



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics [N1MiBP1>MAT]

### Course

Field of study

Mechanical and Automotive 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

36

Laboratory classes

0

Other

0

Tutorials

18

Projects/seminars

0

### Number of credit points

6,00

### Coordinators

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### Lecturers

### Prerequisites

1. The basic mathematics of secondary school. 2. Logical thinking, learning with understanding, the use of textbooks. 3. Awareness of the purpose of learning and acquiring new knowledge

### Course objective

1. Getting to know the issues of differential and integral calculus and the possibility of their application in subjects directional. 2. Getting to know the problems of differential and integral calculus of functions of several variables and ordinary differential equations. Indication of examples of the application of the learned issues in technology.

### Course-related learning outcomes

Knowledge:

Has knowledge in the field of mathematics, including algebra, analysis, theory of differential equations, probability, analytical geometry necessary to: describe the operation of discrete mechanical systems, understand computer graphics methods, describe the operation of electrical and mechatronic systems.

Skills:

Can obtain information from literature, the Internet, databases and other sources. Can integrate the obtained information, interpret and draw conclusions from it, and create and justify opinions.  
Can assess material, environmental and labor costs for making a simple machine.  
Has the ability to self-educate with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books.

Social competences:

Is ready to critically assess his knowledge and received content.

Is ready to fulfill social obligations and co-organize activities for the benefit of the social environment.

Is ready to initiate actions for the public interest.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture:

Assessment on the basis of a written exam conducted during the exam session at the end of the semester. The assessment also takes into account the student's activity during classes.

Tutorials:

Assessment on the basis of 3 tests and activity in the classroom.

## Programme content

Update 2024/2025

Functions of one variable.

Differential calculus of the function of one variable.

Indefinite integral. Definite integral.

DIFFERENT CALCULUS OF FUNCTIONS OF SEVERAL VARIABLES.

MULTIPLE INTEGRALS.

ORDINARY DIFFERENTIAL EQUATIONS.

## Course topics

Update 2024/2025

Functions of one variable

(number sequences, monotonicity and limit, Euler number, limit and continuity of functions, indeterminate symbols). Differential calculus of the function of one variable (derivative of a function, determination, interpretation, calculation, differential of function and its application, theorems on average value and their applications - extremes of function, concavity and convexity, inflection points, de L'Hospital rule, function test). Indefinite integral (original function, integration of sum and product, integration by substitution and parts, integration of rational functions and non-measurable ones). Definite integral (determination, interpretation and relation to the field, properties, improper integrals, applications - calculation of flat area fields, curve arc length, volume and surface area of rotational solids).

DIFFERENT CALCULUS OF FUNCTIONS OF SEVERAL VARIABLES; definition of the function of two variables, limits and continuity of the function of two variables, partial derivative, Schwarz theorem, a total differential, extreme of functions of two variables, derivative of a entangled function.

MULTIPLE INTEGRALS; normal area, double integral; evaluating, a iterated integral, reversing the order of integration, exchange of variables in the double integral - polar coordinates, the use of a double integral in geometry and mechanics -Cartesian and polar coordinates.

ORDINARY DIFFERENTIAL EQUATIONS; definition of ordinary differential equation, general, particular and singular solution, initial-value, differential equation with separated variables, first order linear differential equation; method of constant change, Bernoulli's differential equation, second order linear differential equation with real constant coefficients; the method of prediction and variation of constants.

## Teaching methods

Lecture:

At the lecture, the theory is supported by examples. The lecture is conducted in an interactive way with formulating questions towards students. Completed with self-solve tasks, which are verified and have an

impact on the final grade.

#### Tutorials:

The exercises include an example of solving tasks on the blackboard (by the teacher and students) along with the analysis of subsequent stages. The way students solve the problem on the blackboard is reviewed by the tutor.

### Bibliography

#### Basic

1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, t. I. PWN, Warszawa 2006.
2. F. Leja, Rachunek różniczkowy i całkowy. Państwowe Wydawnictwo Naukowe, Warszawa 1978
3. I. Foltysńska, Z. Ratajczak, Z. Szafranski, Matematyka cz. I i II, Wydawnictwo Politechniki Poznańskiej, Poznań 2001

#### Additional

1. M. Gewert, Z. Skoczylas, Analiza matematyczna 1, Oficyna Wydawnicza GiS, Wrocław 2006.
2. Dennis G. Zill, Calculus with Analytic Geometry, Prindle, Weber & Schmidt, Boston 1985.

### Breakdown of average student's workload

|   | Hours | ECTS |
|---|-------|------|
| Total workload  | 150   | 6,00 |
| Classes requiring direct contact with the teacher   | 57    | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 93    | 4,00 |