MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

THE LATEST HISTORY OF UZBEKISTAN

MODULE HANDBOOK

Field of knowledge	500 000	Science, mathematics and statistics
Field of education	540 000	Mathematics and statistics
Field of study	60540200	Applied mathematics

KARSHI - 2021

MODULE REFERENCES

Module name:	THE LATEST HISTORY OF UZBEKISTAN
Code, if applicable:	UYTB105
Semesters in which the module is taught:	1
Lecturer:	Sulaymanova Soxiba, senior teacher Quvvatova Nodira, senior teacher Tuxtayeva Ra'no, senior teacher
Language	Uzbek
Relation to curriculum:	Compulsory
Type of teaching, contact hours:	Lecture, practical
Workload:	150 hours Contact hours: 60 hours; lecture – 30 hours; practical – 30 hours Self-study: 90 hours
Credit points:	5
Recommended prerequisites:	History of Uzbekistan Archaeology Historical geography Medieval Uzbekistan Source studies

Module objectives Intended learning outcome	The essence of the historical path that our country has taken during the years of independence, the significance of the changes that have taken place in the recent history of Uzbekistan; Knows how to comprehensively analyze the aspects of the relationship between the development of statehood and international relations; Knows from the perspective of historicity and objectivity the processes of integration of Uzbekistan with the world community, ensuring security, interethnic harmony and religious tolerance, increasing the role and influence of the Republic of Uzbekistan in international ratings and indices in modern processes;

	Learns to analyze the uniqueness of historical processes in different periods of the recent history of Uzbekistan; Knows how to use the idea of national independence in studying the problems of the recent history of Uzbekistan, strengthening the worldview, Acquires the skills to express their attitude to the processes taking place around them, and to understand the role of history in the development of society and human worldview; will acquire the skills to understand the connection between current events and important events in history. will acquire the skills to apply the knowledge acquired in the subject in scientific research and scientific and pedagogical activities, and to conduct research on current issues of the history of statehood.
Content	Lecture 1. Introduction. The subject, goals and objectives of the academic discipline “The Latest History of Uzbekistan”, theoretical and methodological principles. Lecture 2. Historical foundations of the ideas of independence in Uzbekistan Lecture 3. Historical foundations of the ideas of independence in Uzbekistan Lecture 4. Historical foundations of the ideas of independence in Uzbekistan Lecture 5. Socio-political processes in Uzbekistan on the eve of independence Lecture 6. The historical significance of the formation of the independent Republic of Uzbekistan. The unique path of independence and development of Uzbekistan. Lecture 7. The formation of the foundations of democratic, civil society in Uzbekistan, the implemented political reforms. Lecture 8. Economic reforms, the formation of private ownership. The development of market relations in Uzbekistan. Lecture 9. Reforms in the social sphere in the Republic of Uzbekistan. Lecture 10. Spiritual and cultural development in Uzbekistan during the years of independence. Lecture 11. Reforms implemented in the field of education in the Republic of Uzbekistan. Lecture 12. Uzbekistan and the world community. Lecture 13. Reflection of changes taking place in the socio-political, economic and cultural life of New Uzbekistan in international ratings and indices Lecture 14. Reforms implemented in New Uzbekistan under the leadership and initiative of President Sh.M. Mirziyoyev Lecture 15. The socio-political significance of building a people's and humane state in New Uzbekistan. Seminars Seminar 1. Introduction. The subject, goals and objectives of the

