STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Mathematics I		**1010401221010340104**

Field of study	Profile of study (general academic, practical)	Year /Semester
TECHNICAL PHYSICS	**(brak)**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **2**	Classes: **2**	Laboratory: **-**	Project/seminars: **-**	**5**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
the sciences	**5 100%**
Physical sciences	**5 100%**

Responsible for subject / lecturer:

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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:

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST-ORDER (definition, the initial-value problem, the general solution, an explicit solution, the equation with separated variables, the homogeneous equation, linear homogeneous and non-homogeneous equations, Bernoulli equation, the exact differential equation, and a general strategy for finding solutions).

ORDINARY DIFFERENTIAL EQUATIONS OF SECOND-ORDER REDUCIBLE TO ORDINARY DIFFERENTIAL EQUATIONS OF FIRST-ORDER (types and a general strategy for finding solutions).

ORDINARY LINEAR DIFFERENTIAL EQUATIONS OF SECOND-ORDER WITH CONSTANT COEFFICIENTS (a form of linear second-order equations with real constant coefficients, homogeneous differential equations with constant coefficients, auxiliary equation ? characteristic equation, the complementary function, nonhomogeneous differential equations with constant coefficients, the method of undetermined coefficient, the particular solution, linear dependence and independence of solutions, the Wronskian)

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 form A to B, methods of evaluation, independence of the chosen path, a contour integral ? the curve integral along closed curves, Green?s theorem, applications of curve integrals)

INFINITE SERIES (definition, necessary conditions for convergence, criteria for convergence ? the comparison test, the ratio test, the root test, the integral test, Leibniz? criterion for alternating series, power series ? definition, radius of convergence, Taylor?s series and application to infinite series ? expansion to real functions, Fourier series).

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. Foltyńska, Z. Ratajczak, Z. Szafrański: Matematyka dla studentów uczelni technicznych, cz.1, cz.2, cz.3, Wyd. Poznań: Politechnika Poznańska.

Additional bibliography:

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

Result of average student's workload

Activity	Time (working hours)

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