field Mechanical Engineering	Year / Semester 1 / 1
Specialty -	Course core
Hours Lectures: 2 Classes: 10 Laboratory: - Projects / seminars: -	Number of credits 4
	Language polish

Lecturer:

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Status of the course in the study program:

- Core course at the Mechanical Engineering Faculty to second degree studies.

Assumptions and objectives of the course:

- Ability to apply knowledge of numerical analysis in engineering problems.

Contents of the course (course description):

- The basic information about floating point systems. Characteristics of floating points numbers. Presentation of characteristics of numerical operations. Solutions of equations in one variable: the bisection algorithm, fixed-point iteration, the Newton-Rapson method. Calculations of zeros of real polynomials: Horner?s algorithm. Interpolation and polynomial approximation. Cubic spline interpolation. Numerical integration: trapezoidal composite procedure, Simpson?s composite algorithm. Initial-value problems for ordinary differential equations: Euler?s method, Runge-Kutta methods; solving of higher-order equations and systems of differential equations. Direct method for solving linear systems (Gaussian elimination); iterative techniques in matrix algebra (Jacobi and Gauss-Seidel algorithms). Eigenvalues and eigenvectors of matrix ? power method. Approximation theory: discrete least-squares approximation. Boundary-value problems for ordinary differential equations: the shooting method (for linear and nonlinear problems), the method of finite differences.

Introductory courses and the required pre-knowledge:

- Knowledge of mathematics and differential calculus gained during first degree of Mechanical Engineering.

Courses form and teaching methods:

- Lectures: theoretical introduction, solving an example problem.
Classes: short theoretical introduction, solving example problems by group of students and individually by students.

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

- Credit ? a test.

Basic Bibliography:

Additional Bibliography: