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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:	3. Has	knowledge of the app	ropriate use of computational tech	nniques, supporting the work of th	e engineer while		
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 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: 	3. Is al and jus	ble to extract informations - [-K_U0	on from the literature, databases a 2]	and other sources, interpret it and	draw conclusions, formulate		
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:	4. Is at	ole to plan and arrange	e self-education process - [-K_U0	3]			
Social competencies:	5. Is at and tee	ble to make correct us chnical problems; is at	e of standard analytical tools, inclued to make a critical evaluation of	uding numerical and calculation on results of such analysis - [-K_U09	ies, to solve detailed physical 9]		
	Socia	al competencies:					

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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