COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematical Analysis [N1AiR1>AM]

Course

Field of study
Automatic Control and Robotics

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
part-time

Requirements
compulsory

Number of hours

Lecture
36

Laboratory classes
0

Other (e.g. online)
0

Tutorials
18

Projects/seminars
0

Number of credit points

6,00

Coordinators

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Lecturers

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Prerequisites

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

Course objective

Knowledge in differential and integral calculus which is necessary to study engineering sciences. Skills for application of acquired knowledge to theoretical as well as practical problems in other subjects as physics, technical science.

Course-related learning outcomes

Knowledge:
1. 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.

2. The student has a basic knowledge of the partial derivatives and the total differential of functions of several variables.
3. The student has knowledge of methods of calculation and applications of double integrals to analyze physical problems.
4. The student has knowledge of number series, power series representation and Fourier series representation of functions.

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 is able to analyze the properties of functions of one and two variables using the concepts and methods of differential calculus.
3. The student can use a total differential of a function and power series representation of some function in approximate computations.
4. The student is able to use the integral calculus of functions of one and two variables for calculations resulting from the needs of engineering practice.

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:

Knowledge acquired during lectures is verified by means of a test consisting of 5 questions. Passing threshold: 60%.
Skills acquired during tutorials are verified on the basis of three tests. Each test includes 3 tasks of varying difficulty assessed in the points system. Passing threshold: 55%

Programme content

Elementary functions and their properties. Composition of functions, inverse function (including inverse trigonometrical functions). Sequences and their properties. Theorems on finite and infinite limits of sequences. Concept of limit function and its applications.Continuous function and its properties. Derivative of real function. Properties of derivatives. Geometric sense of derivative of function at a point, differentiation rules. Mean value theorems. First and Second Derivative Test. L"Hospital"s Rule and its application. Derivative of higher orders. Taylor formula and expanding of functions into exponential series. Parametric function and its derivative. Indefinite integral. Methods of integration functions. Define integral and its geometric and mechanical applications. Improper integrals. Criteria of convergence of improper integrals. Partial derivatives and their application to search of extrema of functions of two variables. Applying total differential to approximate computations. Least squares method as an example of determining the local extremum of a function. Double integrals. Physical
applications of double integrals. Series numbers, convergence of series, absolute convergence. Convergence tests of series. Power series, the concept of convergence of the series, differentiation and integration of power series. Fourier series. Expanding some functions into power series and Fourier series. Applying power series to approximate calculations.

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. Initiate discussion on solutions.

Bibliography

Basic
1. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 (definicje, twierdzenia, wzory), Oficyna Wydawnicza GiS, Wrocław, 2011
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (definicje, twierdzenia, wzory), Oficyna Wydawnicza GiS, Wrocław, 2007
3. Analiza matematyczna w zadaniach, t. 1, t. 2, W. Krysicki, L. Włodarski, PWN, Warszawa, 2011

Additional
1. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 (przykłady i zadania), Oficyna Wydawnicza GiS, Wrocław, 2011
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (przykłady i zadania), Oficyna Wydawnicza GiS, Wrocław, 2007
3. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka dla studentów uczelni technicznych, t.II i III, Wydawnictwo Politechniki Poznańskiej, Poznań 2004

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	54	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	96	3,00