STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Mathematics		**1010601311010340001**
Field of study: **Transport**	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): **full-time**	
No. of hours: Lecture: **4** Classes: **2** Laboratory: **-** Project/seminars: **-**		No. of credits: **7**
Status of the course in the study program (Basic, major, other): **other**	(university-wide, from another field): **university-wide**	
Education areas and fields of science and art: **the sciences**; **Mathematical sciences**		ECTS distribution (number and %): **7 100%**; **7 100%**

Responsible for subject / lecturer:

dr inż. Agnieszka Szawioła
email: agnieszka.szawiola@put.poznan.pl
tel. 61 665 2712
Faculty of Electrical Engineering
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

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

Assumptions and objectives of the course:

Getting to Know the issues of algebra and geometry, differential and integral calculus and the possibility of their application in subjects directional.

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

Knowledge:

1. Getting to Know the issues of algebra and geometry, differential and integral calculus and the possibility of their application in subjects directional.... - [K_W01]
2. It defines the basic concepts of mathematics concerned departments. - [K_W01]

Skills:

1. Can apply calculus in physics and mechanics. - [K_U01]
2. Put using mathematical concepts to describe simple mechanical processes and issues. - [K_U01]

Social competencies:

1. Understands the need for learning throughout life, can inspire others to learn. - [K_K01]

Assessment methods of study outcomes

Lecture: Assessment on the basis of written examination conducted in the examination session at the end of the semester.

Exercises: evaluation based on the current control messages in the form of written tests and activity in class.

Course description

Update 2017/2018

Program content.

Lecture:

Functions of one variable; definition, boundaries, properties, inverse function, graphs of elementary functions. Differential calculus of one variable function; definition of derivative, geometric and physical interpretation, calculation of derivatives, Taylor's and Maclaurin's formula, mean value theorems, study of the properties of functions (de L'Hospit's rule, extremes, monotonicity, inflection points, convexity, mean value). Integral calculus of functions of one variable; indefinite integral (original function, integration of sum and product, integration by substitution and parts, integration of rational, trigonometric and non-measurable functions), definite integral (determination, interpretation and relation to field, properties, applications - calculation of flat area fields, curve arc length , volume and surface area of rotational solids), improper integral. Selected ordinary differential equations, (first order equations with distributed variables, linear non-homogeneous order I, constant change method, non-homogeneous linear order II with fixed coefficients, prediction method); general and specific solution, the initial issue. Matrices and their properties (operations on matrices, matrix determinant, inverse matrix, matrix equation). Systems of linear equations; Cramer's method and Gauss elimination, Kronecker-Capelli theorem. Vectors in space; scalar and vector product and application in geometry. Differential calculus of functions of several variables; partial derivative, extremes of functions of many variables and entangled functions, absolute difference. Complex numbers; algebraic, trigonometric, exponential, complex numbers, Moivre's formula, Euler's equations, second order complexes.

Exercises:

Complex numbers; algebraic, trigonometric form, effects on complex numbers, Moivre's formula, Euler's formula, complex equations of the second order. Elementary functions and their graphs. Limit of function. Calculation of derivatives. The de L'Hospital rule. Study of the properties of one variable function; extremes, monotonicity, point of inflection, convexity. Calculation of the indefinite integral; integration by parts and by substitution, integral of a rational function, selected integrals of an irrational function. Definite integral and its applications in geometry (area areas, arc length, volume and surface area of a rotating solid). Matrices and determinants; operations on matrices, properties of determinants. Systems of linear equations; Cramer's method and Gauss elimination. Vector bill in space; scalar and vector product and application in geometry. Elements of the differential calculus of functions of two variables (partial derivatives of the first and second order). The total differential.

Applied learning methods: lectures and exercises.

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.

The exercises provide for an example solution of the task on the board together with the analysis of subsequent stages. The method of solving the problem by the students on the blackboard is reviewed by the lecturer.

Basic bibliography:

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. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka cz. I i II, Wydawnictwo Politechniki Poznańskiej, Poznań 2001.

Additional bibliography:

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

Result of average student's workload

Activity	Time (working hours)
1. Preparation for the lecture	5
2. Participation in the lecture	60
3. Fixing the content of the lecture	20
4. Participation in consultations	15
5. Preparation for the exam	10
6. Participation in the exam	2
7. Preparation for exercises	13
8. Participation in the exercises	30
9. Strengthening the content of exercises	20
10. Preparation for passing	10

Student’s workload

Source of workload	hours	ECTS

Total workload	220	7
Contact hours	107	4
Practical activities	78	3