



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Calculus I

Course

Field of study

Artificial Intelligence

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

1 / 1

Profile of study

general academic

Course offered in

English

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

Other (e.g. online)

Tutorials

30

Projects/seminars

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

dr hab. Maciej Ciesielski

Responsible for the course/lecturer:

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Prerequisites

The knowledge from the area of high school mathematics. 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 I and to get the skills that allow to apply the obtained knowledge to analyze 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:

Lecture:

- grading knowledge and abilities showed in an written exam

Exercises:

- testing knowledge and preparation to exercises,
- awarding practical knowledge obtained during the previous exercises and lectures,
- grading knowledge and abilities related with calculations,
- test for exercises and/or written elaboration (that can be made partially outside of exercises)

Programme content

1. FUNCTION OF ONE VARIABLE AND AND PROPERTIES

Definition of a function, domain, image of a function, graph of a function, monotonic function, bounded function, periodic function, even, odd, composite function, surjection, injection, inverse function, logarithmic function, trygonometric and inverse trygonometric function, hyperbolic function and inverse hyperbolic function, implicit function, parametric function, curve in spherical coordinates

2. REAL VALUED SEQUENCES

Definition of a sequence, bounded sequence, monotone sequence, limit of a sequence, convergent sequence, divergence sequence, Squeeze Theorem, properties of the limit of a sequence



3. LIMIT OF FUNCTION AND CONTINUITY

Definition of the limit of a function, proper and improper limit of a function, left- and right-hand limits, properties of the limit of a function and Squeeze Theorem, undefined expressions, continuity of a function, properties of a continuous function (namely Weierstrass Theorem and Darboux Theorem), discontinuity of type I and II.

4. DERIVATIVE OF FUNCTIONS

Definition of the derivative of a function, geometrical interpretation of the derivative, left- and right hand derivatives, properties of the derivative of the functions, chain rule, tangent line, total derivative, application of total derivative, higher derivatives, Leibniz Theorem, properties of a differentiable function, de' Hospital's rule, Taylor formula and Maclaurina formula and applications, asymptotes, global and local extreme points, monotonicity of a function, inflection points of a function, concavity and convexity, applications of extreme points.

5. INDEFINITE INTEGRALS

Antyderivative, the rule for integration by substitution and integration by parts, decomposition of the rational function into the simple fractions, the rule for integration of rational function, integration of trygonometric functions and irrational functions.

Teaching methods

Lectures – the lecture is organized with the multimedia presentations and complemented with many examples, showing an application of the presented issues.

Exercises – 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 topics in mathematics, grading homeworks.

Bibliography

Basic

Marian Gewert, Zbigniew Skoczylas; *Analiza matematyczna 1 Definicje, twierdzenia, wzory*; Wydanie XXVI poprawione Wrocław 2019, str. 160

Fichtenholz, G. M. *Rachunek różniczkowy i całkowy. Tom 1. (Polish) [Differential and integral calculus. Vol. 1]* Translated from the Russian by Ryszard Bittner, Bolesław Gleichgewicht and Tadeusz Huskowski. Eleventh edition. Wydawnictwo Naukowe PWN, Warsaw, 1997. 550 pp.

Additional

James Stewart; *Calculus: Early Transcendentals, 6th Edition*; Thomson Higher Education, Belmont, CA, 2008.



Breakdown of average student's workload

	Hours	ECTS
Total workload	127	5,0
Classes requiring direct contact with the teacher	64	2,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	63	2,5

¹ delete or add other activities as appropriate