COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1IŚrod2>Mat1]

Course

Field of study
Environmental Engineering

Year/Semester
1/1

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
45

Laboratory classes
0

Other
0

Tutorials
30

Projects/seminars
0

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge with range of secondary school. The ability to associate facts, information processing, reasoning, interpretation and ability to reflect. Student understands the need and cnows the possibility of studying, improving language skills, professional, personal and social skills.

Course objective

The recognizing methods and applications of mathematical analysis and linear algebra.

Course-related learning outcomes

Knowledge:
1. The student explains the basic mathematical laws and explains conditions for their application.
2. The student knows rules for finding derivative, indefinite and definite integrals and their applications.

Skills:
1. The student uses the literature and also other sources of knowledge.
2. The student uses calculus in calculations resulting from the needs of engineering practice.

3. The student formulates simple conclusions on the basis of results.

Social competences:
1. The sens of usefulness of mathematical competence in engineering practice.
2. The ability to work in a team.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

LECTURE.A two-part written examination at the and of the semestr:
-sat.1 theoretic knowledge;
-sat.2 applications in practical exercises.
Duration of test: 70 minutes.
Classes: tests during the semestr (5x30 minutes).

Programme content

-Complex numbers.
-Elementary function and sequences of numbers.
-Differential and integral calculus.De L'Hospital rule.
-Trigonometric and rational integrals, partial fractions and quadratic expressions, miscellaneous substitutions. areas, lenghts of curves, the area and the volumeof the surface of revolution obtained by revolving C about the x-axis.. Integrals with infinite limits of integration.
-Functions of several variables. Partial derivatives, differentials, extrema of functions of several variables.

Course topics

Lecture
Sequences of -properties, theorems about convergent and divergent sequences.
Functions - examples of elementary functions, properties of functions - monotonicity, heterovalence, parity, periodicity.
Determination of the inverse function, cyclometric functions.
Function Boundary, Continuity .
Derivative of a function - fundamental theorems, derivative of a complex function.
Derivative of the inverse function. Derivative of a function in exponential form. Derivative of a function in parametric form. Differential of a function, tangent to a curve. the rule of de l'Hospital.
De l'Hospital's rule and other indefinite symbols, asymptotes.
Lagrange's theorem of the mean value and conclusions. Study of monotonicity of function.
A necessary condition and sufficient conditions for the existence of an extremum of a local function. The largest and smallest value of the function in the interval. Feature convexity and inflection points.
The course of function variation. Drawing a graph of a function based on a table. Determining the domain of functions of many variables. Partial derivative of a multivariate function.
Partial derivatives of the second order, Schwarz's theorem, differentials, extrema of functions of several variables.. Complete differential with applications. Surfaces in R^3 space.
Definition of the integral.
Integral of elementary functions – basic formulas. Integration by substitution, integration by parts.
Integration from recursive formulas Definition of a rational function. Simple fractions, decomposition of a rational function into simple fractions, integration of simple fractions of type I. and II.
Integration of trigonometric functions, universal substitution.
Integration of trigonometric functions continued. Integration of selected irrational functions.
Definite integral - definition, geometric interpretation and properties. Newton-Leibniz theorem. Integral average. Calculation of the area bounded by curves using the definite integral - curves in the explicit form.
Calculation of the area bounded by curves using the definite integral - curves in parametric form.
Use of definite integrals to calculate volumes and areas of solids of rotation.
Calculating the arc length of a curve using the definite integral.

Practical lessons.
Complex numbers: algebraic and trigonometric forms. Representation of a complex number on a plane. Operations on complex numbers. Exponentiation and root of complex numbers. Solving equations in the set of complex numbers.

Sequences of -properties, theorems about convergent and divergent sequences.
Determination of the inverse function, cyclometric functions.
Function Boundary, Continuity .
Derivative of a function, derivative of a complex function.
Derivative of the inverse function. Derivative of a function in exponential form. Derivative of a function in parametric form. Differential of a function, tangent to a curve. the rule of de l'Hospital.
De l'Hospital's rule and other indefinite symbols, asymptotes.
Study of monotonicity of function.
A necessary condition and sufficient conditions for the existence of an extremum of a local function.
Feature convexity and inflection points.
The course of function variation. Drawing a graph of a function based on a table. Determining the domain of functions of many variables. Partial derivative of a multivariate function.
Partial derivatives of the second order, Schwarz's theorem, differentials, extrema of functions of several variables.. Complete differential with applications.
Definition of the integral. Integration by substitution, integration by parts.
Integration from recursive formulas. Decomposition of a rational function into simple fractions, integration of simple fractions of type I. and II.
Integration of trigonometric functions, universal substitution.
Integration of trigonometric functions continued. Integration of selected irrational functions.
Definite integral,geometric interpretation and properties. Newton-Leibniz theorem. Calculation of the area bounded by curves using the definite integral - curves in the explicit form.
Calculation of the area bounded by curves using the definite integral - curves in parametric form.

Teaching methods

Traditional education:
Lecture with presentation supplemented by examples given on the board. Interactive lectures with problems and questions for students. The activity of students is taken into account in valuation of them. Discussion during lectures is expected.
Connections with others mathematical subjects are indicated.
Practical lessons. Solving of exemplary exercises on a blackboard. Discussion of solutions with relative comments.

Bibliography

Basic:
1. W. Stankiewicz, J. Wojtowicz, Zadania z matematyki dla wyższych uczelni technicznych, PWN, część pierwsza i druga, Warszawa.
2. M. Gewert, Z.Skoczylas, Analiza matematyczna 1. Definicje, twierdzenia, wzory. Oficyna Wydawnicza GiS.
3. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka część I i II, Wydawnictwo Politechniki Poznańskiej.

Additional:
1. E. Swokowski, Calculus with analytic geometry, Prindle, Weber, Schmidt, Boston, Massachusetts.
2. W. Krysicki, L.Włodarski,Analiza matematyczna w zadaniach, PWN, Warszawa.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	75	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	3,00