COURSE DESCRIPTION CARD - SYLLABUS

Course name
Applied mathematics [S2LiK1>MS]

Course

Field of study
Aerospace Engineering

Year/Semester
1/1

Area of study (specialization)
Unmanned Aerial Vehicles

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

The student starting this subject should have knowledge and skills in the first-cycle mathematics and computer science courses. He should also have the ability to obtain information from the indicated sources and be ready to cooperate as part of the team. He should know the limitations of his own knowledge and understand the need for further education.

Course objective

Presentation of selected numerical methods and analytical methods for solving selected differential equations.

Course-related learning outcomes

Knowledge:
1. has knowledge in the field of mathematics, including algebra, analysis, theory of differential equations, necessary for numerical solving of boundary problems, inverse problems, optimization, statistical analyzes
2. has structured and theoretically founded knowledge about computer-aided manufacturing methods and their application in industry

Skills:
1.can communicate using various techniques in the professional environment and other environments, using the formal notation of construction, technical drawing, concepts and definitions of the scope of the field of study studied
2.can use formulas and tables, technical and economic calculations with the help of a spreadsheet, programming tools of his own authorship, specialized software
3. is able to carry out detailed technical calculations in the field of fluid mechanics, thermodynamics and combustion, such as heat and mass balances, calculate thermodynamic waveforms in thermal flow machines, in particular flow and rocket engines

Social competences:
1. is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment, and the related responsibility for decisions
2. is aware of the social role of a technical university graduate, and especially understands the need to formulate and transmit to the society, in particular through the mass media, information and opinions on the achievements of technology and other aspects of engineering activities; makes efforts to provide such information and opinions in a generally comprehensible manner

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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The knowledge acquired during the course is verified by the assessment of activity, assigned tasks and an exam. The skills acquired during the exercises are verified on the basis of the developed projects and the final test.

Programme content

Linear differential equations of the order of n. Selected nonlinear differential equations. Selected numerical methods of solving initial problems, interpolation and approximation.

Course topics

Homogeneous and non-homogeneous linear differential equations of the first order.
Nonlinear differential equations:
- Bernoulli,
- Riccati,
- Clairaut,
- Lagrange-d'Alembert,
- Complete differential equation,
- Integrating factor.

Linear differential equations of order higher than the first:
- with constant coefficients, homogeneous and heterogeneous,
- Eulerian homogeneous and inhomogeneous.

Systems of differential equations.
Fourier series.
Polynomial interpolation with applications.
Numerical methods of the Runge-Kutta type for solving initial problems. Ode45 method.

Teaching methods

Informative (conventional) lecture (transfer of information in a systematic way) - can be (propedeutical) or monographic (specialist)
Exercise method (subject exercises) - in the form of auditorium exercises (the application of acquired knowledge in practice - can take a different nature: solving cognitive tasks or training psychomotor skills; transforming conscious activity into a habit by repetition)

Bibliography

Basic

1. Fortuna Z., Macukow B., Wąsowski J., Metody numeryczne, Wydawnictwo Naukowe PWN, Warszawa 2020.
2. Kincaid D., Cheney W., Analiza numeryczna [Numerical Analysis: Mathematics of Scientific Computing (The Sally Series; Pure and Applied Undergraduate Texts, Vol. 2)], WNT, Warszawa 2006.
3. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, t. II, PWN, Warszawa 2020.
Additional
1. Horla D., Metody obliczeniowe optymalizacji w zadaniach, WPP, Poznań, 2016

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00