COURSE DESCRIPTION CARD - SYLLABUS

Course name
Numerical methods [N2EiT1>METNUM]

Course

Field of study
Electronics and Telecommunications

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

The knowledge of the algebra and of the mathematical analysis also of probability theory and of the mathematical statistics elements within the range of first-cycle of studies on technical universities.

Course objective

Acquaintedness with concepts and theorems from the range of numerical methods. Recognition of numerical algorithms of solution of typical problems from the algebra and the mathematical analysis. Preparation to the practical application of recognized methods to the problem solving from the range of the electronics and telecommunications.

Course-related learning outcomes

Knowledge:
1. Knowledge from the range of numerical methods finding use in the electronics and telecommunications.
2. Orderly and underpinned with the theory the knowledge about rules and limitations of the problem solving with numerical methods.

Skills:

1. Recognition of problems, in this of practical issues which can be solved algorithmically.
2. Selection of proper numerical methods of the problem solving from the range of the electronics and telecommunications.
3. Interpreting of obtained results of calculations with the regard of conditionings of calculations realized with numerical methods.

Social competences:
1. Consciousness of the necessity of the professional approach to the resolution of technical problems and undertakings of the responsibility for proposed solutions.
2. Understanding of the meaning of mathematics and its uses in the solution of modern engineering problems.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - base to the credit is the obtainment of the positive evaluation from the quiz (theory) at the end of the semester.
Tutorials - base to the credit is the obtainment of the positive evaluation from the test at the and of the semester and from the homeworks.

Assessment criteria:
<= 50% 2.0
51%-60% 3.0
61%-70% 3.5
71%-80% 4.0
81%-90% 4.5
91%-100% 5.0

Programme content

1. Computer arithmetic, consequences of the floating point representation of numbers. Analysis of the accuracy of numerical algorithms. Conditioning numerical tasks. Stability, correctness, computational complexity of the algorithm.
2. Solving linear systems of algebraic equations. Direct methods (Gaussian elimination, Jordan elimination, LU matrix factorization). Iterative methods (Jacobi's, Gauss - Seidel).
3. Solving nonlinear equation, roots of polynomials - bisection method, regula falsi method (false-position method), secant method, tangent method.
4. Interpolation - polynomial methods, spline function methods.
5. Approximation - least-squares approximation, Pade approximation.
6. Numerical integration - quadrature-based methods, Monte-Carlo methods.

Teaching methods

Lectures - in form of presentations illustrated with examples. The stage-check of the understanding of the content across the discussion.
Tutorials - tasks illustrative lecture-contents. Every task is preceded an information of which issue concerns and finished with conclusions harking back to of the theory.

Bibliography

Basic:
1. Dryja M., Jankowscy J. i M., "Przegląd metod i algorytmów numerycznych", Cz. II, Wyd. 2, WNT, Warszawa 1988
2. Fortuna Z., Macukow B., Wąsowski J., „Metody numeryczne", WNT, Warszawa 2021.
3. Jankowscy J i. M, "Przegląd metod i algorytmów numerycznych", Cz. I, Wyd. 2, WNT, Warszawa 1988.

Additional:
1. Kincaid D., Cheney W.: "Analiza numeryczna", WNT, Warszawa 2006
2. Stoer J., Bulirsch R., „Wstęp do analizy numerycznej", PWN, Warszawa 1987.
3. Ralston A., „Wstęp do analizy numerycznej", PWN, Warszawa 1983.

Breakdown of average student's workload

	Hours	ECTS
Total workload	115	5,00
Classes requiring direct contact with the teacher	40	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	3,00