



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Selected topics in Mathematics

### Course

Field of study

Mechanical and Automotive Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### Number of hours

Lecture

18

Laboratory classes

0

Other (e.g. online)

0

Tutorials

9

Projects/seminars

0

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

dr inż. Agnieszka Szawiola

Responsible for the course/lecturer:

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phone: 61 665 2712

Faculty of Control, Robotics and Electrical  
Engineering

Institute of Mathematics



### Prerequisites

1. Knowledge of algebra and geometry, differential calculus and integral calculus of functions of one variable in the scope of the 1st semester of study.
2. Logical thinking, learning with understanding, the use of textbooks.
3. Willingness to acquire new knowledge and the need for systematic self-education.

### Course objective

1. Getting to know the problems of differential and integral calculus of functions of several variables, line integrals 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.

Has knowledge in the field of physics, including the basics of classical mechanics, optics, electricity and magnetism, solid state physics, quantum and nuclear physics, necessary to understand specialist lectures in the field of the theory of construction materials and materials science, theory of machines and mechanisms, theory of electric drives and mechatronic systems.

Has extended basic knowledge necessary to understand specialist subjects and specialist knowledge about the construction, construction methods, manufacturing and operation of a selected group of working, transport, thermal and flow machines covered by the diploma path.

#### 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.

Has the ability to self-educate with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books.

Can prepare and present a short verbal and multimedia presentation devoted to the results of an engineering task.

#### Social competences

Is ready to critically assess his knowledge and received content.

Is ready to initiate actions for the public interest.

Is willing to think and act in an entrepreneurial manner.



## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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 2020/2021

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.

LINE INTEGRALS; not-directed line integral and of applying them in mechanics, directed line integrals, directed line integral independent of the path, directed line integrals along simple closed curve, Green's theorem, the area and work using the line integrals.

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,II, PWN, Warszawa 2006.
2. F. Leja, Rachunek różniczkowy i całkowy. Państwowe Wydawnictwo Naukowe, Warszawa 1978
3. I. Foltyńska, Z. Ratajczak, Z. Szafranski, Matematyka cz. I, II, III Wydawnictwo Politechniki Poznańskiej, Poznań 2001

Additional

1. M. Gewert, Z. Skoczylas, Analiza matematyczna 2, 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	100	4,0
Classes requiring direct contact with the teacher	32	2,0
Student's own work (literature studies, preparation for tutorials, preparation for tests and the final exam) <sup>1</sup>	68	2,0

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