	academic discipline "The Latest History of Uzbekistan", theoretical and methodological principles. Seminar 2. Historical foundations of the ideas of independence in Uzbekistan Seminar 3. Historical foundations of the ideas of independence in Uzbekistan Seminar 4. Historical foundations of the ideas of independence in Uzbekistan Seminar 5. Socio-political processes in Uzbekistan on the eve of independence Seminar 6. The historical significance of the formation of the independent Republic of Uzbekistan. The unique path of independence and development of Uzbekistan. Seminar 7. Formation of the foundations of democratic, civil society in Uzbekistan, implemented political reforms. Seminar 8. Economic reforms, the formation of private ownership. Development of market relations in Uzbekistan. Seminar 9. Reforms in the social sphere in the Republic of Uzbekistan. Seminar 10. Spiritual and cultural development in Uzbekistan during the years of independence. Seminar 11. Reforms implemented in the field of education in the Republic of Uzbekistan. Seminar 12. Uzbekistan and the world community. Seminar 13. Reflection of changes taking place in the socio-political, economic and cultural life of New Uzbekistan in international ratings and indices Seminar 14. Reforms being implemented in New Uzbekistan under the leadership and initiative of President Sh.M. Mirziyoyev Seminar 15. The socio-political significance of building a people-oriented and humane state in New Uzbekistan
Study and examination requirements and forms of examination	Types of control and assessment criteria The student must fully master the theoretical and methodological concepts of the subject, be able to correctly reflect the results of the analysis, independently observe the processes being studied, and complete the tasks and assignments given in the current, intermediate and final types of control. 1. The maximum sum of the current and intermediate control points is 50 points, and the qualifying score is 30 points. Tasks (tests, oral or written questions, case studies, etc.) for the current and intermediate types of control are compiled in a ratio of 40/60 or 50/50, based on the ratio of the audience (lecture, practical, laboratory and seminar) and independent study hours allocated to this subject. 2. The maximum score of the final control is 50 points. Assignments for the final type of control (tests, oral or written questions, case studies, etc.) are compiled in a ratio of 40/60 or 50/50, based on the ratio of classroom hours (lectures, practical,

	laboratory and seminar) and independent study hours allocated to this subject. 3. If the sum of the current and intermediate control points is less than 30 points or a student who misses 25 percent or more of the classroom hours allocated to the subject without a reason is excluded from this subject and is not included in the final control and is considered not to have mastered the relevant credits in this subject. A student who is not included or has not entered the final control type, as well as who has received an unsatisfactory grade in this type of control, that is, has not been able to collect a qualifying score (30 points), is considered to be an academic debtor. In such cases, the student re-masters the subject within the specified time limits.
Media employed	- lectures; - interactive case studies; - seminars (logical reasoning, quick questions and answers); - group work; - presentations; - individual projects.
Reading list	1. R.H. Murtazayeva O‘zbekistonda millatlararo munosabatlar va tolerantlik. Darslik. - Toshkent: Mumtoz so‘z, 2019. 2. R.H.Murtazayeva, A.A.Yermetov, A.A.Odilov va boshq. O‘zbekistonning eng yangi tarixi. - Toshkent, 2024. 3. A.S.Sagdullayev umumiy tahriri ositida. O‘zbekiston tarixi. 1-jild. Darslik. – Toshkent: NIF MSH. 2024. 3. B.J.Eshov, A.A.Odilov. O‘zbekiston tarixi. 2-jild. Darslik. – Toshkent: NIF MSH. 2024. 4. K.D.Saipova. Noveyshaya istoriya Uzbekistana (uchebnoe posobie). –Tashkent: NIF MSH, 2024.
Reviewers	B.J. Eshov – Professor of the Department of History of Uzbekistan, Doctor of Philosophy O.A. Rahmonkulova - Associate Professor of the Department of History of Uzbekistan, Doctor of Philosophy.
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

FOREIGN LANGUAGE

MODULE HANDBOOK

Field of knowledge	500 000	Science, mathematics and statistics
Field of education	540 000	Mathematics and statistics
Field of study	60540200	Applied mathematics

KARSHI – 2021

MODULE REFERENCES

Module name:	Foreign language (English)
Code, if applicable:	XJTB128
Semesters in which the module is taught:	1-2
Lecturer:	Elmurodova Sohiba, lecturer
Language	Uzbek / English
Relation to curriculum:	Compulsory
Type of teaching, contact hours:	Practical
Workload:	210 hours Contact hours: 90 hours; Practical – 90 hours Independent study: 120 hours
Credit points:	7
Recommended prerequisites:	English Lexicology English Grammar Practice of reading and writing

Module objectives Intended learning outcome	The module aims to develop the four core language skills - reading comprehension, listening comprehension, writing, and speaking - in an integrated manner, enhance communication abilities in various contexts, improve both practical and theoretical knowledge of the target language, and ensure that students can freely apply their acquired knowledge, skills, and competencies in real-life activities. The task of the subject is to provide students with the necessary language skills, in accordance with internationally recognized standards, to achieve a B1 level of proficiency in the target foreign language through an integrated approach, and to develop their communicative competence. The objectives of the course based on this curriculum are as follows: • to develop students' ability to use English effectively for practical communication purposes; • to raise students' awareness of the nature of language and language learning skills; • to develop transferable skills that complement other areas of the curriculum; • to support students' personal development; During the course, the students will: • write and speak properly; • be able to use all language skills orally and verbally for effective

