Numerical Methods - opis przedmiotu

Informacje ogólne

Nazwa przedmiotu	Numerical Methods
Kod przedmiotu	06.9-WM-ER-IB-39_18
Wydział	Wydział Nauk Inżynieryjno-Technicznych
Kierunek	WM - oferta ERASMUS
Profil	-
Rodzaj studiów	Program Erasmus
Semestr rozpoczęcia	semestr zimowy 2023/2024

Informacje o przedmiocie

Semestr	1
Liczba punktów ECTS do zdobycia	4
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	• prof. dr hab. inż. Andrzej Obuchowicz • dr hab. inż. Tomasz Klekiel, prof. UZ

Formy zajęć

Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Wykład	15	1	-	-	Zaliczenie na ocenę
Laboratorium	30	2	-	-	Zaliczenie na ocenę

Cel przedmiotu

• familiarize students with the basic aspects of numerical mathematics to solve common problems,

• familiarize students with the basic algorithms to solve these tasks,

• education students' ability to use Matlab to issues of engineering calculations.

Wymagania wstępne

Mastery of knowledge and skills in the subject Elements of Algebra and Mathematical Analysis

Zakres tematyczny

Lecture: Computer Arithmetic (Fixed and floating point representation of numbers, calculation errors in floating-point arithmetic, atabilność and accuracy of numerical algorithms, numerical conditioning task). Solving nonlinear equations (bisection method, regulatory falsi, secant and tangent method). Solving linear algebra (exact method for solving systems of linear equations: Gauss method, pivoting, triangular distribution method, Thomas-Banachiewicz Cholesky method, iterative methods: Jordan, Gauss-Seidel, setting benchmarks and matrix inverse spectral problem). Interpolation (definition and classification methods, polynomial interpolation: Lagrange interpolation formula, Newton's interpolation formula, spline interpolation, splines 3 degrees). Approximation (mean square approximation discrete and continuous, triangular families of orthogonal polynomials in approximation). Quadrature (pattern of rectangles and triangles, Newton-Cotes quadrature, Gauss quadrature, numerical integration of the limits of improper integrals and singular points within the interval of integration, integration of multidimensional functions). Ordinary differential equations (Euler's method, Runge-Kutta methods). Introduction to the methods of boundary and partial differential equations.

Environmental engineering calculations Matlab (system resources, environmental programming, graphical tools, and editing). Floating-point arithmetic (numerical experiments, errors of calculation procedures and the accumulation and transfer of numerical instability). Solving equations (equations of nonlinear systems of linear equations, systems of a van der Monde, testing algorithms, Newton and Newtona_Raphsona). Data Processing (interpolation method, method of approximation of mean method, spectral analysis, Fast Fourier Transform). Ordinary differential equations, initial and boundary issues. Elementary finite element techniques and testing them on the basis of certain issues.

Metody kształcenia

Lecture: Lecture conventional

Laboratory: The laboratory exercises on which a students solve tasks from list.

Efekty uczenia się i metody weryfikacji osiągania efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
Able to take advantage of the functionality of MATLAB environment to basic numerical, graphical representation of the results.		• aktywność w trakcie zajęć • kolokwium	• Laboratorium

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
Able to choose of these algorithms which is the most advantageous to solve a specific numerical problem.		• aktywność w trakcie zajęć • kolokwium	• Laboratorium
Knows the basic numerical methods for solving nonlinear equations and systems of linear equations and differential, know the basic techniques of interpolation, approximation and numerical integration.		• aktywność w trakcie zajęć • kolokwium	• Wykład
Student who has completed the subject understands the limitations of numerical algorithms related to floating-point arithmetic.		• aktywność w trakcie zajęć • kolokwium	• Wykład

Warunki zaliczenia

Grading **lecture**

The pass of the lecture is to provide a positive evaluation of the test.

Grading of the **laboratory**

Evaluation of the laboratory is based on two tests making in a half and on the end semester.

Literatura podstawowa

1. Numerical Methods Using MATLAB (Ellis Horwood Series in Mathematics & Its Applications),George Linfield (Author) Dr John Penny (Author), 1994 ISBN: 9780130309662
2. Chetana Jain, Computing in Scilab,2023 Cambridge University Press, ISBN-10 : 1009214195
3. S. Nagar, Introduction to Scilab: For Engineers and Scientists,2017, ISBN-13: 978-1-4842-3191-3

Literatura uzupełniająca

1. John R. Dormand, Numerical Methods for Differential Equations : a Computational Approach, CRC Press LLC, 1996
2. Salahuddin Taimoor, Numerical Techniques in MATLAB: Fundamental to Advanced Concepts, ISBN: 9781032472584
3. Steven C. Chapra, Raymond P. Canale, Numerical Methods for Engineers,2015, Published by McGraw-Hill Education, ISBN 978–0–07–339792–4
4. B. H. Flowers, An Introduction to Numerical Methods in C++, Oxford University Press, USA, ISBN: 9780198506935
5. Suddhasheel Ghosh, Numerical Methods in MATLAB/Octave for Engineers,2017, Department of Civil Engineering
6. Jawaharlal Nehru Engineering College

Uwagi

Zmodyfikowane przez dr Katarzyna Skrzypek (ostatnia modyfikacja: 12-05-2024 11:12)