COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematical Analysis I [S1MwT1>AM1]

Course

Field of study
Mathematics in Technology

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
60

Projects/seminars
0

Number of credit points

8,00

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 transformation.

Course objective

Deep knowledge in mathematical logic, differential and integral calculus which is necessary to study mathematics and engineering sciences. Skills for application of acquired knowledge to theoretical as well as practical problems in other subjects as chemistry, physics, engineering, economy.

Course-related learning outcomes

Knowledge:
Knowledge of fundamental theorems in calculus and their proofs. Understanding the structure of

mathematical theories, the use of logical formalisms in order to build and analyse the simple mathematical models describing phenomena of technical disciplines. Advavced knowledge possession in mathematical logic, set theory, sequence and series theory. fluent knowledge in differential and integral calculus.
Skills:
Ability to present basic theorems of mathematical analysis and their proofs. The skill of construction of examples illustrating concrete mathematical notions and counterexamples disproving hypothesis. He knows how to use mathematical theories in selected technical topics. Ability to understand the structure of mathematical theories and to use logical formalisms in order to build and analyse the simple mathematical models describing phenomena of various scientific disciplines. Ability to perform correctly a mathematical reasoning, formulate theorems and definitions, use the predicate calculus and quantifiers.
Social competences:
Precise wording of questions in order to deepen understanding of a given subject or to find the missing elements of reasoning. Awareness of the limitations of own knowledge and understanding the need of further education in sciences technical topics.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Valuation of knowledge and skills during oral and written and oral exam.
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. Elementy teorii mnogości. General theory of relations. Equivalence and ordering relations. Theory of cardinality. Construction of the Real and the complex numbers. Infimum and supremum of sets. Sequences and their properties. Theorems on finite and infinite limits of sequences. Subsequences and problems connected with Bolzano-Weierstrass theorem. Cauchy condition and its relationship with convergence of a sequence Series. Convergence tests of series. Elementary functions and their properties. Continuous functions and their properties. Derivative of real and complex function. Properties of derivatives. Mean value theorems. First and Second Derivative Test. D'Hospitale Theorem and its application. Indefinite integral. Recurence formulas for integration. Basic methods of integration.

Teaching methods

Lectures:
• lecture conducted in an interactive way with formulating questions to a group of students or to indicated specific students;
• theory presented in connection with the current knowledge of students;
• students' activity during classes is taken into account when issuing the final grade.
Exercises:
• solving exemplary tasks on the board;
• detailed review of problem solutions and discussion of 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	220	8,00
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)	98	3,00