Code	III.**11**.
Course Title (English)	Introduction to Numerical Methods
Course Title (Polish)	Wprowadzenie do metod numerycznych
Credits	**3** ECTS

Language of instruction **English**

Programme Computer Modelling and Simulation, Intelligent Energy, Biotechnology for Environmental Protection, Business and Technology

Type of studies BSc studies

Unit running the programme Institute of Thermal Machinery

***Course coordinator** and academic teachers* Artur Tyliszczak, Assoc. Prof.

Form of classes and number of hours

Semester	Lec.	Tut.	Lab.	Proj.	Sem.	Credit points
III	15	-	15	-	-	**3**

Learning outcomes The objectives of this course are designed to instruct engineering students in the principles of numerical methods. Students will learn how to solve practical engineering problems with the help of the computers and existing mathematical/numerical tools. They will learn basics of computer algorithms and programming in a software dedicated to numerical calculus. The course covers the main problems related to interpolation and approximation, integration and differentiation, linear algebra. The knowledge of these subjects is necessary for future courses.

Prerequisites Basic knowledge of differential and integration calculus, fundamental properties of vectors (representation of vectors using rectangular components, vector multiplication), basics of linear algebra.

Course description LECTURE

Introduction: numerical errors; simple numerical algorithms (e.g. Horner scheme).
Interpolation: natural polynomials; Lagrange, Newton, Chebyshev interpolation methods; trigonometric polynomials; B-spline interpolation.

Approximation: polynomial, trigonometric and B-spline approximation.
Integration: Newton-Cotes quadratures, Gaussian quadratures, rectangle method, trapezoidal and Simpson's rules.
Differentiation: finite difference method.
Linear algebra: matrix calculus, matrix inversion, Gaussian elimination, LU methods, basic iterative methods (Jacobi, Gauss-Seidel).

TUTORIALS: see lecture content

LABORATORY
Selected test cases from the content of the lectures. Students will use a free software dedicated for numerical calculus.

PROJECT
Not applicable

SEMINAR
Not applicable

Form of assessment	????

Basic reference materials	1. A. Quarteroni, R. Sacco, F. Saleri. Numerical Mathematics. Sptinger. 2007.
	2. A. Quarteroni, A. Valli. Numerical approximation of PDE. Springer. 1997.
	3. R.L. Burden. J.D. Faires, NumericalAnalysis. Brooks/Cole, Cengage Learning. 2011.
	4. D. Levy. Introduction to Numerical Analysis. Department of Mathematics and Center for Scientific Computation and Mathematical Modeling (CSCAMM) University of Maryland. Free PDF source file.
	5. T. Cyders, G. Schaefer. Basic Numerical Methods and FreeMat. Free PDF source file.
	6. http://en.wikibooks.org/wiki/Numerical_Methods

Other reference materials	For Polish-speaking students:
	1. E. Majchrzak, B. Mochnacki, Metody numeryczne. Podstawy teoretyczne aspekty praktyczne i algorytmy, Wydawnictwo Politechniki Śląskiej, Gliwice, 1996.
	2. S. Kosma, Metody numeryczne dla zastosowań inżynierskich, Wydawnictwo Politechniki Radomskiej, Radom, 1999.

e-mail of the course coordinator and academic teachers	atyl@imc.pcz.pl
Average student workload (teaching hours + individ.)	2 hours of teaching hours + 2hours of individual work per week
Remarks:	
Updated on:07.07.2014	