



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics [S1Bud1>MAT1]

### Course

Field of study

Civil 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

full-time

Requirements

compulsory

### Number of hours

Lecture

30

Laboratory classes

0

Other

0

Tutorials

30

Projects/seminars

0

### Number of credit points

5,00

### Coordinators

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### Lecturers

### Prerequisites

Knowledge of mathematics in the extended high school area. The ability to obtain information from the indicated sources, to think logically, associate facts, analyze problems and apply the right conclusions.

### Course objective

To acquaint students with extended mathematical knowledge in the field of differential and integral calculus of one variable functions, to develop the ability to apply it in engineering and to prepare them for effective study of physics, chemistry and specializations.

### Course-related learning outcomes

Knowledge:

Student

1. Knows the concept of sequence of numbers.
2. Knows the concept of derivative, methods of solving and its applications.
3. Knows the concept of indefinite integral and methods of solving it.
4. Understands the concept of definite integral and its interpretation.

## Skills:

### Student

1. Is able to determine monotonicity and limit of the sequence.
2. Can calculate the derivative and apply it to determine the limit, monotonicity, maxima, minima of functions of single variable.
3. Is able to calculate indefinite and definite integral, measures of areas, the length of curves, volumes and surface areas of solids of revolution.

## Social competences:

The graduate is ready to critically evaluate his or her knowledge. The graduate understands the need for and knows the possibilities of continuous learning - improving professional, personal and social competences.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture – written exam

Tutorials – test(s) and class participation

In both forms of classes, the following percentage thresholds are applied:

below 50% – grade 2.0

50%–59% – grade 3.0

60%–69% – grade 3.5

70%–79% – grade 4.0

80%–89% – grade 4.5

90%–100% – grade 5.0

## Programme content

Differential and integral calculus of functions of one variable

### Course topics

#### 1. Functions and Limits

Composition of functions. Inverse functions, inverse trigonometric functions.

Limit of a sequence. The number  $e$  and the natural logarithm.

Limit and continuity of a function.

#### 2. Differential Calculus

Derivative and differential of a function. Differentiability of functions.

Equation of the tangent and normal to the graph of a function.

L'Hospital's rule for indeterminate limits.

Monotonicity and extrema of functions.

Convexity and concavity of functions, inflection points.

Study of the behavior of functions.

#### 3. Integral Calculus

Indefinite integral.

Integration by substitution.

Integration by parts.

Integration of rational functions.

Integration of functions involving trigonometric expressions.

Definite integral.

Geometric applications of definite integrals to calculating areas of plane regions, arc lengths of curves, surface areas, and volumes of solids of revolution.

Improper integrals.

#### 4. Differential Equations

Selected first-order differential equations.

### Teaching methods

1. Interactive lecture with questions to the group of students which is supported by solving examples on board.
2. Classes during which students solve tasks on board. Teacher's detailed assessment of students' solutions followed by discussion and comments.

### Bibliography

Basic

1. M. Mączyński, J. Muszyński, T. Traczyk, W. Żakowski, Matematyka - podręcznik podstawowy dla WST, PWN, t. I - Warszawa 1979, t. II - Warszawa 1981.
2. J. Mikołajski, Z. Sołtysiak, Zbiór zadań z matematyki dla studentów wyższych szkół technicznych, Wydawnictwo PWSZ w Kaliszu, cz. II - Kalisz 2010.
3. M. Gewert, Z. Skoczyłaś, Analiza Matematyczna 1 - Definicje, twierdzenia, zwory, Oficyna Wydawnicza GIS, Wrocław 2021 i Wrocław 2019.
4. M. Gewert, Z. Skoczyłaś, Analiza Matematyczna 1 - Przykłady i zadania, Oficyna Wydawnicza GIS, Wrocław 2021 i Wrocław 2019.
5. M. Gewert, Z. Skoczyłaś, Równania różniczkowe zwyczajne – Teoria, przykłady, zadania, Oficyna Wydawnicza GIS, Wrocław 2011.

Additional

1. G. Decewicz, W. Żakowski, Matematyka t. I. WNT, Warszawa 2003.
2. F. Leja, Rachunek różniczkowy i całkowy. PWN, Warszawa 2008.
3. I. Folyńska, Z. Ratajczak, Z. Szafranski, Matematyka cz. I i II, Wydawnictwo Politechniki Poznańskiej, Poznań 2001.
4. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, t. I, PWN, Warszawa 2006.
5. W. Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych, PWN, Warszawa 2003.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	145	5,00
Classes requiring direct contact with the teacher	62	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	83	3,00