COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1Elmob1>Mat1]

Course

Field of study
Electromobility

Year/Semester
1/1

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
60

Laboratory classes
0

Other (e.g. online)
0

Tutorials
45

Projects/seminars
0

Number of credit points

8,00

Coordinators

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Lecturers

Prerequisites

Student possesses mathematical knowledge at basic level from secondary school. Student has logical reasoning skills

Course objective

The acquirement of knowledge and computational skills in single variable differential and integral calculus, linear algebra, analytical geometry and complex numbers 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 complex numbers, linear algebra, analytical geometry and single variable differential and integral calculus.
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. Elementary functions of one variable.
2. Concept of limit function of one variable and applications.
3. Differential calculus of function of one variable.
4. Integral calculus of function one variable. Improper integrals.
5. Series numbers, the concept of convergence of the series. Convergence tests of series.
6. Power series. Applying power series to approximate calculatios.
7. Fourier series.
8. Complex numbers . Arithmetic operations on complex numbers.
9. Matrix algebra. Systems of linear equations in many unknowns.
10. Fundamentals of solid analytic geometry.

Course topics

1. Elementary scalar functions of one variable (formulas, graphs, properties). Sequences, limit of a sequence.
2. Concept of limit a function of one variable. Limits involving infinity and one-sided limits. Applications (asymptotes, continuity of function).
3. Concept of derivative function.. The geometrical maining and physical maining of the derivative. Differential calculus of function of one variable. The derivatives of certain simple functions. Basic differentiation rules .The derivative of a composite function, the derivative of an inverse function, the derivative of an implicit function, the derivative of a logarithmic and an expotential functio, the derivatives of inverse trigonometric functions, the derivative of a function rerpresented parametrically. Derivatives of higher orders. Increase and decrease of a function, maxima and minima of a function of one variable, concavity and convexity of a graph of a function, points of inflection. L'Hospital's rule. Taylor's formula.
4. Antiderivative. Indefinite integral. Basic properties of the indefinite integral. Basic integration methods.

Techniques for integrating rational fractions with quadratic denominator. Integration of simplest irrational expressons. Integration of trigonometric functions.
The conept of the definite integral. Geometrical maining of the definite integral. Basic properties of the definite integral. Some applications of the definite integrals (areas in rectangular coordinates, the arc length in rectangular coordinates, the volume of a solid of resolution). Improper integrals.
5. Series numbers, the concept of convergence of the series. Convergence tests of series.
6. Power series, the concept of convergence of the series, the study of convergence. Expanding a given function into power series.
7. Fourier series. Expanding a given function into Fourier series.
8. Complex numbers . Arithmetic operations on complex numbers. Simple polynomials equations (fundamental theorem of algebra).
9. Matrix algebra. Systems of linear equations in many unknowns. Gauss method.
10. Vectors, scalar product of vectors, vector product. Fundamentals of solid analytic geometry, general equation.of a plane, equations of a straight line in space. Angle between two planes.

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. solving sample tasks on the board.
2. detailed reviewing of task solutions and discussions with comments.
3. initiating discussions on solutions.

Bibliography

Basic
1. W. Żakowski, Matematyka, T.1 i T.2, WNT, Warszawa 2003.
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 (Definicje, twierdzenia, wzory), GiS, Wrocław 2019.
3. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 (Przykłady i zadania), GiS, Wrocław 2020.
4. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna 1, (Definicje, twierdzenia, wzory), GiS, Wrocław 2020.
5. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna 1, (Przykłady i zadania), GiS, Wrocław 2020.

Additional
1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T.1, T.2, PWN, Warszawa 2011.
2. M. Grzesiak, Liczby zespolone i algebra liniowa, Wydawnictwo PP, Poznań 1999.

Breakdown of average student's workload

	Hours	ECTS
Total workload	207	8,00
Classes requiring direct contact with the teacher	107	4,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	100	4,00