	professional communication and collaboration; • be able to competently express his speeches in Russian and foreign languages; • be able to read, interpret and analyze scientific data; • be able to learn and generalize the description of technologies, events, processes and give conclusions; • be able to read special texts, understand their content and translate them into their native languages; • knowledge of the English language as required; • using language to conduct monologues and dialogues on everyday topics; • be able to write informal letters, e-mails, reports, proposals and recommendations;
Content	**Semester 1** **1. Reading:** Text: Hi! Introducing people. Vocabulary relating to countries & nationalities; ordinal/cardinal numbers; jobs. **Grammar skills:** Indefinite articles A/AN; The verb "Be"; **2. Speaking:** Asking for personal information; talking about land marks. **3. Listening:** Names of places. **4. Writing:** Project about your family. (Family, jobs, physical descriptions, numbers) **Grammar skills:** Personal pronouns; the verb "Be"; the verb "Have got"; Possessives; Capital letters; Full stops; the conjunction "and" **5. Reading:** Text: A friend in need. Internet advertisements for pen-friends. Vocabulary relating to people's appearance, abilities and colours. **Grammar skills:** The verb "Have got"; the verb "can" (abilities, polite requests) **6. Speaking:** Describing people; radio programme about missing people. **7. Listening:** Getting to know each other 1 **8. Writing:** An article about a famous person (countries; nationalities; colours; physical/character descriptions) **Grammar skills:** Modal verb "can"; the verb "Be"; the verb "Have got"; Possessives; the conjunctions "and"/"but" **9. Reading:** Text: Home Sweet Home. Advertisement for houses. Vocabulary relating to houses/homes; furniture&appliances. **Grammar skills:** There is/are; this/that/these/those; plurals; prepositions of place (in front of, in, on, next to, behind, under) **10. Speaking:** Describing a house; talking to an estate agent **11. Listening:** Getting to know each other 2 **12. Writing:** An advertisement for a sports center (sports and sports

	center) **Grammar skills:** There is/are; prepositions of place **13. Reading:** Text: Like Father Like Son. Letters to pen-friends. Vocabulary relating to family relationships; free time activities; days of the week. **Grammar skills:** Possessive case; possessive adjectives/pronouns; whose/who's; the Present Simple **14. Speaking:** Days you like/hate; talking about a person. **15. Listening:** Numbers. Cardinals. 1 **16. Writing: A**n article about your favourite season (the weather; activities) **Grammar skills:** The Present Simple tense; Prepositions of time; Adverbs of frequency. **17. Reading:** Text: An Early Bird Or A Night Owl? An article about people's daily routine. Vocabulary relating to daily routines; telling the time; months; pros and cons. **Grammar skills:** Adverbs of frequency; prepositions of time (in, on, at) **18. Speaking: (Enterprise. Beginner level.)** Daily routine; Interviewing a celebrity. **19. Listening: (Basic IELTS listening)** Numbers. Cardinals. 2 **20. Writing:** A postcard to a friend from a holiday resort. **Grammar skills:** The Present Continuous tense; Reflexive pronouns. **21. Reading:** Text: Dolphins. Facts about animals. Vocabulary relating to animals, colours, sizes. **Grammar skills:** Question words; irregular nouns. **22. Speaking:** Describing animals; quiz about animals; **23. Listening:** Numbers. Ordinals. **24. Writing:** Writing a recipe (Food. Ways of cooking) **Grammar skills:** The imperative; uncountable nouns; how much/how many; some/any; plurals **25. Reading:** Text: Holidays. Postcards to friends while on holiday. Vocabulary relating to weather conditions/climate; clothes. **Grammar skills:** The Present Continuous tense. The Present Simple vs. the Present Perfect Continuous tense. **26. Speaking:** Describing clothes. Making comments on clothes. **27. Listening:** Numbers. Decimal fractions. **28. Writing:** An article about a celebrity's daily routine (daily

