COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1Eltech1>Mat2]

Course

Field of study
Electrical Engineering

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

Basic knowledge of mathematics defined by the core curriculum of mathematics education at the advanced level in secondary school. Differential and integral calculus of functions of one variable.

Course objective

Equipping the student with skills related to the use of concepts and methods of mathematical analysis of functions of several variables to describe and analyze problems in the field of technical sciences.

Course-related learning outcomes

Knowledge:
1. The student has a basic knowledge of the partial derivatives and the total differential of functions of several variables.
2. The student has knowledge of methods of calculation and applications of multiple integrals and line integrals to analyze physical problems.
3. The student has knowledge of power series representation and Fourier series representation of functions.
4. The student has knowledge of methods of solving selected ordinary differential equations.

Skills:
1. The student can apply partial derivatives to study local extremes and to indicate the direction of the fastest growth of the functions of two nad three variables.
2. The student can use a total differential of a function in approximate computations.
3. The student can calculate and apply multiple integrals and line integrals to describe and analyze some physical problems.
4. The student can solve simple ordinary differential equations of the first and second order.

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 two 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. Power series. Expanding some functions into a power series. Applying power series to approximate calculatios.
6. Fourier series.
7. First order differential equations. Second order linear nonhomogeneous differentisl equations with constant coefifcients.
8.The Laplace transform and application to initial-value problems for differential equations with constant coefficients.

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. Power series, the concept of convergence of the series, the study of convergence. Expanding a given function into power series.
6. Fourier series. Expanding a given function into Fourier series.
7. First order differential equations. First-order equqtions with variables separable. First-order linear differential equations. Second-order linear differential equations with constant coefficients.
8. The Laplace transform and application to initial-value problems for differential equations with constant coefficients.

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. W. Żakowski, Matematyka, T.2, WNT, Warszawa 2003
2. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T.1, T.2, PWN, Warszawa 2011
3. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (definicje, twierdzenia, wzory), Wydawnictwo GiS, Wrocław 2007
4. M. Gewert, Z. Skoczylas, Elementy analizy wektorowej (teoria, przykłady, zadania), Wydawnictwo GiS, Wrocław 2004

Additional
1. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka dla studentów uczelni technicznych, t.II i III, Wydawnictwo Politechniki Poznańskiej, Poznań 2004
2. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne (teoria, przykłady, zadania), Wydawnictwo GiS, Wrocław 2016

Breakdown of average student's workload

	Hours	ECTS
Total workload	170	6,00
Classes requiring direct contact with the teacher	75	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	95	3,00