STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Mathematical Analysis**		Code **1010531111010340586**
Field of study **Automatic Control and Robotics**	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				No. of credits **6**
Lecture: **60**	Classes: **45**	Laboratory: **-**	Project/seminars: **-**	

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	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**	Student should have the ability to use algebraic expressions, the ability to solve equations and inequalities algebraic, exponential, logarithmic and trigonometric, the ability to use the properties of elementary functions and the ability to acquire information from the indicated sources.
3	**Social competencies**	He should understand the necessity of expanding his competences / be ready to cooperate within the team.

Assumptions and objectives of the course:

1. To provide students with basic knowledge of the theory of real functions of one and several variables, differential and integral calculus, number and power series as well as first order differential equations.

2. Shaping students' ability to apply the concept of limit function to study the selected properties of functions, the use of concepts and methods of calculus and calculus arising from the needs of engineering practice. Shaping teamwork skills.

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

Knowledge:

1. Student has knowledge of methods of mathematical analysis of the functions of one and several variables; - [K_W1]

Skills:

1. Student is able to find information on access to literature, databases and other sources also in a foreign language; - [K_U1]

Social competencies:

1. Student understands the need and knows the possibilities of continuous training - raising professional, personal and social competences; - [K_K1]

2. The student is aware of the responsibility for his own work and readiness to comply with the rules of working in a team and taking responsibility for the tasks he has carried out jointly; - [K_K3]

Assessment methods of study outcomes

Verification of learning outcomes.

Forming rating:

1. lectures: based on answers to questions about the content of previous lectures

2. exercises: based on the current progress of task implementation.

Summary rating:

1. lectures: assessment of knowledge and skills demonstrated in the written exam. The exam consists of two parts; the first part deals with the knowledge of concepts and theorems and the ability to illustrate them with examples; in the second part, the ability to use mathematical instruments to solve practical problems is verified.

The exam is assessed in a point system using a scale of 0-30 points.

2. Exercises: two written assignments carried out under the teacher's supervision.

Obtaining additional points for activity during classes, in particular for the effectiveness of applying knowledge, remarks related to the improvement of didactic materials, indicating the perceptual diffculties of students enabling the improvement of the didactic process.

Course description

1. Elements of logic. Elements of set theory, the set of real numbers. The concept of the relationship (including equivalence relation, the relation of order and order linear relationship). The scalar function.

2. Elementary functions (formulas, graphs, properties).

3. The limit and continuous of function and applications.

4. Differential calculus of one variable function with selected applications in engineering practice (rules for finding derivatives, higher order derivatives, local extrema of functions, the Mean Value Theorems, The first dervative test, concavity and the second derivative test, Taylor and Maclaurin series, L'Hospital's rule).

5. Integral calculus of one variable function with selected applications in engineering practice, Riemann's integral, improper integrals.

6. Infinite series, the concept of convergence of the series. Convergence criteria.

7. The concept of a function of several variables, field, graph, limit of a function at a point.

8. Differential calculus of functions of several variables with selected applications in engineering practice (partial derivatives, directional derivative, differential complete, local extremes).

9. Differential operators (gradient, rotation, divergence, laplasian).

10. Integral calculus of functions of several variables (multiple integral) with selected applications in engineering practice.

11. Curvilinear integrals with applications in engineering practice, scalar field and vector field, Green's theorem.

12. Power series, the concept of convergence of the series, the study of convergence. The development of selected types of functions in power series.

13. First-order differential equations, Cauchy's problem.

Applied methods of education.

Lecture.

1. Interactive lecture with formulation questions to a group of students or to specific students indicated.

2. Theory presented in connection with current knowledge students.

3. Presenting and discussing new issues preceded by justification of purposefulness and a reminder of related content learned at the preceding lectures.

Practical lessons.

1. Solving example tasks on the board.

2. Detailed review of task solutions and discussions on comments.

3. Initiate discussion on solutions.

Basic bibliography:

1. Analiza matematyczna 1, M. Gewert, Z Skoczylas, Oficyna Wydawnicza GiS, Wrocław, 2006

2. Analiza matematyczna 2, M. Gewert, Z Skoczylas, Oficyna Wydawnicza GiS, Wrocław, 2007

3. Elementy analizy wektorowej, M. Gewert, Z Skoczylas, Oficyna Wydawnicza GiS, Wrocław, 2004

4. Analiza matematyczna w zadaniach, t. 1, t. 2, W. Krysicki, L. Włodarski, PWN, Warszawa, 2011

Additional bibliography:

1. Matematyka dla studentów wyższych uczelni technicznych, t. 1-3, I. Foltyńska, Z. Ratajczak, Z. Szafrański, Wydawnictwo Poli-techniki Poznańskiej, Poznań, 2004

2. Równania różniczkowe zwyczajne, M. Gewert, Z Skoczylas, Oficyna Wydawnicza GiS, Wrocław, 2006

Result of average student's workload

Activity	Time (working hours)

1. Taking part in practical lessons	45
2. Preparing for practical lessons	10
3. Preparing for written tests	13
4. Taking part in lectures	60
5. Taking part in consultationes	2
6. Studying literature	3
7. Preaparing for the exam and taking part in it : 14h + 2h	16
8. Discussion of the results of the exam	1

Student's workload

Source of workload	hours	ECTS
Total workload	150	6
Contact hours	110	4
Practical activities	45	2