

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Mathematics I		Code 1010401221010340104
Field of study TECHNICAL PHYSICS	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) full-time	
No. of hours Lecture: 2 Classes: 2 Laboratory: - Project/seminars: -		No. of credits 5
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 technical sciences		ECTS distribution (number and %) 5 100%
Responsible for subject / lecturer: dr hab. inż. Ewa Magnucka-Blandzi email: ewa.magnucka-blandzi@put.poznan.pl tel. 61 665 2354 Faculty of Electrical Engineering ul. Piotrowo 3A 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Has knowledge of mathematics of the first semester of undergraduate study
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 of the first semester of undergraduate study. 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. Knows mathematical methods essential for describing basic physical laws and solving problems related to technical physics including: basic concepts of differential and integral calculus, linear algebra and analytical geometry - [K_W01] 2. Has knowledge of mathematics needed to use mathematical tools to describe aspects of mechanics, constructions and technological processes - [K_W07] 3. Has knowledge of the appropriate use of computational techniques, supporting the work of the engineer while understanding the limitations - [K_W01]		
Skills: 1. Is able to use knowledge she or he has acquired to describe processes, create models in the area of technical physics - [K_U01] 2. Is able to use analytical methods to formulate and solve problems in the area of measuring physical quantities - [K_U01] 3. Is able to extract information from the literature, databases and other sources, interpret it and draw conclusions, formulate and justify opinions - [K_U02] 4. Is able to plan and arrange self-education process - [K_U03] 5. Is able to make correct use of standard analytical tools, including numerical and calculation ones, to solve detailed physical and technical problems; is able to make a critical evaluation of results of such analysis - [K_U09]		
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

-Lectures:

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; eigenvalues and eigenvectors)

VECTOR ALGEBRA AND VECTOR ANALYSIS

(scalars, vectors, affine vectors, definition of vector, linear combinations, definition of scalar multiplication of a vector, parallelism, definition of vector addition, linear independence, free vectors, definition of the scalar product, orthogonality, definition of the vector product, triple product, expressions in a Cartesian coordinate system, gradient, divergence, curl)

MULTIPLE INTEGRALS (definition of the double integral, a region of type I (x-section), a region of type II (y-section), iterated integrals, evaluation of double integrals, reversing the order of integration, double integrals in polar coordinates - Jacobian functional determinant, the triple integral, evaluation by iterated integrals, triple integrals in cylinder coordinates and in spherical coordinates - Jacobian functional determinant, conversion of cylindrical coordinates to rectangular coordinates, conversion of spherical coordinates to rectangular coordinates, the area of the region, definition of first moment and the second moment (the moment of inertia) about the x-axis and y-axis, the center of mass, the center of inertia, the volume of the solid)

CURVE INTEGRALS (definitions of the curve integral, the curve integral of scalar functions, the curve integral along smooth curve from A to B, methods of evaluation, independence of the chosen path, a contour integral - the curve integral along closed curves, Green theorem, applications of curve integrals)

and

applications of the above issues in the technics, particularly in mechanics and physics

Classes:

the acquisition of practical skills in solving tasks of selected issues discussed during the lectures

Basic bibliography:

1. M. Gewert, Z. Skoczylas: Analiza matematyczna I i II, Algebra liniowa I i II, Równania różniczkowe zwyczajne.
2. I. Folyńska, Z. Ratajczak, Z. Szafranski: Matematyka dla studentów uczelni technicznych, cz.1, cz.2, cz.3, Wyd. Poznań: Politechnika Poznańska.

Additional bibliography:

1. W. Kryszicki, L. Włodarski, Analiza matematyczna w zadaniach, cz.1, cz.2, Wydawnictwo naukowe PWN, Warszawa

Result of average student's workload

Activity	Time (working hours)
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1. Participation in lectures	30	
2. Participation in classes	30	
3. Preparation for tests at each subsequent classes	15	
4. Preparation for each classes	7	
5. Preparation for written test / oral	10	
6. Assessment classes	4	
7. The written exam / oral	4	
8. Consultations	4	
Student's workload		
Source of workload	hours	ECTS
Total workload	104	5
Contact hours	72	3
Practical activities	30	1