COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1Elmob1>Mat2]

Course

Field of study
Electromobility

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
45

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

Student possesses knowledge of selected mathematic fields, including complex numbers, linear algebra, analytical geometry and single variable differential and integral calculus. Student has logical reasoning skills.

Course objective

The acquirement of knowledge and computational skills in multiple variables differentia and integral calculus and differential equations that are necessary to handle engineering problems.

Course-related learning outcomes

Knowledge:
1. Student has extended and in-depth knowledge of selected mathematic fields, including multiple variables differential and integral calculus and differential equations.
2. Student has a systematized knowledge in the field of mathematics, useful in formulating and solving complex problems in the area of electrical engineering.

Skills:

1. Student is able to obtain information from literature, databases and other properly selected sources, including information in English; is able to combine the obtained information, to interpret and critically assess it, to draw conclusions and to formulate opinions and provide exhaustive justifications for them
2. Student is able to use the known methods and mathematical models - and, if necessary, modify them - for the analysis and design of components of electronic systems.
3. Student is able to develop, evaluate and use existing analytical, simulational and experimental methods to solve complex engineering tasks in the field of electrical engineering, including non-typical tasks that contain a research component.
4. Student has the ability to learn independently, mainly in order to improve professional skills; is able to identify areas of detailed technical knowledge necessary to implement a specific engineering task and acquire them independently as well as present them

Social competences:
1. Student understands the need of lifelong learning
2. Student is able to cooperate and work in a team, and take different roles in it
3. Student is able to define priorities which serve the implementation of a task assigned by him-/herself or by others

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Knowledge acquired during lectures is verified by means of a test consisting of 13 questions. Passing threshold: 60%.

Exam issues, on the basis of which questions are prepared, will be sent to students by e-mail using the university e-mail system.

Tutorials:
Skills acquired during tutorials are verified on the basis of three written tests. Each test includes 5 tasks of varying difficulty assessed in the points system. Passing threshold: 55%.

Programme content

1. The concept of a function of several variables, domain, graph, limit of a function.
2. Differential calculus of the functions of two nad three variables, some applications in engineering practice.
3. Double and triple integrals, some applications in engineering practice.
4. Line integrals.
5. First order differential equations with variables separable. Linear differentia equations of the first order. Second order linear nonhomogeneous differentisl equations with constant coefifcients.
6.The Laplace transform and application to initial-value problems for differential equations with constant coefficients.
7. Elements of field theory.

Course topics

1. The concept of a function of several variables, domain, graph, limit of a function.
2. Differential calculus of the functions of two nad three variables. Partial derivatives. Directional derivatives. The gradient. The extremum (maximum or minimum) of functions teo and three variables.The total differential of a function. Application of the differential of a function to approximate computations. Constructing empirical formulas by the method of last squares.
3. Double and triple integrals. Double integral in rectangular cartesiań coordinates. expressing a double integral in s polar coordinates. Geometrical applications of the double integral.
4. Line integrals with selected applications in engineering practice. The line integral of the first kind. The line integral og the second kind. Condition under which the line integral of the second kind is independent of path. The work performed by a potential force.
5. First order differential equations. First-order equations with variables separable. First-order linear differential equations. Second-order linear differential equations with constant coefficients.

6. The Laplace transform and application to initial-value problems for differential equations with constant coefficients.
7. Elements of field theory: scalar field, vector field, gradient, divergence of vector field, solenoidal vector field, circulation and rotation of vector field, irrotational vector field, nabla operator, Laplasian.

Teaching methods

Lectures:
1. lecture is conducted in an interactive way with formulating questions for a group of students or for selected students.
2. student activity during classes is taken into account when the final grade is considered.

Tutorials:
1. sample tasks are solved on the blackboard.
2. detailed discussion of solved tasks.

Bibliography

Basic:
1. W. Żakowski, Matematyka, T.1 i T.2, WNT, Warszawa 2003.
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (Definicje, twierdzenia, wzory), GiS, Wrocław 2019.
3. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (Przykłady i zadania), GiS, Wrocław 2019.
4. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne (Definicje, twierdzenia, wzory), GiS, Wrocław 2019.
5. M. Gewert, Z. Skoczylas, Elementy analizy wektorowej (Teoria, przykłady, zadania), GiS, Wrocław 2011.

Additional:
1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T.1, T.2, PWN, Warszawa 2011.
2. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka dla studentów uczelni technicznych, cz1., cz.2, Wydawnictwo PP, Poznań 2004.

Breakdown of average student's workload

	Hours	ECTS
Total workload	152	6,00
Classes requiring direct contact with the teacher	77	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	3,00