



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics

### Course

Field of study

Engineering Management

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

1/1

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

10

Laboratory classes

Tutorials

10

Projects/seminars

Other (e.g. online)

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

Ph.D., Eng., Mariola Skorupka

Responsible for the course/lecturer:

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Faculty of Automatic Control, Robotics and  
Electrical Engineering

ul. Piotrowo 3A, 61-138 Poznań,

### Prerequisites

The student should have knowledge of mathematics in the field of high school and basic scope extended by differential calculus (in the scope of extended).



## Course objective

Acquainting with problems of linear algebra and learning methods and applications of differential calculus of functions of one and many variables.

## Course-related learning outcomes

### Knowledge

The student defines matrices and determinants [P6S\_WG\_08].

The student describes systems of linear equations and lists methods for solving them [P6S\_WG\_08].

The student characterizes the concepts of vectors, scalar and vector products [P6S\_WG\_08].

The student names elements of a plane and line in space [P6S\_WG\_08].

The student explains the graphs of elementary and rational functions [P6S\_WG\_08].

The student recognizes the limits of functions [P6S\_WG\_08].

The student identifies inverse functions [P6S\_WG\_08].

The student classifies research methodologies in the context of management sciences [P6S\_WG\_11].

### Skills

The student plans and conducts experiments, including measurements and computer simulations [P6S\_UW\_09].

The student interprets the results of experiments and calculates their significance [P6S\_UW\_09].

The student formulates engineering tasks and solves them using analytical, simulation, and experimental methods [P6S\_UW\_10]. The student identifies and solves simple design tasks related to the construction and operation of machines [P6S\_UW\_14].

The student applies problem-solving methods in the field of construction and operation of machines [P6S\_UW\_15].

### Social

### competences

The student prepares and implements business ventures related to mathematics and engineering [P6S\_KO\_03].

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Lecture: Knowledge acquired during the lecture is verified by a 60 minute pass in the last class.

Assessment threshold: 50% of points obtained from final essay and students' activity in class. Lecture for the grade. Assessment issues based on which questions are developed. They will be sent via e-mail using the university e-mail system.

2. Knowledge acquired during the exercises is verified by two tests carried out during 7 and 14 classes and activity during classes. Each test consists of the same number of points. Passing threshold: 50% of points – the sum of points obtained from tests and activity during classes.

## Programme content

### Lecture:

STRUCTURES AND NUMBER SERIES: limitation, monotonicity, string boundaries, definition of the number  $e$  and its application.



DIFFERENTIAL ACCOUNT OF ONE VARIABLE FUNCTION: derivative of function, extrema of differentiable function, monotonicity intervals, second derivative - convexity, concavity, inflection points, derivatives of higher orders, de L'Hospital rule.

MATRIX ACCOUNT: operations on matrices, concept of inverse matrix - calculation, matrix determinant - properties and methods of determination, systems of linear equations, Kronecker-Capell theorem, solving systems of linear equations by Gauss elimination method.

DIFFERENTIAL ACCOUNT OF MULTIPLE VARIABLE FUNCTIONS: definition of the function of two variables, partial derivative, Schwarz theorems, extremes of the function of two variables.

#### Exercises:

STRUCTURES AND NUMBER SERIES: limitation, monotonicity, string boundaries, the number  $e$  and its application.

DIFFERENTIAL ACCOUNT OF ONE VARIABLE FUNCTION: derivative of function, extrema of differentiable function, monotonicity intervals, second derivative - convexity, concavity, inflection points, derivatives of higher orders, de L'Hospital rule.

MATRIX ACCOUNT: operations on matrices, inverse matrix - calculation, matrix determinant - methods of determination, solving systems of linear equations by Gauss elimination method.

DIFFERENTIAL ACCOUNT OF MULTIPLE VARIABLE FUNCTIONS: definition of the function of two variables, partial derivative, Schwarz theorems, extremes of the function of two variables.

#### Teaching methods

1. Lecture: multimedia presentation, illustrated with examples on the board. Conducted in an interactive way with the formulation of questions to a group of students. Initiating discussions during the lecture.
2. Exercises: solving tasks given by the teacher on the board along with analyzing the next stages. The method of solving the task by students on the board is reviewed by the tutor. Completed with tasks for independent solution at home.

#### Bibliography

Basic

1. W. Kryszicki, L. Włodarski, *Analiza matematyczna w zadaniach*, T. 1-2, PWN, Warszawa 2011.
2. I. Foltyńska, Z. Ratajczak, Z. Szafranski, *Matematyka dla studentów uczelni technicznych*, T. 1-3, Wydawnictwo Politechniki Poznańskiej, Poznań 2004.
3. M. Gewert, Z. Skoczylas, *Analiza matematyczna 1/Definicje, twierdzenia, wzory/* Oficyna Wydawnicza GiS, Wrocław 2011.



4. M. Gewert, Z. Skoczylas, Analiza matematyczna 1/Przykłady i zadania/ Oficyna Wydawnicza GiS, Wrocław 2011.

#### Additional

1. W. Stankiewicz, J. Wojtowicz, Zadania z matematyki dla wyższych uczelni technicznych, T. 1-2, PWN, Warszawa 2003.

2. M. Lassek, Matematyka dla studentów technicznych, T. 1-2, Wydawnictwo Wspierania procesu edukacji, Warszawa 2004.

#### Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	25	1,0
Student's own work (literature studies, preparation for exercises and lecture, preparation for passing the ezercises and the lecture) <sup>1</sup>	75	3,0

<sup>1</sup> delete or add other activities as appropriate