	routine; telling the time; leisure activities) **Grammar skills:** The Present Simple tense; adverbs of frequency; sequence links (first, then, after that, next) **29. Reading:** Text: Laura's restaurant. Advertisements for a restaurant. Vocabulary relating to types of food/drinks; meals; restaurants. **Grammar skills:** Plurals; countable and uncountable nouns; a/an/some; how much/how many; a few/ a little' some/any **30. Speaking:** Ordering food at a restaurant; talking about fast food restaurants. **Semester 2** **1. Listening:** Numbers. Money. **2. Writing:** A story (emotions/reactions; adverbial phrases of time) **Grammar skills:** The Past Simple tense; time links showing sequence (later, before, after, when) **3. Reading:** Text: An Article About A Place Then And Now. Vocabulary relating to places/building in a town; giving directions; abilities. **Grammar skills:** Was/were; had; could; prepositions of place (in front of, opposite, next to, on, between) **4. Speaking:** Talking about changes in a place; talking about past abilities. **5. Listening:** Numbers. Time. **6. Writing:** An article giving good and points about keeping a cat as a pet. **Grammar skills:** Comparative/superlative form of adjectives; links of addition/contrast (also, what's more, however, on the other hand) **7. Reading:** Text: A Fairy Tale Princess. Diana Spencer biography. Back Street boys. Vocabulary relating to famous people and their achievements. **Grammar skills:** The Past Simple tense; asking questions. **8. Speaking:** Painters and paintings/composers and music. **9. Listening:** Numbers. The telephone. **10. Writing:** A film review; terminology of films/drama; expressing opinion, reaction; recommending. **Grammar skills:** The Present Simple (historic present); links of addition, contrast, reason **11. Reading: (Enterprise. Beginner level.)** Text: The Boy Who Saved The Netherlands. Vocabulary relating to feelings/relations; danger/emergencies.

	Grammar skills: The Past Simple tense; Joining sentences; Prepositions of movement; adjectives and adverbs. **12. Speaking:** Telling a story. **13. Listening:** Numbers. Dates. **14. Writing:** A letter giving advice to a friend (travel preparations, home safety) **Grammar skills:** Must/mustn't; should/shouldn't; the imperative; clauses of purpose/reason **15. Reading:** Text: Los Angeles – the City Of Angels. Vocabulary relating to towns/cities/transport/holidays. **Grammar skills:** Comparisons; quite, too, very, much **16. Speaking:** Geography quiz; Deciding on a hotel. **17. Listening:** Survival English 1 **18. Writing:** A story **Grammar skills:** The Past Simple; adjectives/adverbs; similes; punctuation of indirect speech. **19. Reading:** Text: A letter to a friend about summer plans. Horoscopes. Vocabulary relating to future plans/intentions; arrangements; future predictions. **Grammar skills:** Be going to; will; the present continuous tense (future meaning); it/there will be **20. Speaking:** Asking for personal information; Talking about tomorrow's weather forecast. **21. Listening:** Survival English 2 **22. Writing:** A letter to a friend about your holiday plans (sightseeing; tourist attractions/activities) **Grammar skills:** The Present Continuous tense (future meaning); going to; infinitive of purpose **23. Reading:** Text: Helping the environment. A leaflet giving advice on how to protect the environment. Vocabulary relating to the environment; health tips; house rules; school rules. **Grammar skills:** Should/shouldn't (advice); must (obligation); mustn't (prohibition); can (giving permission); can't (refusing permission) **24. Speaking:** Giving advice about healthy living; talking about house rules; school rules. **25. Listening:** Survival English 3 **26. Writing:** A letter to a friend about your preparations for a birthday party **Grammar skills:** The Present Perfect tense; already, yet, for, since,

	just, so far, never, ever **27. Reading:** Text: Tipping in America. Vocabulary relating to holidays/sightseeing; describing a city. **Grammar skills:** The Present Perfect tense; revision of all tenses. **28. Speaking:** Talking about taking messages/notes. **29. Listening:** Survival English 4 **30. Writing:** An article predicting what life will be like in the year of 2200 (dwellings; transport; education; work; health) **Grammar skills:** The Future Simple tense (for predictions); variety of link words
Study and examination requirements and forms of examination	**Oral Examination:** For this exam, the student is given 20 minutes for preparation to answer the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are provided for all questions – 5 (Excellent) 2. If answers are provided for all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not correspond to the questions – 2 (Unsatisfactory)
Media employed	The knowledge, qualifications and skills acquired by students in a foreign language are based on the priority tasks defined in the Resolution of the President of the Republic of Uzbekistan No. PQ-5117 dated May 19, 2021, "On measures to bring the activities of popularizing foreign language learning in the Republic of Uzbekistan to a qualitatively new level," to raise students' proficiency in a foreign language (English) to the B2 level. It also aims to develop the four core language skills - reading comprehension, listening comprehension, writing, and speaking - in an integrated manner, enhance communication abilities in various contexts, improve both practical and theoretical knowledge of the target language, and ensure that students can freely apply their acquired knowledge, skills, and competencies in real-life activities. The task of the subject is to provide students with the necessary language skills, in accordance with internationally recognized standards, to achieve a B1-B2 level of proficiency in the target

