COURSE DESCRIPTION CARD - SYLLABUS

Course name

Numerical methods

Course

Field of study

Mathematics in Technology

Year/Semester

2/3

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

45

Other (e.g. online)

Tutorials

15

Projects/seminars

Number of credit points

6

Lecturers

Responsible for the course/lecturer:

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Faculty of Control, Robotics and Electrical Engineering

ul. Piotrowo 3A 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

The student has a knowledge of mathematics (range: linear algebra, differential and integral calculus, initial value problems for ordinary differential equations), and computer science (for programming in high level language).
The student is able to solve math problems analytically within the range specified above.
The student is able to implement a computer program.
The student is aware of the level of his knowledge.
The student is aware of deepening and expanding knowledge.

Course objective

Understanding the basic numerical methods. Applying them to solve mathematical problems and simple engineering problems. Supporting mathematical and engineering calculations with appropriate IT tools. Verification of obtained solutions.

Course-related learning outcomes

Knowledge

1. The student has knowledge about the use of mathematical methods and tools in the field of numerical methods.
2. The student has theoretically founded knowledge of numerical methods.
3. The student knows at least one software package or programming language.

Skills

1. The student is able to use knowledge in higher mathematics.
2. The student can use numerical tools and methods to solve simple engineering problems.
3. The student can construct the algorithm of solving a simple engineering task and implement it and test it in the chosen development environment.
4. The student is able to operate the devices in accordance with general requirements and knows how to apply the principles of health and safety at work in a computer laboratory.
5. The student can use the knowledge and methods and tools to solve typical engineering tasks.
6. The student knows how to use a foreign language to the extent that it is possible to use English-language software.

Social competences

1. The student is aware of the level of his knowledge.
2. The student is aware of deepening and expanding knowledge to solve technical problems.
3. The student is able to think and act in a creative way, is aware of the responsibility for the effects of the work of the team, as well as its individual participants.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:

* assessment of knowledge and skills demonstrated on the exam.
* control of perception during lectures.

Auditory exercises:

* assessment of the ability to solve tasks in the field of numerical methods.

Laboratory exercises:

* assessment of skills related to the implementation of project tasks
* assessment of student preparation for laboratory classes and assessment of skills related to the implementation of laboratory exercises
* assessment of teamwork skills

Programme content

Update: 01.09.2020.

1. Floating point arithmetic, numerical errors.

2. Stability and accuracy of algorithms.

3. Numerical solutions of nonlinear equations and systems of equations (selected methods).

4. Polynomial interpolation.

5. Taylor series.

6. Newton–Cotes quadrature rules.

7. Numerical differentiation.

8. Initial-value problems for first-order ordinary differential equations (selected one-step methods of Runge-Kutta type).

Teaching methods

lectures and auditorium classes:
lecture with multimedia presentation supplemented with examples given on the blackboard,
lecture conducted in an interactive manner with formulating questions for students,
taking into account the students' activity during the class when issuing the final grade,
during the lecture initiating the discussion,
theory presented in connection with practice,
theory presented in connection with the current knowledge of students,
taking into account different aspects of the issues presented,
presentation of a new topic preceded by a reminder of related content known to students in other subjects;
laboratories:
laboratories supplemented with multimedia presentations,
reviewing reports by the laboratory's leader,
work in teams,
computational experiments;

Bibliography

Basic

1. Fortuna, Macukow, Wąsowski, Metody numeryczne, WNT: PWN, 2017

2. Kincaid, Cheney, Analiza numeryczna, WNT 2006,

3. Magnucka-Blandzi, Dondajewski, Gleska, Szyszka, Metody numeryczne w MatLabie. Wybrane zagadnienia, Wyd. Politechniki Poznańskiej 2013,

Additional

1. Burden, Faires, Numerical analysis, Prindle, Weber&Schmidt, Boston,

2. Rosłoniec, Wybrane metody numeryczne z przykładami zastosowań w zadaniach inżynierskich, Oficyna Wydawnicza Politechniki Warszawskiej 2008,

Breakdown of average student's workload

	Hours	ECTS
Total workload	160	6,0
Classes requiring direct contact with the teacher	98	4,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	62	2,0

[1] delete or add other activities as appropriate