COURSE DESCRIPTION CARD - SYLLABUS

Course name
Applied mathematics and mathematical methods

Course

Field of study	Year/Semester
Transport	1/1
Area of study (specialization)	Profile of study
	general academic
Level of study	Course offered in
Second-cycle studies	Polish
Form of study	Requirements
part-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
9		
Tutorials	Projects/seminars	
9		

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

Karol Gajda, Ph.D.,Eng.
Faculty of Control, Robotics and Electrical
Engineering
Institute of Mathematics
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tel. 61 665 2805

Responsible for the course/lecturer:

Prerequisites

The student starting this subject should have knowledge and skills from the first-cycle studies in mathematics and computer science. 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

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Student has advanced and in-depth knowledge of transport engineering, theoretical foundations, tools and means used to solve simple engineering problems

Skills

Student is able - when formulating and solving engineering tasks - to integrate knowledge from various areas of transport (and, if necessary, also knowledge from other scientific disciplines) and apply a system approach, also taking into account non-technical aspects

Student is able to correctly use the selected method of estimating the labor consumption of manufacturing technical objects

Student is able - in accordance with the given specification, taking into account non-technical aspects - to design a complex device, system in the field of transport engineering or a process and to implement this project - at least in part - using appropriate methods, techniques and tools, including adapting the existing or developing new tools

Social competences

Student understands the importance of using the latest knowledge in the field of transport engineering in solving research and practical problems

Student understands the importance of popularizing activities regarding the latest achievements in the field of transport engineering

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the course is verified by the assessment of activity, assigned tasks and an exam.

The skills acquired during the tutorials 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, approximation, optimization.

Teaching methods

1) lectures:

- presenting a new topic preceded by a reminder of related content, known to students from other subjects,

- an interactive lecture with the formulation of questions to a group of students or to identified specific students,

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- a lecture supplemented with examples given on the blackboard and calculations made with the use of open source software,

- lecture supplemented with tasks for independent solution, the solution of which has an impact on the final grade,

- student activity during classes is taken into account when assigning the final grade.

2) tutorials:

- an example of solving the task on the board along with analyzing the next stages,

- students' way of solving the task on the blackboard is reviewed by the tutor.

Bibliography

Basic

1. Fortuna Z., Macukow B., Wąsowski J., Metody numeryczne, WNT, 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	60	2,0
Classes requiring direct contact with the teacher	18	1,0
Student's own work (literature studies, preparation for tutorials, preparation for tests) [1]	42	1,0

[1] delete or add other activities as appropriate