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	**Differential and Difference Equations**							**Course code**	**FCS-00064**
								Course type	obligatory
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	**Semester**	3
	45	30			15			**No. of ECTS credits**	**6**

Entry requirements	Linear Algebra (FCS-00030), Linear Algebra and Analytic Geometry 2 (FCS-00060), Calculus (FCS-00002), Calculus 2 (FCS-00070),
Course objectives	Getting students to learn ordinary differential equations and methods of solving them. Gaining ability to solve selected types of ordinary differential equations and systems. Getting students to learn methods of solving linear difference equations and systems and basic types of partial differential equations. Getting students to learn applications of differential and difference equations.
Course content	Lectures: Differential equations of first order, field of directions, existence and uniqueness of solutions. Integrable types of equations of first order. Linear equations of higher orders, homogeneous and nonhomogeneous. Fundamental matrix, exponential matrix. Variation of constant method. Laplace transformation. Linear difference equations and systems. Selected types of partial differential equations. Applications of differential and difference equations. Classes: Differential equations of first order, field of directions, existence and uniqueness of solutions. Integrable types of equations of first order. Linear equations of higher orders, homogeneous and nonhomogeneous. Fundamental matrix, exponential matrix. Variation of constant method. Laplace transformation. Linear difference equations and systems. Applications of differential and difference equations. Specialistic workshop: Differential equations of first order, field of directions, existence and uniqueness of solutions. Integrable types of equations of first order. Linear equations of higher orders, homogeneous and nonhomogeneous. Fundamental matrix, exponential matrix. Laplace transformation. Linear difference equations and systems. Applications of differential and difference equations. Numerical methods of solving differential equations.
Teaching methods	informative lecture, lecture problem, discussion related to the lecture, programming, subject exercises,
Assessment method	Lectures: written and oral exam; Classes: 4-6 tests; Specialistic workshop: entry tests and reports

Symbol of learning outcome	**Learning outcomes**	**Reference to the learning outcomes for the field of study**
LO1	knows basic concepts related to differential and difference equations and their applications to modeling	K_W01
LO2	knows basic computational methods and theorems connected with differential equations	K_W01
LO3	is able to solve selected types of differential and difference equations, knows proper computational tools	K_U01
LO4	is able to apply differential and difference equations to modeling	K_U01

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

	Student workload (in hours)	**No. of hours**
Calculation		
	1 - Attendance at lectures -	45
	2 - Attendance at classes and specialistic workshop -	45
	3 - Preparation to classes and specialistic workshop -	15
	4 - Preparation of reports and homework -	18
	5 - Attendance at consultations -	5
	6 - Preparation to exam -	10
	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	97 (5)+(1)+(2)+(8)	3.9
Student workload – practical activities	88 (3)+(4)+(2)+(7)	3.5

Basic references	1. W.-C. Xie, Differential Equations for Engineers, Cambridge : Cambridge University Press, 2010. 2. B.R. Hunt, Differential equations with MATLAB : updated for MATLAB 7 and Simulink 6, Hoboken : Wiley J., 2005. 3. C.R. Wylie, Differential equations, New York : McGraw-Hill, 1979. 4. S. Elaydi, An introduction to difference equations, New York : Springer, 2005.
Supplementary references	1. A.A. Šestakov, A course of higher mathematics : integral calculus, differential equations, vector analysis, Mir, Moscow 1990

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