STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Mathematics**		Code **1010104131010340004**
Field of study **Civil Engineering First-cycle Studies**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 3**
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: **16** Classes: **22** Laboratory: **-** Project/seminars: **-**		No. of credits **5**
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 **technical sciences** **Technical sciences**		ECTS distribution (number and %) **5 100%** **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 second 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

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).

Basic bibliography:

1. M. Gewert, Z. Skoczylas: Analiza I, Analiza II, Równania różniczkowe zwyczajne GiS, Wrocław, 2006.
2. I. Foltyńska, Z. Ratajczak, Z. Szafrański: Matematyka dla studentów uczelni technicznych, Wydawnictwo Politechnikii Poznańskiej, Poznań, 2000.
3. N. M. Matwiejew: Zadania z równań różniczkowych zwyczajnych, PWN, Warszawa 1974.

Additional bibliography:

1. W. Krysicki, L. Wlodarski, Analiza matematyczna w zadaniach cz.1, Wydawnictwo Naukowe PWN, Warszawa, 2010

Result of average student's workload

Activity	Time (working hours)
1. Preparation for exercise	40
2. Preparation for colloquia	30
3. Exam preparation	20

Student's workload

Source of workload	hours	ECTS
Total workload	120	5
Contact hours	38	2
Practical activities	38	1