STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Mathematics**		Code **1010134221010340004**

Field of study **Environmental Engineering Extramural First-**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**

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				No. of credits **6**
Lecture: **20**	Classes: **20**	Laboratory: **-**	Project/seminars: **-**	

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	ECTS distribution (number and %**)**

Responsible for subject / lecturer:

dr Marian Liskowski
email: marian.liskowski@put.poznan.pl
tel. (61)665 2842
Faculty of Electrical Engineering
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knowledge of mathematics defined by the core curriculum of mathematics education at the advanced level of secondary school.
2	**Skills**	The ability to associate facts, information processing, reasoning, interpretation and ability to reflect.
3	**Social competencies**	Focus on expanding knowledge and learn new skills in order to participate more fully in life and society.

Assumptions and objectives of the course:

1). Familiarize students with the methods linear algebra in the section on complex numbers, matrix, vector calculus and education skills to apply them to the analysis of the problems in the field of engineering.

2). Developing skills related to finding information not directly expressed, finding connections between distributed information, inference on the basis of several factors.

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

Knowledge:

1. The student knows the concept of a complex number. - [K_W01]

2. The student knows the concept of a matrix and the determinant of a matrix. - [K_W01]

3. The student has a basic knowledge of the partial derivatives and the total differential of functions of several variables. - [K_W01]

4. The student has knowledge about the methods of calculating the double integrals and triple integrals. - [K_W01]

5. The student knows the concept of number series. - [K_W01]

Skills:

1. The student can find solutions of simple algebraic equations in the set of complex numbers. - [K_U01, K_U02]

2. The student can use the matrix operations to solve linear equations and study the solvability of such a system - [K_U02, K_U07]

3. The student can describe using mathematical formulas basic geometric figures and he analyses their relative position. - [K_U09, K_U10]

4. The student can apply partial derivatives to study local extremes and to indicate the direction of the fastest growth of the two variable function. - [K_U02, K_U07]

5. The student use a total differential of a function in approximate calculations. - [K_U09]

6. The student can use the double integrals for calculations relating to engineering practice. - [K_U07]

7. The student can solve simple differential equation of first order and and first order linear differential equation. - [K_U07]

Social competencies:
1. The sense of usefulness of mathematical competence in engineering practice - [K_K04]
2. The ability to reflect and critically assess their own performance - [K_K02, K_K06]

Assessment methods of study outcomes
Lecture. A two-part written examination at the end of the semester: - Sat. 1 knowledge test (3 questions) - Sat. 2 test of skills (3 jobs). Method of evaluation: Each of the two parts of the test is evaluated in a scoring system using a scale of 0-15 points. Duration of test: 60 minutes. TUTORIALS: - 2 colloquia written during the semester (7 and 14 weeks), each rated on a scoring system, - continuous evaluation for each course.

Course description
1. Complex numbers.
2. Matrix algebra. Systems of linear equations.
3. Vectors and solid analytic geometry.
4. Number series, the concept of convergence of the series, the study of convergence.
5. The concept of a function of several variables, field, graph, limit of a function at a point.
6. Differential calculus of functions of several variables with selected applications in engineering practice (directional derivative, differential complete, local extremes).
3. Integral calculus of functions of two and three variables with selected applications in engineering practice.
4. The concept of ordinary first order differential equations. The general solution and a particular solution of differential equation. The first order linear differential equation.

Basic bibliography:
1. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1 (Definicje, twierdzenia, wzory), Oficyna Wydawnicza GiS, Wrocław 2003
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 2, Oficyna Wydawnicza GiS, Wrocław, 2007
3. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne (Teoria, przykłady, zadania), Oficyna Wydawnicza GiS, Wrocław 2006

Additional bibliography:
1. W. Krysicki, L. Wlodarski, Analiza matematyczna w zadaniach cz.1, Wydawnictwo Naukowe PWN, Warszawa, 2010
2. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka dla studentów uczelni technicznych, t.II i III, Wydawnictwo Politechniki Poznańskiej, Poznań 2004

Result of average student's workload	
Activity	**Time (working hours)**
1. Preparing for classes	30
2. Preparing for written tests	30
3. Studying for exam	30

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	130	6
Contact hours	40	2
Practical activities	0	0