COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics

Course

Field of study

Architecture

Year/Semester

I/1

Area of study (specialization)

-

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

english

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

0

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

Dr Alina Gleska

Institute of Mathematics

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Responsible for the course/lecturer:

Prerequisites

Student has basic knowledge of elementary functions, algebraic operations, analytical geometry, trigonometry and mathematical analysis.

Students should be able to solve simple rational equations and inequalities, to give domains of elementary functions and to know their curves.

Students seriously treat the process of studying.

Course objective

The aim of subject is introduction to complex numbers and their some practical applications. Differential and integral calculus of one variable are presented together with their applications in mathematics. The elements of algebra will be presented.

Course-related learning outcomes

Knowledge

B.W4. mathematics, space geometry, statics, material strength, shaping, construction and dimensioning of structures, to the extent necessary to formulate and solve tasks in the field of architectural and urban design;

Skills

-

Social competences

-

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - written exam during session

Tutorials - one long test + activity

Assessment criteria:

below 50% - 2,0 50%-59% - 3,0 60%-69% - 3,5

70%-79% - 4,0 80%-89% - 4,5 90%-100% - 5,0

Programme content

Complex numbers – short history; algebraic form (modulus, conjugate numbers, arithmetics, square roots), trigonometric form (de Moivre's formula, theorem about calculating roots).

Definition of sequences. Monotonicity, boundedness and limits of sequences. Theorem about the uniqueness of a limit. Arithmetics of proper and improper limits. The sandwich theorem (about three sequences). Definition of Euler's constant. Many examples.

Definition of a function. Domain and range of functions. Monotonicity of functions. Odd and even functions. Periodicity. Compound functions.Inverse functions.

Review of elementary functions – polynomials, power functions,exponential functions, logarithmic functions, trigonometric ones, the inverse trigonometric functions (arcus) – formulas, graphs, properties.

Limits of the functions at a point.Arithmetics of proper limits. One-handed limits. Improper limits.

Definition of the derivative at a point. Geometric interpretation. Equations for a tangent line and a normal line. Rules for differentiation (especially for compound functions).

Extrema of functions - global and local. Criteria for existing such extrema. Higher order derivatives.

Antiderivative of a function, indefinite integrals. Integrals of elementary functions. Integration by parts and integration by substitution. Integration of rational functions. Integration of trigonometric functions (universal substitution).

Definition of definite integrals. Relations between indefinite and definite integrals. Integration by parts and integration by substitution for definite integrals. Geometric interpretation of definite integrals. Applications of definite integrals (areas, volumes of solids, arches length etc).

Matrices. Arithmetic operations for matrices. Determinants of matrices (Laplace's expansions with respect to rows or columns).

Solutions of Cramer's systems of linear algebraic equations using determinants.

Gauss-Jordan elimination method of solving systems of linear algebraic equations (systems with one solution, with infinitely many solutions or without solutions).

Vectors in space R3. Operations on vectors (also using their coordinates) . Dot product of two vectors and the criterium of orthogonality of two vectors. Cross product and the criterium of parallelity of two vectors. Triple product. Applications of products for calculating areas of parallelograms and triangles, and volumes of tetrahedrons and parallelepipeds.

Definition of the function of many variables. Geometric interpretation of function of two variables. Domain of functions. Partial derivatives of I and II order of function of two and three variables. Schwarz's theorem about mixed derivatives. Local extrema of functions of two and three variables.

Teaching methods

Both form can be taught remotely.

Lecture - multimedial presentation + examples on the blackboard/paper

Tutorials - solving problems; discussion about obtained results

Bibliography

Basic

1. Lectures in English placed on Moodle platform

2. C. L. Mett, J. C. Smith, Calculus with applications, McGraw-Hill Book Company, 1985.

3. E. W. Swokowski, Calculus: with analytic geometry, Boston, 1983.

4. W. Żakowski, Matematyka, T.1 i T.2, WNT, Warszawa 2003.

5. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 (Definicje, twierdzenia, wzory), GiS, Wrocław 2011.

6. M. Gewert, Z. Skoczylas, Analiza matematyczna 1 (Przykłady i zadania), GiS, Wrocław 2011.

7. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna 1, (Definicje, twierdzenia, wzory), GiS, Wrocław 2007.

8. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna 1, (Przykłady i zadania), GiS, Wrocław 2007.

Additional

1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T.1, T.2, PWN, Warszawa 2011.

2. M. Grzesiak, Liczby zespolone i algebra liniowa, Wydawnictwo PP, Poznań 1999.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for tutorials, preparation for tests/exam) [1]	55	2,0

[1] delete or add other activities as appropriate