



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics [N1IBiJ1>MAT]

### Course

Field of study

Safety and Quality 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

part-time

Requirements

compulsory

### Number of hours

Lecture

9

Laboratory classes

0

Other

0

Tutorials

18

Projects/seminars

0

### Number of credit points

3,00

### Coordinators

dr Grzegorz Grzegorzcyk

grzegorz.grzegorzcyk@put.poznan.pl

### Lecturers

### Prerequisites

Basics of mathematics - secondary school level. Logical and scientific thinking, efficient calculating.

### Course objective

The subject is aimed at introducing basic terms from the area of mathematics such as linear algebra and differential calculus; giving skills and competences for solving fundamental mathematic topics and for using mathematics in management.

### Course-related learning outcomes

Knowledge:

1. Defines elements of linear algebra, including matrices, determinants, their properties, and operations on matrices, as well as can explain the concept of the inverse matrix and the rank of a matrix [K1\_W04].
2. Lists and characterizes methods for solving systems of linear equations, including Cramer's theorem, Gauss elimination method, and the Kronecker-Capelli theorem, and can illustrate their application in economic issues [K1\_W04].
3. Describes the definition of a numerical sequence, monotonicity of sequences, the definition of the limit of a sequence, and properties of finite limits, as well as identifies the significance of Euler's number

and indeterminate symbols in mathematical analysis [K1\_W04].

4. Explains definitions and properties of injective, monotonic, inverse, composite, and cyclometric functions, as well as can discuss the concepts of limit and continuity of functions, asymptotes of functions, and the application of the derivative of a function in economics [K1\_W04].

Skills:

1. Demonstrates the ability to perform operations on matrices, calculate the inverse matrix, and the rank of a matrix, using acquired knowledge to interpret results in the context of engineering tasks [K1\_U04].

2. Applies methods for solving systems of linear equations to solve economic problems, demonstrating the ability to perform systemic and non-technical analysis in engineering tasks [K1\_U03].

3. Analyzes numerical sequences and functions, using the concept of limit, continuity, and derivative to examine their properties and applications in economics, showing the ability to appropriately select analytical methods [K1\_U04].

4. Compares and distinguishes different types of functions and their properties, applying L'Hôpital's rule, studying monotonicity, and extremes of functions in an economic context, reflecting the ability for critical analysis and synthesis of information [K1\_U01].

Social competences:

1. Recognizes cause-and-effect relationships in mathematical applications to solve economic problems, demonstrating the ability to apply mathematical knowledge in solving real engineering problems [K1\_K01].

2. Shows awareness of the importance of continuous improvement in the applications of mathematics in engineering, emphasizing the need to update knowledge and skills to effectively solve economic and engineering problems [K1\_K02].

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written test on the last lecture. Passing threshold: 50% of points.

Classes: evaluation of four written tests.

Passing threshold: 50% of points.

### Programme content

Elements of linear algebra, systems of linear equations.

Mathematical analysis.

### Course topics

Elements of linear algebra: matrices, inverse matrix, row of matrix, systems of linear equations (Cramer Theorem, method of Gaussian Elimination, Kronecker-Capelli Theorem). Applications of matrices in economics.

Elementary functions (formulas, graphs, properties). Sequences, monotonic sequences, the limit of a sequence, the arithmetic of limits. Continuity, limits of functions, asymptote. Derivative and its geometric interpretation, monotonicity intervals, extrema, L'Hospital's rule, application of the derivative in economics. Indefinite integral, definite integral and its geometric interpretation

### Teaching methods

- lecture with multimedia presentation accompanied with examples presented on the blackboard, theory presented with connections of current knowledge from previous lectures and with questions to the group of students;

- classes: solving problems on the board, initiating discussion about the solutions.

### Bibliography

Basic:

1. Gewert M., Skoczylas Z., Analiza matematyczna 1, Definicja, twierdzenia, wzory, Oficyna Wyd. GiS

2. Gewert M., Skoczylas Z., Analiza matematyczna 1, Przykłady i zadania, Oficyna Wyd. GiS

3. Jurlewicz T. , Skoczylas Z. , Algebra liniowa 1, Definicja, twierdzenia, wzory, Oficyna Wyd. GiS
4. Jurlewicz T., Skoczylas Z. , ALgebra liniowa 1, Przykłady i zadania, Oficyna Wyd. GiS

Additional:

1. Krysicki W., Włodarski L., Analiza matematyczna w zadaniach, cz. I, Wydawnictwo Naukowe PWN.
2. Foltyńska I., Ratajczak Z., Szafranski Z., Matematyka dla studentów uczelni technicznych, cz. I -II, Wydawnictwo Politechniki Poznańskiej, Poznań 2004.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	27	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	48	2,00