UNIWERSYTET GDAŃSKI

Course title Matematyka/Mathematics	**ECTS code** 13.3.0455

Name of unit administrating study
Faculty of Chemistry

Studies

Field of study	Type	Form	
Chemistry	Bachelor	Full-time studies	

Teaching staff
Dr Aleksandra Nowel

Forms of classes, the realization and number of hours

A. Forms of classes, in accordance with the UG Rector's regulations
lecture, auditorium classes

B. The realization of activities
In-class learning

C. Number of hours
lecture 30 h, audytorium classes 60 h

ECTS credits

classes 90 h
tutorial classes 15 h
student's own work 95 h
TOTAL: 200 h - 8 ECTS

The academic cycle
2019/2020 winter semester

Type of course
obligatory

Language of instruction
Polish

Teaching methods

Problem lecture
work in groups

Form and method of assessment and basic criteria for evaluation or examination requirements

A. Final evaluation, in accordance with the UG study regulations
Course completion (with a grade), exam

B. Assessment methods
written test exam, written exam with open questions, tests

The basic criteria for evaluation

The credit from classes is obtained if more than 50% of the maximum sum of points from two tests is obtained.
The credit from lecture is obtained if a written exam is passed, one must get more than 50% of the maximum sum of points from the exam.
Criteria for grades in accordance with the University of Gdansk study regulations.

Required courses and introductory requirements

A. **Formal requirements** none
B. **Prerequisites** none

Aims of education

Introduction to the elementary concepts of differential and integral calculus (real functions of one and many variables) and linear algebra; developing the skills to solve basic problems of higher mathematics (with achieving accounting skills in this area) to the extent necessary to understand and describe chemical and physical processes. Developing students' skills of abstract understanding of problems.

Course contents

Introductory information and elementary functions (symbols of quantifiers, formula for the natural power of binomial, definition of real function and basic properties of functions, linear, quadratic, polynomial, rational, irrational, exponential and logarithmic functions, trigonometric and cyclometric functions)
Sequence and limit of a sequence, limit and continuity of a function (definition of a numerical sequence, sequence properties, convergent sequences, proper and improper limit of a sequence, properties of limits, number e, proper and improper limit of a function at a point and infinity, right and left limits, continuity of a function at a point, continuous functions, properties of continuous functions)
Derivative of a function (definition of a derivative of a function at a point, differentiable functions, derivative function, geometric interpretation, tangent equation, properties of differentiable functions, differentiation rules, higher order derivatives)
Application of derivative, de l'Hospital rtheorem (monotonicity, local extreme, necessary and sufficient condition for existence of local extreme of differentiable function, global extremes, de l'Hospital theorem)
Asymptotes, partial derivatives of functions of several variables (definition of oblique and vertical asymptotes, finding function asymptotes, partial derivative, local extremum of functions of two variables)
Integral (primitive function, definition of integral, properties of integral, integration by parts, integration by substitution)
Definite integral (definition of definite integral, properties of definite integral, geometric interpretation and application of definite integral)
Multiple integrals (concept of multiple integral, normal areas, coordinate change in multiple integral)
Matrix operations, matrix determinant, inverse matrix (matrix definition, matrix operations, matrix determinant, Sarrus formula, Laplace expansion, properties of determinants, singular matrix, invertible matrix, formula for inverse to nonsingular matrix)
Complex numbers (field of complex numbers, algebraic, trigonometric and exponential form, conjugation, complex roots, de Moivre's formula)
Linear spaces (definition of linear space, Euclidean spaces and Euclidean norm, spaces over the field of real and complex numbers, linear combination, linear dependence and independence of vectors)
Linear space base, scalar product, transformation of linear spaces (base concept, vector's coordinates in the base, scalar product, orthogonality, linear operators and linear functionals)

Bibliography of literature

A. **Literature required to pass the course**

T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Przykłady i zadania
M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Przykłady i zadania
G. Kwiecińska: Matematyka : kurs akademicki dla studentów nauk stosowanych. Cz. 1, Wybrane zagadnienia algebry liniowej
G. Kwiecińska: Matematyka : kurs akademicki dla studentów nauk stosowanych. Cz. 2, Analiza funkcji jednej zmiennej
W. Krysicki, L. Włodarski: Analiza matematyczna w zadaniach. 1 i 2

B. **Extracurricular readings**

Erich Steiner : ,,Matematyka dla chemików", Warszawa, Wydaw. Naukowe PWN, 2001.
Halina Pidek--Łopuszańska: ,,Matematyka dla chemików", Wiedza Powszechna, Warszawa 1974.

Knowledge

knows the basic symbols and mathematical symbols, transforms algebraic expressions
classifies basic elementary functions and lists their properties
lists basic formulas of differential and integral calculus and applies them to solving problems
uses differential and integral calculus to study the properties of functions of one variable and many variables

lists basic matrix calculus formulas knows the properties of linear spaces and can verify them
Skills Is able to link the problem in the field of algebra and mathematical analysis and their applications with the relevant theoretical problem