STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Mathematics**		Code **1010104111010340004**
Field of study **Civil Engineering First-cycle Studies**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 1**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **26** Classes: **18** Laboratory: **-** Project/seminars: **-**		No. of credits **6**
Status of the course in the study program (Basic, major, other) **basic**	(university-wide, from another field) **university-wide**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **6 100%** **6 100%**

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has knowledge of mathematics at the secondary level.
2	**Skills**	Has the ability to think logically (derivation of new facts basing on known). Has the ability to use mathematical tools to solve problems in the field of secondary education. Has the ability to learn with the understanding.
3	**Social competencies**	Knows the limits of his own knowledge and understands the need for further education. Can independently search for information in the literature, including in foreign languages.

Assumptions and objectives of the course:

Learning the use of mathematical tools and methods to describe and solve simple technical problems. Indication of the possibility of the application of mathematics in more complex issues.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student knows formulas, diagrams and properties of elementary functions. - [K_W01]
2. Student knows the meaning of a limit of function. - [K_W01]
3. Student knows: the meaning of derivative of a function and its geometric and physical interpretation, rules of derivations of functions, meaning of indefinite integral of function and basic method of integration and geometric interpretation of definite integral. - [K_W01]

Skills:

1. Student uses notation of limit for study of behavior of function on ends of domain intervals. - [K_U01, K_U02]
2. Student analyses properties of functions with applications of differential calculus methods. - [K_U02, K_U07]
3. Student apply integral calculus in engineering practice. - [K_U02, K_U07]
4. Student builds mathematical models of simple phenomena and processes in nature. - [K_U09, K_U10]

Social competencies:

1. Follows the rules of professional ethics, is responsible for the reliability of results obtained in his or her work and their interpretation, and the assessment of work done by others - [K_K02]
2. Understands the need of and opportunities for continuous self-improvement (first- and second-cycle studies, postgraduate studies) ? raising his or her professional, personal and social competences - [K_K03]
3. Is able to think and act in a creative and entrepreneurial manner - [K_K08]

Assessment methods of study outcomes

Lectures:

- Assessment of knowledge and skills in the written exam
- Assessment of knowledge and skills during the oral exam

Classes:

- Assessment of knowledge and skills related to solving the tasks on the basis of written tests
- Assessment of students readiness for exercises (the questions devoted to issues / tasks discussed in the lecture) on the basis of written tests

Course description

SEQUENCES OF REAL NUMBERS (the definition of a sequence, bounded sequences, increasing and decreasing sequences, the fundamental definition of limit, rules for manipulating limits, improper limits, rules for manipulations with infinity, theorem of three sequences, Euler number and its value, indeterminant expressions).

ELEMENTARY FUNCTIONS (the definition of a real-valued function, increasing and decreasing functions, injective functions, inverse functions, composed functions, the trigonometric functions, the hyperbolic functions, the inverse trigonometric functions, limits of functions, definition of continuous function at a point, asymptotes, the definition of the derivative and the geometric interpretation, basic rules of derivatives, the rule for differentiating inverse functions, higher derivatives, the derivative of a composed function - the chain rule, L?Hospital?s rule, applications of derivatives, curvature and curvature radius, mean value theorem, local extrema and critical points ? necessary and sufficient condition for a local extremum, criterions for increasing or decreasing, inflection points ? necessary and sufficient condition for an inflection point, local concavity and local convexity).

INDEFINITE INTEGRAL (definition of the indefinite integral and the primitive function, properties of integrals, integration by parts, substitution formula).

DEFINITE INTEGRAL (definition of the definite integral, properties of integrals, integration by parts, substitution formula, the geometric interpretation of the definite integral, applications to arc length of a plane curve, applications to plane area, applications to the lateral surface and to the volume of a solid of revolution with respect to the axis OX, and OY).

LINEAR ALGEBRA (the Cartesian product, definition of a matrix, algebraic operations: addition of two matrices, multiplication of a matrix by a number, multiplication of two matrices, the definition of the determinant, properties of determinants, the calculation of three-rowed determinants, Laplacian rule for the development of determinants, inverse matrices, transposed matrices, the definition of the rank of a matrix, algorithms for determining the rank, systems of linear equations and solutions: Cramer's theorem, Kronecker-Capelli theorem, a homogeneous system, the Gaussian algorithm)

COMPLEX NUMBERS (absolute value, arguments, the principal value of the argument; a geometric interpretation, Cartesian representation, in polar coordinates, Gaussian plane, rules for arithmetic, roots, square roots, solving quadratic equations in the complex domain, De Moivre's formula)

Basic bibliography:

1. M. Gewert, Z. Skoczylas: Analiza I, Analiza II, Algebra liniowa, GiS, Wrocław, 2006.

2. I. Foltyńska, Z. Ratajczak, Z. Szafrański: Matematyka dla studentów uczelni technicznych, Wydawnictwo Politechniki Poznańskiej, Poznań, 2000.

Additional bibliography:

1. W. Krysicki, L. Wlodarski, Analiza matematyczna w zadaniach cz.1, Wydawnictwo Naukowe PWN, Warszawa, 2010

Result of average student's workload

Activity	Time (working hours)
1. Preparation for exercise	40
2. Preparation for colloquia	40
3. Exam preparation	30

Student's workload

Source of workload	hours	ECTS
Total workload	154	6
Contact hours	44	2
Practical activities	18	1