

**Syllabus of the educational discipline**  
**«ALGORITHMS AND CALCULATION METHODS»**

<i>Cycle of Higher Education</i>	<i>First cycle of higher education (Bachelor's degree)</i>
<i>Field of Study</i>	<i>12 Information Technologies</i>
<i>Specialty</i>	<i>123 Computer engineering</i>
<i>Educational program</i>	<i>Computer systems and networks</i>
<i>Discipline status</i>	<i>Normative</i>
<i>Teaching language</i>	<i>English</i>
<i>Year of studies, semester</i>	<i>3 year (5 semester)</i>
<i>Number of credits ECTS</i>	<i>3,5 credits</i>
<i>Distribution by types of trainings and hours of study</i>	<i>Lectures, Laboratory studies, Independent training</i>
<i>Form of final assessment</i>	<i>Exam</i>
<i>Teacher</i>	<i>Korol Yuriy Yurievich, associate professor of department of computer systems and networks</i>
<i>Teacher's contacts</i>	<i>yuriy.korol@uzhnu.edu.ua</i>
<i>Course Schedule</i>	<i>According to the timetable</i>
<p>The purpose of the discipline "Algorithms and calculation methods" is to teach students to develop and implement algorithms for approximate solutions of various problems of applied mathematics; to help students in the formation of personality, his intelligence and ability to logical and algorithmic thinking; to develop students the ability to expand mathematical knowledge and apply it to solve applied problems; to develop practical skills of using modern tools of computer technology</p> <p>As a result of studying the discipline the student must:</p> <p><i>know:</i></p> <ul style="list-style-type: none"> <li>- multiple methods, basic concepts, requirements for multiple methods and their implementation on the computer; solving equations with one unknown (separation of roots, methods of splitting a segment in half, simple iteration, Newton and chords); solving numerical integration and linear programming problems; multiple methods for solving the Cauchy problem for ordinary differential equations.</li> </ul> <p><i>be able to:</i></p> <ul style="list-style-type: none"> <li>- justify the choice of numerical method for solving a mathematical problem; know the features of its implementation on a computer; have a method algorithm and be able to create a program in one of the programming languages; make the necessary calculations and analysis of the results.</li> </ul>	
<p><b>Prerequisites for learning</b>            Mathematical Analysis, Linear Algebra and Analytic Geometry</p>	
<p><b>Content of the educational discipline</b></p>	
<p><b>Module 1.</b></p> <p><b>Topic 1.</b> Introduction. Mathematical models and multiple methods</p> <p><b>Topic 2.</b> Solving nonlinear equations with one unknown</p> <p><b>Topic 3.</b> Direct methods for solving systems of linear algebraic equations.</p> <p><b>Topic 4.</b> Iterative methods for solving systems of linear algebraic equations</p> <p><b>Topic 5.</b> Solving systems of nonlinear algebraic equations.</p> <p><b>Topic 6.</b> Calculation of eigenvalues and eigenvectors of a matrix</p> <p><b>Topic 7.</b> Interpolation and approximation of functions</p> <p><b>Module 2.</b></p> <p><b>Topic 6.</b> Numerical integration of functions</p> <p><b>Topic 7.</b> Linear programming problems</p> <p><b>Topic 8.</b> Numerical methods for solving the Cauchy problem for ordinary differential equations</p> <p><b>Topic 9.</b> Linear Multistep Methods for Solving the Cauchy Problem</p> <p><b>Topic 10.</b> Implicit methods for solving rigid differential equations and their systems</p> <p><b>Topic 11.</b> Boundary value problems for ordinary differential equations</p>	

<b>Course page on the Moodle platform (personal training system)</b>	<i>Syllabus of the educational discipline, hyperlinks to electronic publications of the discipline, recommended literature, students' attendance, lecture materials, presentations, questions for self-control, methodical materials for laboratory works, tests, tasks for checking students' knowledge.</i> <a href="https://moodle.uzhnu.edu.ua">https://moodle.uzhnu.edu.ua</a>		
<b>Recommended literature</b>			
<ol style="list-style-type: none"> <li>1. R. W. Hamming <i>Numerical Methods for Scientists and Engineers (Dover Books on Mathematics) 2nd Revised ed. Edition, Dover Publications, 1987, - 752p.</i></li> <li>2. Everitt B. <i>A handbook of statistical analyses using R / B. Everitt, T. Hothorn. – 2-nd ed. – Chapman and HALL/CRC, 2009. – 376 p.</i></li> <li>3. Shumway R. H. <i>Time series analyses and its applications: With R examples / R. H. Shumway, D. S. Stoffer. – 3-rd ed. – New York : Springer, 2011. – 596 p.</i></li> </ol>			
<b>Assessment system of learning outcomes</b>			
<p><i>The ECTS grade that a student receives after studying a credit module of a discipline is determined according to the student's rating. A student's credit module rating consists of the points the student receives during the semester for the following types of work:</i></p>			
<p><i>1. Modular control work (MCW) duration of 2 acad. hours each. The maximum number of points for the MCW is 50 points.</i></p>			
<p><i>2. Performance of laboratory works.</i></p>			
<p><i>During an academic semester students perform 9 laboratory works: in the first module - 5 laboratory works (maximum number of points - 40), in the second module - 4 laboratory works (maximum number of points - 40).</i></p>			
<p><i>Scores on individual and independent work of students are awarded for: preparation of essays, modernization of tasks, creative approach to task performance, performance of tasks to improve didactic materials on the discipline: 0-10 points for each module.</i></p>			
<p><i>Each module is assessed a maximum of 100 points. At the end of the discipline a rating score is derived as the arithmetic average of the points from the two modules.</i></p>			
<b>ECTS and national grading scale</b>			
Mark scale	ECTS	Exam	Test
90 - 100	A	Excellent	Satisfied
82 - 89	B	Good	
74 - 81	C		
64 - 73	D	Satisfactory	
60 - 63	E		
35 - 59	FX	“Unsatisfactory” with possibility to pass the exam again	“Not satisfied” with possibility to pass the exam again
1 - 34	F	“Unsatisfactory” with obligatory repeated study of the discipline	“Not satisfied” with obligatory repeated study of the discipline