COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S2Eltech2>Mat]

Course

Field of study
Electrical Engineering

Year/Semester
1/1

Area of study (specialization)
Drive Systems in Industry and Electromobility

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
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Knowledge: Student has knowledge of mathematics on the first-cycle studies (of complex numbers and real mathematical analysis of strings, series of numbers and powers, ordinary and partial derivatives, integrals, ordinary differential equations) – [K1_W01] Skills: Student can perform operations on complex numbers, calculate derivatives and integrals, solve first-order and second-order ordinary differential equations – [K1_U10] Social competencies: The student understands the need for continuous improvement of competences (language, professional and social) and knows the importance of higher mathematics methods in the description of engineering and technical issues. Can independently search for information in the literature.

Course objective

The main aim is the understanding of notions and methods theory in order to apply them to solving engineering and technical problems.

Course-related learning outcomes

Knowledge:
The student has expanded and in-depth knowledge of some branches of mathematics (including

elements of discrete and applied mathematics), necessary for modeling and analysis of the operation of advanced electrical devices and systems as well as description and analysis of the operation and synthesis of complex electrical systems – [K2_W01]

Skills:
1. The student is able to use the known methods and mathematical models (if necessary, modifying them appropriately) to the analysis and design electrical processes, electrical equipment and systems – [K2_U06]
2. The student has the ability to self-education using modern teaching tools – [K2_U06]

Social competences:
Student is aware of the importance of mathematical methods in the description of physical and technical issues and responsibility for decisions.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: written / oral exam in theory and tasks.
Classes: evaluation of written tests during the semester and the direct activity during the classes. Getting extra points related with activity (presentations of examples of applications of mathematics, use of literature, discussion of problems, presenting reports concerning applications of the theory and diligence of the study).

Programme content

Elements of complex analysis and linear algebra.
Differential and integral calculus of functions of many variables.
Functional series.
Selected methods for solving first- and second-order partial differential equations.
Mathematical methods necessary for modelling and analysis of the operation of advanced electrical devices and systems, as well as description and analysis of the operation and synthesis of complex electrical systems.

Course topics

Complex numbers and sequences.
Complex functions of the real variable: definition, geometric interpretation, derivative, integral.
Complex functions of the complex variable: definition, basic types of complex functions and their properties, derivative, Cauchy-Riemann equations for holomorphic functions, integral.
Linear independence of vectors. The base of real (complex) real space.
Matrix eigenvalue problem.
Taylor series and Laurent series. On Fourier series.
First-order linear (quasi-linear) partial differential equations: properties and methods of solving.
Secondary linear (quasi-linear) partial differential equations: reduced to canonical form and solved (elliptic, hyperbolic or parabolic equations), the Laplace equation, wave equation, conductivity equation, initial and boundary conditions.
Issues of electrical engineering described by partial differential equations (e.g. electric line equation) and methods of solving edge problems of electrical engineering (e.g. telegraphers equation).
Examples of applications of mathematics in electrical engineering.

Teaching methods

1) Lectures:
- interactive lecture with questions to students or specific students,
- using partially a multimedia presentation (e.g. examples, photos, animations),
- theory presented in connection with the current knowledge of students,
- presenting a new topic preceded by a reminder of related content known to students from other subjects,
- taking into account various aspects of the issues presented (economic, ecological, social),
- student activity is taken into account during the course of the assessment.

2) Classes:

- solving sample tasks on the blackboard,
- initiate discussion on solutions,
- homework / additional tasks.

Bibliography

Basic:
1. D. Bobrowski, J. Mikołajski, J. Morchało, Równania różniczkowe cząstkowe, Wydawnictwo PP, Poznań 1995.
2. E. Kącki, L. Siewierski, Wybrane działy matematyki wyższej z ćwiczeniami, PWN, Warszawa 1981.
3. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, PWN, Warszawa 1974 (or later).
4. L. Siewierski, Ćwiczenia z analizy matematycznej z zastosowaniami, T.1, T.2, PWN, Warszawa 1981.
5. W. Stankiewicz, J. Wojtowicz, Zadania z matematyki dla wyższych uczelni technicznych, T.2, PWN, Warszawa 2001.

Additional:
1. I. Foltyńska, Z. Ratajczak, Z. Szafrański: Matematyka dla studentów uczelni technicznych, cz.1, cz.2, cz.3, Wydawnictwo Politechniki Poznańskiej, Poznań 2004.
2. F. Leja, Rachunek różniczkowy i całkowy, PWN, Warszawa 1971 (or later).
3. F. Leja, Teoria funkcji analitycznych, PWN, Warszawa 1987.
4. W. Leksiński, J. Nabiałek, W. Żakowski, Matematyka, WNT, Warszawa 2002.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00