COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematical Analysis II [S1MNT1>AM2]

Course

Field of study
Mathematics of Modern Technologies

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
0

Tutorials
60

Projects/seminars
0

Number of credit points

9,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematical analysis I, in particular the ability to use the notion of the limit of sequence and function, calculate derivatives and integrals and use them in concrete practical situations.

Course objective

Provide students with deep knowledge of differential and integral calculus (real functions of several real variables) necessary for the further 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 of advanced differential and integral calculus, including multivariable functions and Fourier series theory. Mastering definitions, theorems, proof, methods of proving, terminology, also in a foreign language. [K_W01(P6S_WG)];
• knowledge of the basic theorems of mathematical analysis II and their proofs. Mastering and understanding the relationship between mathematical analysis and other disciplines, in particular the use of

mathematical analysis tools to describe technical and economic problems [K_W03(P6S_WG)].

Skills:
• the ability to proving and applying the most important theorems of mathematical analysis II and to constructing examples and counterexamples [K_U01(P6S_UW)].

Social competences:
• backgroundforacriticalevaluationoftheobtainedresultsofresearchandanalyzes[K_K01(P6S_KK)];
• background for further education due to the awareness of the limitations of one's own knowledge [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::
• metrics on two and three dimensional spaces;
• limit and continuity of function of several variables;
• partial derivatives;
• total derivative and Taylor formula for functions of several variables;
• application of partial derivatives to finding extrema of multivariable functions;
• conditional extrema;
• implicit function theorem;
• tests for finding of extrema of implicit functions;
• Jordan measure;
• multiple Integrals and their geometric and physical applications;
• scalar line integral along a curve in the plane and in the space;
• geometric and physical applications of scalar line integrals;
• vector line integrals and their properties;
• methods of calculating of vector line integrals;
• Green theorem and its applications;
• surface integral of scalar fields and their properties;
• geometric and physical applications of surface integral of scalar fields;
• elements of the theory of vector fields;
• surface integral of vector fields and their properties;
• Gauss-Ostrogradski theorem and its applications;
• Stokes theorem and its applications;
• Fourier series;
• minimum property of Fourier coefficients;
• Bessel and Parseval inequality;
• criteria for uniform convergence of Fourier series;
• applications of Fourier series to description of oscillatory phenomena.

Course topics

Lectures& Tutorials::
• metrics on two and three dimensional spaces;
• limit and continuity of function of several variables;
• partial derivatives;
• total derivative and Taylor formula for functions of several variables;
• application of partial derivatives to finding extrema of multivariable functions;
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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