COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics

Course

Field of study

Chemical and process engineering

Year/Semester

1/1

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

Polish

Form of study

full-time

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 inż. Mariola Skorupka

Institute of Mathematics

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phone: 61 665 2687

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 and chemistry.

Course-related learning outcomes

Knowledge

After completing the first degree studies, the graduate has expanded and in-depth knowledge of various branches of higher mathematics and detailed knowledge on the application of mathematical methods and tools in engineering and chemical sciences - K_W2

Skills

After completing the first degree studies, the graduate:

- can use knowledge of higher mathematics; can build and analyse simple mathematical models; can use mathematical tools and methods, including numerical ones, to solve engineering problems - K_U13

- is able to plan and implement self-education independently in order to raise and update their competences - K_U24

Social competences

After completing the first degree studies, the graduate:

- is aware of the deepening and expansion of knowledge to solve newly created technical problems - K_K1

- understands and appreciates the importance of intellectual honesty in own and other people's actions; is ready to demonstrate reliability, impartiality, professionalism and an ethical attitude - K_K1

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - written exam during session

Tutorials - two 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), exponential form. Fundamental algebra theorem.

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. Asymptotes of the graphs of functions. Continuity of functions.

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).

Mean value theorems and their applicastions.Extrema of functions - global and local. Criteria for existing such extrema.

Higher order derivatives. Taylor's theorem.Expansions of e^x, sinx, cosx functions into Maclaurin's series.

Concavity. Points of inflection.

Indeterminate forms. De l'Hospital's theorem.

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). Integration of some irrational functions (Euler's substitutions and methods of variation of parameters).

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).

Improper integrals.

Number series. Convergence criteria for number series.

Teaching methods

Lecture - multimedial presentation + examples on the blackboard

Tutorials - solving problems; discussion about obtained results

Bibliography

Basic

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

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

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

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

5. 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	130	5,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for tutorials, preparation for tests and the final exam) [1]	60	2,0

[1] delete or add other activities as appropriate