COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematical Analysis [S1AiR1>AM]

Course

Field of study
Automatic Control and Robotics

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
practical

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
30

Projects/seminars
0

Number of credit points

6,00

Coordinators

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Lecturers

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Prerequisites

Basic mathematical knowledge from secondary school. Skills of efficient evaluating of algebraic formulas. Basic knowledge of trigonometric, logarithmic and exponential functions. Efficient fraction and formulas transformation.

Course objective

Deep knowledge in mathematical logic, differential and integral calculus which is necessary to study automatic control and robotics. Skills for application of acquired knowledge to practical problems in area of technical sciences, especially automatic control and robotics.

Course-related learning outcomes

Knowledge:

1. Students know fundamental theorems in calculus and their application in practice.
2. Students have advavced knowledge in mathematical logic, set theory, sequence and series theory.
3. Students have advavced knowledge in differential and integral calculus.

Skills:
1. Students are able to present basic theorems of mathematical analysis and to apply them to solving problems illustrating concrete practical issues.
2. Students are able to use logical formalisms in order to build and analyse the simple mathematical models describing phenomena of technical disciplines.
3. Students have the ability to communicate in an understandable way (in speech and writing) mathematical reasonings and formulating theorems and definitions.
4. Students are able to apply the predicate calculus and quantifiers to solving of concrete mathematical problems.

Social competences:
1. Students are able to formulate presisely questions in order to deepen understanding of a given subject or to find the missing elements of reasoning.
2. Students have awareness of the limitations of own knowledge and understanding the need of further education in sciences technical topics.
3. Students are aware of the responsibility for own work and they are ready to adopt teamwork rules.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture:
Valuation of knowledge and skills during oral and written exam. 50% credit score threshold. Illustrative examples and issues are sent to students via University e-mail system.
Tutorials:
Two large tests concerning an application of knowledge from the lectures in exercises. Systematic control of theoretical knowledge in form of short quizes. Valuation of student answers during lessons. Valuation of activity during lessons.

Programme content

Calculus of sentences and quantifiers Elements of the set theory. General theory of relations. Equivalence and ordering relations. Infimum and supremum of sets. Sequences and their properties. Theorems on finite and infinite limits of sequences. Subsequences. Convergence tests of series. Cauchy product of series. Mertens Theorem. Elementary functions and their properties. Continuous functions and their properties. Function sequences and function series. Pointwise convergence and uniform convergence. Cauchy-Hadamard Theorem. Derivative of real function. Properties of derivatives. Mean value theorems. First and Second Derivative Test. D'Hospitale Theorem and its application. Derivatives of higher order. Taylor formula and expansion of functions into exponential series. Derivatives of implicit functions. Elementary complex functions. Indefinite integral. Fundamental methods of integration. Geometric applications of definite integral. Differential calculus of multivariable functions. Local extrema of functions of ceveral variables. Directional derivative of functions of two and three variables and its applications. Total derivative and its applications to approximate calculations. Multiple integrals and their applications. Line integrals of a scalar and vector fields. Surface integrals. Elements of differential equations.

Teaching methods

Lecture:
1. The lecture conducted in an interactive way with formulating questions for a group of students or for selected students.
2. The theory presented in relation to the current knowledge of students.
3. 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. G. M. Fichtenholz, Rachunek różniczkowy i całkowy, PWN, Warszawa 2007.
2. H. J. Musielakowie, Analiza matematyczna, Wydawnictwo Naukowe UAM 2000
Additional
1. M. Gewert. Z. Skoczylas, Analiza matematyczna 1 i 2, przykłady i zadania,Oficyna wydawnicza GiS Wrocław 2019
2. W. Kołodziej, Analiza Matematyczna, PWN, Warszawa 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	170	6,00
Classes requiring direct contact with the teacher	90	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	80	3,00