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	**Numerical Methods**							**Course code**	**FCS-00102**
								Course type	obligatory
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	**Semester**	2
	15				30			**No. of ECTS credits**	**6**
Entry requirements	Linear Algebra (FCS-00030), Calculus (FCS-00002), Calculus 2 (FCS-00070), Programming Basics (FCS-00031),								
Course objectives	The aim of the course is to familiarize students with chosen numerical methods and an implementation of chosen numerical method algorithms.								
Course content	Lecture: Newton and Hermite interpolation. Splines. Mean-square approximation. Numerical methods to solve: nonlinear equations (bisection, secant and Newton methods), systems of linear equations (Gauss and Cholesky methods) and nonlinear equations (Newton method). Deriving matrix eigenvalues and eigenvectors. Numerical integration: definite and multiple integral computing (Gaussian and Newton-Cotes quadratures). Numerical methods for initial value and boundary value problem solving for ordinary differential equations (difference methods and the Runge-Kutta type methods). Examples of numerical methods applications. Special workshop: Newton and Hermite interpolation. Splines. Mean-square approximation. Numerical methods to solve: nonlinear equations (bisection, secant and Newton methods), systems of linear equations (Gauss and Cholesky methods) and nonlinear equations (Newton method). Deriving matrix eigenvalues and eigenvectors. Numerical integration: definite and multiple integral computing (Gaussian and Newton-Cotes quadratures). Numerical methods for initial value and boundary value problem solving for ordinary differential equations (difference methods and the Runge-Kutta type methods). Examples of numerical methods applications.								
Teaching methods	informative lecture, programming,								
Assessment method	Lecture - test, special workshop - written in-class tests and reports on realized tasks.								

Symbol of learning outcome	**Learning outcomes**	**Reference to the learning outcomes for the field of study**
LO1	knows chosen numerical methods of algebra	K_W01
LO2	knows chosen numerical methods of calculus	K_W01
LO3	knows how to implement algorithms realizing chosen numerical methods of algebra	K_U01 K_U02
LO4	knows how to implement algorithms realizing chosen numerical methods of calculus	K_U01 K_U02

Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	test-lecture	L
LO2	test-lecture	L
LO3	work observation at special workshop, reports	Sw
LO4	work observation at special workshop, reports	Sw

Student workload (in hours)	**No. of hours**
1 - Attendance at lectures - 15x1h	15
2 - Attendance at specialistic workshop - 15x2h	30
3 - Participation in student-teacher sessions -	5
4 - Preparation for specialistic workshop -	30
5 - Homework realization -	45
6 - Preparation for passing the lecture -	30
TOTAL:	**155**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	50 (1)+(2)+(3)	1.9
Student workload – practical activities	110 (4)+(2)+(3)+(5)	4.3

Basic references	1. P. Tatjewski, Numerical methods, OW PW, 2014. 2. A. Bjorck, G. Dahlquist, Numerical methods, Courier Corporation, 2003. 3. U.M. Ascher, Ch. Greif, A First Course on Numerical Methods, SIAM, 2011.
Supplementary references	1. S.C. Chapra, R.P. Canale, Numerical methods for engineers, MCGraw-Hill, 2006. 2. A. Kharab, R.B. Guenther, An introduction to numerical methods: a MATLAB approach, CRC/Taylor & Francis, 2012. 3. R.Z. Morawski, A. Miękina, Solved Problems in Numerical Methods for Students of Electronics and Information Technology, OW PW, Warszawa, 2021.

Organisational unit conducting the course	Department of Mathematics	**Date of issuing the programme**
Author of the programme	dr Krzysztof Piekarski	March 3, 2023

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