

Białystok 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	
L01	knows chosen numerical methods of algebra								K_W01	
L02	knows chosen numerical methods of calculus								K_W01	
L03	knows how to implement algorithms realizing chosen numerical methods of algebra								K_U01 K_U02	
L04	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	
L01	test-lecture								L	
L02	test-lecture								L	
L03	work observation at special workshop, reports								Sw	
L04	work observation at special workshop, reports								Sw	
Student workload (in hours)								No. of hours		
Calculation										
	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