COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematical Analysis I [S1MNT1>AM1]

Course

Field of study
Mathematics of Modern Technologies

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
0

Tutorials
60

Projects/seminars
0

Number of credit points

9,00

Coordinators

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Lecturers

Prerequisites

Basic mathematical knowledge of high school. Knowledge of trigonometric, exponential and logarithmic func- tions. The ability to efficient transformation of formulas and performing basic algebraic operations on frac- tions.

Course objective

In-depth mastery of the theory of sequences and number series, as well as differential and integral 2 calculus necessary for the study of mathematics. Having the ability to apply the acquired knowledge, both to theoretical and practical issues in other areas, e.g. in physics, chemistry, technology and economics.

Course-related learning outcomes

Knowledge:
• knowledge and understanding at an advanced level of mathematical analysis, including definitions, theorems, proofs, methods of proving, terminology, also in a foreign language [K_W01(P6S_WG)];
• knowledge of the basic theorems of mathematical analysis and their proofs. Understanding the role and importance of the proof in mathematics and the significance of assumptions. Mastering the structure of mathematical theories. Knowledge and understanding of the relationship between mathematical

analysis and other disciplines, in particular the use of mathematical tools to describe technical and economic phenomena and problems [K_W03(P6S_WG)].

Skills:
• ability to apply at an advanced level of basic theorems of mathematical analysis and their proofs [K_U01(P6S_UW)].

Social competences:
• background for a critical evaluation of the obtained research and analysis results [K_K01(P6S_KK)];
• awareness of the limitation of own knowledge and understanding the need for further education [K_K02(P6S_KK)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: valuation of knowledge and skills demonstrated in the written and oral exam
Tutorials: control of the ability to use the knowledge provided during lectures for solving tasks in the form of two tests; systematic control of the acquired theoretical knowledge in the form of a few short tests; valuation of the student's answers during the classes; valuation of student activity in the classroom.

Programme content

Update: 01.06.2023r.
Lectures& Tutorials:
• infimum and supremum of sets;
• theorems on finite and infinite limits of real sequences;
• subsequences and problems related to Bolzano-Weirstrass theorem;
• real series;
• criteria for convergence of non-negative term series;
• Cauchy product of two infinite series;
• mertens theorem;
• elementary functions and their properties;
• continuous functions and their properties;
• function sequences and function series;
• poinwise convergence and uniform convergence;
• Cauchy-Hadamard theorem;
• derivatives of a real valued functions;
• properties of derivatives;
• mean value theorems for differential calculus;
• applications differential calculus to investigation of function variability;
• L'Hospital's rule and its applications;
• derivatives of higher orders;
• taylor's formula and expansion of function to power series;
• indefinite integral and its properties;
• basic methods of integration;
• definite integral and its properties;
• the mean value theorems for definite integrals;
• theorems on taking limits under the integral sign;
• riemann integral;
• applications of Riemann integral;
• improper integrals.

Course topics

Lectures& Tutorials:
• infimum and supremum of sets;
• theorems on finite and infinite limits of real sequences;
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• real series;
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• riemann integral;
• applications of Riemann integral;
• improper integrals.

Teaching methods

Lectures:
• the lecture conducted in an interactive way with formulating questions for a group of students or for selected students;
• the theory is presented in relation to the current knowledge of students;
• student activity during classes is taken into account when the final grade is considered.
Tutorials:
• solving sample tasks on the board;
• detailed reviewing of task solutions and discussions with comments;
• initiating discussions on solutions.

Bibliography

Basic:
• G. M. Fichtenholz, Rachunek różniczkowy i całkowy, PWN, Warszawa 2007;
• H. J. Musielakowie, Analiza matematyczna, Wydawnictwo Naukowe UAM 2000.

Additional:
• W. Rudin, Analiza rzeczywista i zespolona, PWN, Warszawa 1998;
• A. Sołtysiak, Analiza matematyczna, cz. I, cz. II. WN UAM, Poznań 2004;
• W. Swokowski, Calculus with analytic geometry, Prindle, Weber & Schmidt Publishers 1998.

Breakdown of average student's workload

	Hours	ECTS
Total workload	225	9,00
Classes requiring direct contact with the teacher	122	5,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	103	4,00