COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1Eltech1>Mat1]

Course

Field of study
Electrical Engineering

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

9,00

Coordinators

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Lecturers

Prerequisites

Knowledge of mathematics defined by the core curriculum of mathematics education at the advanced level of secondary school.

Course objective

Equipping the student with skills related to the use of concepts and methods of mathematical analysis, linear algebra and vector calculus to describe and analyze problems in the field of technical sciences.

Course-related learning outcomes

Knowledge:
1.The student has knowledge of graphs and properties of elementary functions.
2. The student knows the concept of the derivative of a function and the geometric sense of a derivative of a function at a point, differentiation rules, the concept of indefinite integral and basic integration methods, the geometric sense of a definite integral.
3. The student has knowledge about on arithmetical operations on complex numbers and matrices, and their applications.
4. The student knows the equations of the straight line and the plane (in space) in various forms.

Skills:
1. The student uses the concept of limit function to study the behavior of a function at the end-points of the domain.
2.The student uses methods of differential calculus to study the properties of functions.
3. The student uses the integral calculus for calculations resulting from the needs of engineering practice.
4. The student can find solutions of simple polynomial equations in the set of complex numbers.
5. The student is able to use matrix operations to solve general systems of linear equations and is able to analyze the solvability of such systems.
6. The student uses mathematical formulas to describe basic geometric figures (straight line, plane) in three-dimensional space and analyzes their mutual position.

Social competences:
1. The student is able to reflect and critically assess his own achievements.
2. The student is aware of the usefulness of mathematical competence in engineering practice.

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%.

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. Elements of logic. Elements of set theory, the set of real numbers and basic properties. The concept of the relation.
2. Elementary functions of one variable.
3. Concept of limit function of one variable and applications.
4. Differential calculus of function of one variable.
5. Integral calculus of function one variable.
6. Series numbers, the concept of convergence of the series. Convergence tests of series.
7. Complex numbers . Arithmetic operations on complex numbers.
8. Matrix algebra. Systems of linear equations in many unknowns.
9. Fundamentals of solid analytic geometry.

Course topics

1. Elements of logic. Elements of set theory, the set of real numbers and basic properties. The concept of the relation (including equivalence relations and ordering relations). The scalar function.
2. Elementary scalar functions of one variable (formulas, graphs, properties). Sequences, limit of a sequence.
3. Concept of limit a function of one variable. Limits involving infinity and one-sided limits. Applications (asymptotes, continuity of functions).
4. 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..
5. 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 asolidof revolution.
6. Series numbers, the concept of convergence of the series. Convergence tests of series.
7. Complex numbers . Arithmetic operations on complex numbers. Simple polynomials equations (fundamental theorem of algebra).
8. Matrix algebra. Systems of linear equations in many unknowns. Gauss method.
9. 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

Lecture: lecture conducted in an interactive way with the formulation of questions to students.
Tutorials: Solving example tasks on the board. Detailed review of task solutions. Initiating discussion on solutions.

Bibliography

Basic
1. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 (Definicje, twierdzenia, wzory), Oficyna Wydawnicza GiS, Wrocław 2019.
2. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1, (Definicje, twierdzenia, wzory), Oficyna Wydawnicza GiS, Wrocław 2007.
3. W. Żakowski, Matematyka, T.1 i T.2, WNT, Warszawa 2003.
4. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T.1, T.2, PWN, Warszawa 2011.

Additional
1. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna (Przykłady i zadania), Oficyna Wydawnicza GiS, Wrocław 2020.
2. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka dla studentów uczelni technicznych, t. I, II i III, Wydawnictwo Politechniki Poznańskiej, Poznań 2004.

Breakdown of average student's workload

	Hours	ECTS
Total workload	207	9,00
Classes requiring direct contact with the teacher	107	5,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	100	4,00