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) **(brak)**	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 Lecture: **20** Classes: **20** Laboratory: **-** Project/seminars: **-**		No. of credits **4**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art		ECTS distribution (number and %)

Responsible for subject / lecturer:

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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. Valuation of knowledge and skils during written exam. Method of evaluation: The exam is evaluated in a scoring system using a scale of 0-15 points. Duration of exam: 60 minutes. Practical lessons: - two colloquia written during the semester (7 and 14 weeks), each rated on a scoring system, - systematic 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. Applied learning methods. Lecture. 1. Lecture conducted in an interactive way of formulating questions to a group of students or indicated specific students. 2. Student activity is taken into account during the course of the final assessment. Practical lessons: 1. Solving example tasks on the board. 2. Detailed review of the exercise and discussions over the comments. 3. Initiate discussion on solutions.

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, przyklady, 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. Taking part in lectures	20
2. Taking part in practical lessons	20
3. Preparing for practical lessons	20
4. Preparing for written tests	20
5. Preparing for the exam and taking part in it	16
6. Taking part in consultations	4

Student's workload

Source of workload	hours	ECTS
Total workload	100	4
Contact hours	46	2
Practical activities	0	0