Syllabus of the educational discipline
«MATHEMATICAL ANALYSIS 1»

Cycle of Higher Education	*First cycle of higher education (Bachelor's degree)*
Field of Study	*F Information Technologies*
Specialty	*F7 Computer engineering*
Educational program	*Computer systems and networks*
Discipline status	*Normative*
Teaching language	*English*
Year of studies, semester	*First year, first and second semesters*
Number of credits ECTS	*7 credits*
Distribution by types of trainings and hours of study	*Lectures, Practical studies, Laboratory studies, Independent training*
Form of final assessment	*First semester - test, second semester - exam*
Teacher	*Syniavska Olga Olexandrivna, associate professor of department of probability theory and mathematical analysis, PhD*
Teacher's contacts	*olga.synyavska@uzhnu.edu.ua*
Course Schedule	*According to the timetable*

The purpose of studying the discipline "Mathematical Analysis" is the formation of student's basic knowledge of the basics of calculus; formation of the student's ability to abstract thinking, independent analysis and synthesis of complex systems, as well as the ability to use the acquired fundamental knowledge at the stages of problem statement in mathematical and symbolic form.

As a result of mastering the discipline "Linear Algebra and Analytical Geometry" students must demonstrate the following learning outcomes:

knowledge:

- elements of set theory and combinatorics;
- theory of limits;
- fundamental methods of differential and integral calculus to study the functions of one and several variables.

skills:

- use the fundamental technologies of differential and integral calculus in practical problems;
- perform mathematical transformations and calculations that are necessary for the development and use of technical object and software objects and which require the application of fundamental concepts.

Prerequisites for learning

High School Mathematics Course

Content of the educational discipline

Semester 1

Module 1

Content module 1. Numerical sets, sequences, series.

Topic 1. Elements of the set theory.
Topic 2. Complex numbers and operations with them.
Topic 3. Numerical sequences.
Topic 4. Numerical series.
Calculation work

Content module 2. Functions of single variable.

Topic 5. The concept of function.
Topic 6. Limit of a function.
Topic 7. Properties of graphs.
Topic 8. Continuity of functions. Points of iscontinuity of a function.
Calculation work
Modular control work

Module 2

Content module 3. Derivatives and differentials of functions of one variable

Topic 9. Derivative of functions of one variable..

Topic 10. Differentials of functions of one variable.

Topic 11. The basic theorems of differential calculus and their application.

Calculation work

Content module 4. Geometric applications of a derivative.

Topic 12. Monotonic functions. Local extrema.

Topic 13. Convexity and concavity of the graph of functions. Investigation of the function.

Calculation work

Modular control work

Examination

Semester 2

Module 3

Content module 5. Primitive function. Indefinite integral.

Topic 14. Polynomials and rational functions.

Topic 15. Indefinite integral.

Topic 16. Basic methods of integration.

Topic 17. Integrating certain irrational and trigonometric functions.

Calculation work

Content module 6. Definite integral.

Topic 18. Definite integral.

Topic 19. Improper integrals.

Topic 20. Application of definite integrals.

Calculation work

Modular control work

Module 4

Content module 7. Functions of several variables.

Topic 21. Functions of several variables.

Topic 22. Derivatives of functions of several variables.

Topic 23. Differentials of functions of several variables.

Topic 24. Extrema of functions of several variables.

Calculation work

Content module 7. Multiple and curvilinear integrals.

Topic 25. Multiple integrals.

Topic 26. Curvilinear integrals of 1-st and 2-nd order.

Calculation work

Modular control work

Examination

Material and technical support (software) of the discipline *Mathcad (Geogebra, Desmos)*	
Course page on the Moodle platform (personal training system)	*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, task for checking students' knowledge.* *https://moodle.uzhnu.edu.ua*

Recommended literature

1. Higher mathematics: manual. Kyiv: National aviation university "NAU-druk" publishing, 2009. Part 1. / V. P. Denisiuk, L. I. Grishina, O. V. Karupu [et al.]. 2009. 272 p.

2. Higher mathematics: manual. Kyiv: National aviation university "NAU-druk" publishing, 2009. Part 2. / V. P. Denisiuk, V. G. Demydko, V. K. Repeta, [et al.]. 2009. 243 p.

3. Havdzynskyi V.N., Korobova L.N. Differential calculus. Functions of one variable:

textbook. For Students Studying a Course of Higher Mathematics in English. Odessa: ODESSA NATIONAL A.S. POPOV ACADEMY OF TELECOMMUNICATIONS. 2011. 68 p.

4. Gavdzinski V.N., Korobova L.N., Maltseva E.V. Functions of several variables: textbook. Odessa: ODESSA NATIONAL A.S. POPOV ACADEMY OF TELECOMMUNICATIONS. 2012. 48 p.

5. Zhuravska G.V. Higher Mathematics. Integral Calculus of a Function of One Variable. Elements of Theory. Kyiv, "Igor Sikorsky Kyiv Polytechnic Institute", 2019. 68 p.

6. Havdzynskyi V.N., Korobova L.N. Reference Book on Higher Mathematics. Part I. For students doing a course of higher mathematics in englis. Odessa: ODESSA NATIONAL A.S. POPOV ACADEMY OF TELECOMMUNICATIONS. 2010. 64 p. http://www.dut.edu.ua/uploads/l_352_44088621.pdf

7. Glushkov A.V., Khetselius O.Yu., Buyadzhi V.V., Higher Mathematics, Part 1. Study guide. Odessa: TEC. 2017. 325p.

Assessment system of learning outcomes

Current control carried out during semester and evaluated by the amount of points (max is 100 points). A minimum amount, that allows a student to get credit is 35 (max is 100 points).
During each semester, students perform 4 individual computational works. Maximum number of points for each calculated work: 25 points.
Modular control work in each semester is divided into two control works; maximum number of points for each test: 50 points (dilution of tasks is specified in the test).
Final (semester) control is carried out in the form of test/exam and evaluated in points (max is 100 points, min is 35 points). The exam ticket consists of 5 questions - 2 theoretical and 3 practical. The answer to the theoretical question is evaluated by 20 points, and the answer to each practical question is evaluated by 20 points.

ECTS and national grading scale

<table>
<tr><th>Mark scale</th><th>ECTS</th><th>Exam</th><th>Test</th></tr>
<tr><td>90 - 100</td><td>A</td><td>Excellent</td><td rowspan="5">Satisfied</td></tr>
<tr><td>82 - 89</td><td>B</td><td rowspan="2">Good</td></tr>
<tr><td>74 - 81</td><td>C</td></tr>
<tr><td>64 - 73</td><td>D</td><td rowspan="2">Satisfactory</td></tr>
<tr><td>60 - 63</td><td>E</td></tr>
<tr><td>35 - 59</td><td>FX</td><td>"Unsatisfactory" with possibility to pass the exam again</td><td>"Not satisfied" with possibility to pass the exam again</td></tr>
<tr><td>1 - 34</td><td>F</td><td>"Unsatisfactory" with obligatory repeated study of the discipline</td><td>"Not satisfied" with obligatory repeated study of the discipline</td></tr>
</table>