Bialystok University of Technology									
Field of study	**Computer Science**							**Degree level and programme type**	**Engineer's degree full-time programme**
Specialization/ diploma path	**---**							**Study profile**	academic
Course name	**Calculus 3**							**Course code**	**FCS-00062**
								Course type	obligatory
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	**Semester**	3
	30	30						**No. of ECTS credits**	**6**
Entry requirements	Linear Algebra and Analytic Geometry 2 (FCS-00060), Calculus (FCS-00002), Calculus 2 (FCS-00070),								
Course objectives	Providing the knowledge on arcs, surfaces, arc integrals, surface integrals, vector fields, elements of complex and functional analysis, and selected applications. Gaining ability of computing arc and surface integrals of functions and vector fields. Gaining ability of using computer to perform such calculations.								
Course content	Lecture: Notion of arc, its length, curvature and torsion. Undirected and directed arc integral. Surface, its area and orientation. Unoriented and oriented surface integral. Rotation and divergence of vector field. Theorems of Gauss-Ostrogradski, Stokes and Green. Independence of path integral from the path. Applications of arc and surface integrals. Complex functions, differentiability, integrals, singular points. Applications of complex functions. Banach and Hilbert spaces and its applications. Classes: Notion of arc, its length, curvature and torsion. Undirected and directed arc integral. Surface, its area and orientation. Unoriented and oriented surface integral. Rotation and divergence of vector field. Theorems of Gauss-Ostrogradski, Stokes and Green. Independence of path integral from the path. Applications of arc and surface integrals. Complex functions, differentiability, integrals, singular points. Applications of complex functions. Specialistic workshop: Length, curvature and torsion of arc. Undirected and directed arc integral. Surface, its area and orientation. Unoriented and oriented surface integral. Rotation and divergence of vector field. Applications of arc and surface integrals. Complex functions, differentiability, integrals, singular points. Applications of complex functions.								
Teaching methods	informative lecture, lecture problem, discussion related to the lecture, programming, subject exercises,								
Assessment method	Lectures: written and oral exams; Classes: 6-8 tests; specialistic workshop: reports from solved problems.								

Symbol of learning outcome	**Learning outcomes**	**Reference to the learning outcomes for the field of study**
LO1	knows basic notions related to integral calculus on curves and surfaces, complex functions, Banach and Hilbert spaces	K_W01
LO2	knows basic computational methods and theorems from the known areas of mathematical analysis	K_W01
LO3	is able to compute arc and surface integrals and examine complex functions	K_U01
LO4	is able to apply known methods and theorems in other areas	K_U01

Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	written exam	L
LO2	written exam	L
LO3	tests, reports	C,Sw
LO4	tests, reports	C,Sw

	Student workload (in hours)	**No. of hours**
Calculation		
	1 - Attendance at lectures -	30
	2 - Attendance at classes -	30
	3 - Attendance at specialistic workshop -	15
	4 - Doing homework -	30
	5 - Attendance at consultations -	5
	6 - Preparation to exam -	28
	7 - Preparation to tests -	10
	8 - Attendance at exam -	2
	TOTAL:	**150**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	82 (3)+(2)+(1)+(5)+(8)	3.3
Student workload – practical activities	85 (4)+(3)+(2)+(7)	3.4

Basic references	1. G. Strang, Calculus textbook, http://ocw.mit.edu/resources/res-18-001-calculus-online-textbook-spring-2005/textbook/ 2. T. M. MacRober, Functions of a complex variable, http://freebookcentre.net/maths-books-download/Functions-of-a-complex-variable.html 3. Ch. Remling, Functional analysis, http://freebookcentre.net/maths-books-download/Functional-Analysis-by-Christian-Remling.html	
Supplementary references	1. S. Lang, Calculus of several variables, Reading : Addison-Wesley Publ, 1979 2. S. Lang, Complex analysis, Reading : Addison-Wesley Publ, 1977	
Organisational unit conducting the course	Department of Mathematics	**Date of issuing the programme**
Author of the programme	prof. dr hab. inż. Zbigniew Bartosiewicz	Feb. 17, 2022

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW – field work,S – seminar