COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematical Analysis II [S1SI1E>ANA2]

Course

Field of study
Artificial Intelligence

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
30

Projects/seminars
0

Number of credit points

5,00

Coordinators

prof. dr hab. inż. Paweł Kolwicz
pawel.kolwicz@put.poznan.pl

Lecturers

Prerequisites

The knowledge from the area of calculus I and linear algebra. The abilities of solving some problems of linear algebra and calculus. Awareness of the necessity to improve the knowledge and expertise, readiness to undertake a cooperation in the team.

Course objective

The goal of the subject is to attain the knowledge from the area of the selected topics in Calculus II and to get the skills that allow to apply the obtained knowledge to analize the mathematical problems.

Course-related learning outcomes

Knowledge:
Knows and understands in an advanced level selected facts, objects and phenomena, as well as methods and theories explaining the complex relations between them, constituting extended knowledge of mathematics [K1st_W1]

Skills:
Is able to work individually and in a team; is able to plan and organize work – both individually and in a

team; is able to estimate the time needed to complete a task; is able to develop and implement a work schedule ensuring that deadlines are met. The graduate is able to determine and use models of the selected mathematical problems as well as to use them for the analysis and design of computer science [K1st_U3]

Social competences:
Is ready to critically evaluate received knowledge and content. Is ready to recognize the importance of knowledge and to consult experts in solving the problem [K1st_K2]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture:
- grading knowledge and abilities showed in an written exam
Exercises:
- testing knowledge and preparation to exercises,
- awarding practical knowledge obtained during the previous exercies and lectures,
- grading knowledge and abilities related with calculations,
- tests for exercises and/or written elaboration (that can be made partially outside of exercises)

Programme content

1. INDEFINITE, DEFINITE INTEGRALS AND IMPROPER INTEGRALS

2. REAL VALUED SERIES AND POWER SERIES.

3. FUNCTIONS OF SEVERAL VARIABLES

4. DIFFERENTIAL EQUATIONS AND PARTIAL DIFFERENTIAL EQUATIONS

Course topics

1. INDEFINITE, DEFINITE INTEGRALS AND IMPROPER INTEGRALS
Definition of indefinite integral, definition of Riemann"s integral, geometrical interpretation of the definite integral, Newton-Leibniz Theorem, properties of integrals, the rule for integration by substitution and integration by parts, integral of rational function, inverse substitution, application of the definite integral (the area of the bounded region, the length of the curve, volumes of the cylindrical shells and surface area of revolution, improper integrals of type I and II.

2. REAL VALUED SERIES AND POWER SERIES.
Definition of a series, sum of a series, convergence of a series, d"Alembert Theorem, Cauchy Theorem, Comparison Theorem, Integral Comparison Theorem, alternating series, Leibniz Theorem for alternating series, absolute convergence and conditional convergence, power series, radius of convergence and interval of convergence, Taylor series and Maclaurin series.

3. FUNCTIONS OF SEVERAL VARIABLES
Domain and image of functions of several variables, limit of functions of several variables, partial derivatives, local and global extreme points of functions of several variables.

4. DIFFERENTIAL EQUATIONS AND PARTIAL DIFFERENTIAL EQUATIONS
Definition of differential equations and partial differential equations, particaular integral and general integral, Cauchy"s problem, partial differential equations of separation of variables, linear, introduction to partial differential equations (linear equations of first and second order)

Teaching methods

Lectures – the lecture is organized with the multimedia presentations and complemeted with many examples, showing an application of the presented issues.
Tutorials – discussing open problems, comprehensive analysis for selected problems in mathematics,

initiation open discussion devoted to methods which might be used to solve problems related to selected topis in mathematics, grading homeworks.

Bibliography

Basic
[AE] R. A. Adams, C. Essex, “Calculus. A Complete Course”, 4th Edition, 1999.
[Eu] N. Euler, A First Course in Ordinary Differential Equations, Luleå 2015, 232 pp., https://bookboon.com/en/a-first-course-in-ordinary-differential-equations-ebook
[Kr] E. Kreyszig, Advanced Engineering Mathematics, Wiley, 7th Edition, 1993,
Chapters 1–3 and 11.
Additional
[T] G. B. Thomas, “Thomas’ Calculus”, Thirteenth Edition in SI Units, PEARSON Education Limited 2016, ISBN 10: 1-292-08979-2; ISBN 13:978-1-292-08979-9

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	63	2,50