COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematical Analysis II [S1MwT1>AM2]

Course

Field of study
Mathematics in Technology

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
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

Student is familiar with the knowledge of calculus from the first semester. In particular, student has skills of efficient evaluating limits of sequences, derivatives of functions. Using method of calculus in concrete practical situations.

Course objective

Providing students with deep knowledge of differential and integral calculus (real functions of one and many variables) necessary for further study of mathematics. Obtaining the ability to apply the acquired knowledge, both to theoretical and practical issues in other fields - in physics, chemistry, technology and economics.

Course-related learning outcomes

Knowledge:
• the student is able to use the advanced differential and integral calculus, among others theory of func tions of several variables and theory of ordinary differential equations;

Skills:
• the student is able to prove an important theorems of mathematical analysis and to support it by examples;
• the student can interpret and explain functional relationships given in the form of formulas, tables, graphs, schemes and use them in practical problems;
• the student can apply theorems and methods of the single and multivariable calculus in optimization problems. He is able to find the global and local extrema and analyse of functions in order to construct the graph of them. He can explain the correctness of his reasoning.

Social competences:
• the student can formulate questions precisely in order to deepen his own understanding of a given subject or to find the missing elements of reasoning;
• the student is able to find information in literature on one’s own including literature written in foreign languages.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
• Assessment of knowledge and skills demonstrated in the oral exam.
Tutorials:
• Control of the ability to use the knowledge provided during the lectures to solve tasks in the form of two tests.
• Systematic control of acquired theoretical knowledge in the form of several short tests.
• Evaluation of student's answers during classes.
• Evaluation of class activity.

Programme content

The definite integral and its mechanical and geometric applications. Improper integrals. Convergence criteria of improper integrals. Application of improper integrals. Functional sequences and series. Pointwise convergence and uniform convergence. Power series and their properties. The Cauchy-Hadamard theorem. Metrics in the plane and in space. Limit and continuity of functions of many variables. Partial derivatives. Total differential and Taylor's formula for functions of many variables. The use of partial derivatives to find the extremes of functions of many variables. Implicit functions. Searching for extrema of an implicit function. Jordan measure. Multiple integrals and their geometrical and physical applications. Curvilinear integrals undirected in the plane and in space. Geometrical and physical applications of undirected line integrals. Directed line integrals and their properties. Methods of calculating directed line integrals. Green's theorem and its applications. Surface integrals of scalar fields and their properties. Geometrical and physical applications of surface integrals of scalar fields. Elements of field theory. Surface integrals of vector fields and their properties. The Gauss-Ostrogradski theorem and its applications. Stokes' theorem and its applications.

Teaching methods

Lectures:
• theory presented in connection with the current knowledge of students;
• presenting a new topic preceded by a reminder of related content, known to students from other subjects;
• during the lecture, frequent discussion initiation;
• recommending materials for self-completed information.
Tutorials:
• tasks closely related to the theory presented during the lecture;
• solving exemplary tasks on the board;
• detailed review of the solutions to the exercises by the teacher and discussion of the comments;
• taking into account students' activity during classes when issuing the final grade.

Bibliography

Basic
• G. M. Fichtenholz, Rachunek różniczkowy i całkowy, PWN, Warszawa 2007.
• F. Leja, Rachunek różniczkowy i całkowy, PWN, Warszawa 1971.
• 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