



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics [N1IŚrod2>Mat2]

### Course

Field of study

Environmental Engineering

Year/Semester

1/2

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

20

Laboratory classes

0

Other (e.g. online)

0

Tutorials

30

Projects/seminars

0

### Number of credit points

5,00

### Coordinators

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### Lecturers

### Prerequisites

Knowledge of real function calculus. Calculations of derivatives and integrals of one variable functions. Student understands the need and knows the possibility of studying, improving language skills, professional, personal and social skills.

### Course objective

-The recognizing methods and applications of analytical geometry (vectors, lines in space, planes), mathematical analysis (calculus of functions of several variables) and differential equations.

### Course-related learning outcomes

Knowledge:

1. Methods of calculation and applications of multiple and line integrals to describe and analyze selected physical phenomena.
2. Methods of solving differential equations.
3. The student explains the basic mathematical laws and explains conditions for their application.

Skills:

1. The student uses the literature and also other sources of knowledge.
2. The student learns to calculate and apply multiple and line integrals to describe and analyze selected physical phenomena.

Social competences:

1. The sense of usefulness of mathematical competence in engineering practice.
2. The ability to work in a team.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

LECTURE. A two-part written examination at the end of the semester:

- sat.1 theoretic knowledge;
- sat.2 applications in practical exercises.

Duration of test: 70 minutes.

Classes: tests during the semester (3x30 minutes).

### Programme content

- Matrices and determinants, systems of linear equations.
- Vectors, the dot product, the vector product. Lines in space, planes, the paraboloid of revolution, cylinders and the axis of the cone.
- Gradient, directional derivative, tangent planes and normal lines to surfaces. -Multiple integrals with applications.
- Ordinary differential equations (separable, exact, homogeneous, Bernoulli, first-order and second-order linear).
- Number series and power series.

### Course topics

none

### Teaching methods

Traditional education:

Lecture with presentation supplemented by examples given on the board. Interactive lectures with problems and questions for students. The activity of students is taken into account in valuation of them. Discussion during lectures is expected.

Connections with other mathematical subjects are indicated.

Practical lessons. Solving of exemplary exercises on a blackboard. Discussion of solutions with relative comments.

### Bibliography

Basic:

1. W. Stankiewicz, J. Wojtowicz, Zadania z matematyki dla wyższych uczelni technicznych, PWN, część pierwsza i druga, Warszawa.
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Definicje, twierdzenia, wzory. Oficyna Wydawnicza GiS.

Additional:

1. E. Swokowski, Calculus with analytic geometry, Prindle, Weber, Schmidt, Boston, Massachusetts.
2. Dennis G. Zill, A first course in differential equations with applications, Prindle, Weber ; Schmidt, Boston.
3. W. Kryszewski, L. Włodarski, Analiza matematyczna w zadaniach, PWN, Warszawa.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	3,00