POZNAN UNIVERSITY OF TECHNOLOGY
EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematical analysis [S2MwT1>AM]

Course

Field of study
Mathematics in Technology

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge with range of differential and integral calculus (from 1 degree studies).The skills of finding derivatives, integrals and analyzing the function of real variable . He has consciousness of need of broadening his competences, readiness to undertaking of co-operation .

Course objective

The recognizing of notion of function variation and Riemann-Stielties integral, the learning of Lebesgue measure and the notion of general measure. The conquest the skill of operations on measurable functions. The recognizing the general notion of integral with respect to measure, applying it to line integral and Lebesgue integral, the getting known relations between Riemann and Lebesgue integral, the getting skill of analyzing several kinds of converging of sequences of measurable functions.

Course-related learning outcomes

Knowledge:
1. has the knowledge of notions of function variation, Riemann-Stielties integral, can explain notions of open set measure, the Lebesgue measure, notion of algebra and sigma-algebra, notion of measure in sigma-algebra of sets, notion of measurable function and integral with respect to measure.

2. understand differences between several kinds of convergence of function sequences (pointwise convergence, uniform convergence, convergence almost everywhere.
3. is aware of the relationship between the theory of measure and integral with the notions of the probability theory and with the currently developed theory of the Banach function spaces.

Skills:
1. calculate the variation of function and Riemann-Stielties integral.
2. He can think and act in a mathematically correct way in the area of the theory of measure and integral, calculate Lebesgue measure, calculate the counting measure of sets, calculate integral with respect to measure, line integral, Lebesgue integral (simple examples)

Social competences:
1. is aware of the role and importance of knowledge in solving problems of a cognitive and practical nature, typical of professions and jobs appropriate for graduates of the studied field; is aware of the need to deepen and broaden knowledge.
2. is aware of its social role as a graduate of a technical university, is ready to communicate popular scientific content to the society and identify and resolve basic problems related to the field of study

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lecture
- assessment of knowledge and skills at the written exam checking knowledge of concepts and the ability to prove theorems and illustrate the theory with examples (short practical tasks are also possible).
Passing threshold: 50% of points. Exam issues on the basis of which questions are prepared will be sent to students by e-mail using the university e-mail system.
Tutorials:
- continuous evaluation - rewarding the activity (additional points) manifested in the discussion and in cooperation in solving practical tasks,
- continuous assessment - rewarding the increase of skills in using the techniques learned,
- obtaining additional points for activity during classes, including the presentation of papers discussing additional aspects of issues, in particular the application of the theory in other sciences or a reference to the place in the history of mathematics,
- active participation in consultations deepening knowledge and directing further work.
Knowledge acquired as part of the exercises is verified by two tests carried out on about 7 and 15 exercises. Passing threshold: 50% of points.

Programme content

Lecture: theoretical issues (definitions, lemmas, theorems, corollaries, algorithms) and suitable examples for the issues:
Functions with finite variation and Riemann-Stielties integral (application to line integrals). Theory of measure and integral (general notion of measure, Lebesgue measure, counting measure, measurable functions and sequences of measurable functions, integral with respect to a measure, in particular Lebesgue integral). Relations between the theory of measure and integral with the basic concepts of the probability theory. A short reference to the recently developed theory of the Banach function spaces.
Tutorials: solving practical problems illustrating the concepts discussed and examples of problems using the theoretical machinery of the lecture, e.g .:
calculating of the function variation, the Riemann-Stielties integral and line integrals, finding the Lebesgue measure and counting measure of sets (simple examples), checking if a given set is Lebesgue measurable, finding the Lebesgue integral and the integral with respect to general measure (simple examples), studying the convergence of function sequences (pointwise and uniform).

Teaching methods

-Lectures
1. a lecture on an interactive board with questions for a group of students,
2. students" activity (preparation of historical reports on the subject of mathematicians related to the

presented material, reports about the applications of algebra in engineering sciences, presentation of proofs left to be done independently) during classes can increase the final assessment,
3. initiating discussions during the lecture,
4. theory presented in connection with the current knowledge of students from previous lectures.
-Tutorials:
1. solving sample tasks on the board
2. detailed reviewing the solutions of tasks by the teacher and discussions on comments.

Bibliography

Basic
1. H. J. Musielak , Analiza matematyczna, tom II, część 1, Wydawnictwo Naukowe UAM, Poznań 1999.
2. J. Musielak i M. Jaroszewska, Analiza matematyczna, tom II, część 2, Wydawnictwo Naukowe UAM, Poznań 2002.
3. J. Musielak i M. Jaroszewska, Analiza matematyczna, tom II, część 3, Wydawnictwo Naukowe UAM, Poznań 2002.
4. W. Rudin, Podstawy analizy matematycznej, Państwowe Wydawnictwo Naukowe, Warszawa 2000.
5. W. Krysicki i L. Włodarski, Analiza matematyczna 2, Państwowe Wydawnictwo Naukowe, Warszawa 2011.
Additional
1. R. Leitner, W. Matuszewski i Z. Rojek, Zadania z matematyki wyższej, część II Wydawnictwo Naukowo-Techniczne, Warszawa 2003.
2. R. Leitner, Zarys matematyki wyższej dla studentów, część II, Wydawnictwo Naukowo-Techniczne, Warszawa 1995.
3. S. Hartman i J. Mikusiński, Teoria miary i całki Lebesguea, Państwowe Wydawnictwo Naukowe, Warszawa 1957.

Breakdown of average student's workload

	Hours	ECTS
Total workload	110	4,00
Classes requiring direct contact with the teacher	65	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	2,00