	foreign language through an integrated approach, and to develop their communicative competence. Based on the rating system for monitoring the level of knowledge, skills and qualifications of the student, the mastery of the subject by the student is presented in points. The progress of students in the subject during the semester is assessed from 1 to 5 grades, of which: Interval grading exam - grades 3-5 and Final grading exam - grades 3-5.
Reading list	1. Evans Virginia, Dooley Jenny. Enterprise 1, 2, 3, 4 series. Express Publishing (2000) 2. Louis Rogers and Jennifer Wilkin, Dorothy E. Zemach. Skillful Reading and writing. Macmillan. (2012) (1-2 kurs) 3. McCarthy, M. and O'Dell, F., Redman, S. English Vocabulary in Use. Elementary, Pre-intermediate and Intermediate. Cambridge: CUP (3rd edition) UK, 2012 4. Malcolm Mann, Steve Taylor-Knowles. Destination Grammar & vocabulary (book 1&2) (2013) Macmillan Education, UK 5. Li Ya Bin. Basic IELTS listening. Beijing Language and Culture University Press. Vietnam 2010. 6. Virginia Evans, Jenny Dooley. Reading and Writing Targets (Books 1, 2, 3). Express publishing 1998. 7. Oxeden C., Latham. (2008) New English Files. Oxford University Press. Elementary and pre-intermediate (1 kurs) 8. Richards J. C., Grant Trew. Tactics for Listening. (Basic, Developing, Expanding) Oxford University Press, 2010 9. Subject – link. Curriculum Integration Reading Program. USA, Philadelphia. Buil&Grow 10. KEY ENGLISH TEST 1, 2, 3, 4, 5, 6. Cambridge University Press. 11. PRELIMINARY ENGLISH TEST 1, 2, 3, 4, 5, 6. Cambridge University Press. 12. FIRST CERTIFICATE OF ENGLISH 1, 2, 3, 4, 5, 6. Cambridge University Press.
Reviewers	A. G. Alikulov – Associate Professor of the Interfaculty English Department, Candidate of Philological Sciences. M. K. Omonova – Associate Professor of the Linguistics Department, Doctor of Philosophy in Philological Sciences (PhD).
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

Linear Algebra and Analytic Geometry

Module designation	*1. AAGB110*
Semester(s) in which the module is taught	*1,2*
Person is responsible for the module	*Shodiyev Sadulla*
Language	*Uzbek language*
Relation to curriculum	
Teaching methods	*Lecture, discussion, problem solving, quizzes, peer-feedback, practice, dialog.*
Workload (incl. contact hours, self-study hours)	*Workload for 10 ECTS (300 hours):* *Lectures: 60 hours* *Practical training 60 hours* *Self-Study and Independent Learning: 180 hours*
Credit points	*Credits* *Cr* *ECTS* *1. 10(2+2+6)* *10* *1,2*
Required and recommended prerequisites for joining the module	*1. The course **"Linear Algebra and Analytic Geometry"** is logically closely connected with subjects such as **Mathematical Analysis, Complex Analysis, and Differential Equations.***
Module objectives/intended learning outcomes	***1.The purpose of teaching the course** is to introduce students to the essential knowledge of **Linear Algebra and Analytic Geometry** (concepts, theorems and their proofs, methods for solving practical problems, etc.). At the same time, it aims to develop students' **logical thinking, ability to draw correct conclusions, and mathematical culture.***
Content	□ The Gaussian method for solving systems of linear equations. Matrices and operations on them. □ Determinants of small order. Permutations and arrangements. □ Determinants of order nnn and their properties. □ Cofactors and minors. Laplace theorem. □ Additional properties of determinants and matrices.

	Inverse matrix. □ Cramer's rule and the inverse matrix method for solving systems of linear equations. □ nnn-dimensional vector space. Linear dependence. Basis of a vector space. □ Rank of a matrix. Kronecker–Capelli theorem. □ Homogeneous systems of equations. Fundamental solution. □ Complex numbers and operations on them. De Moivre's formula. □ Extracting roots of complex numbers. □ Polynomials in one variable. Horner's scheme. Bézout's theorem. □ Linear spaces. □ Euclidean space. Orthogonal complement. □ Vectors and linear operations on them □ Scalar, vector, and mixed (triple) products of vectors □ Coordinate transformations □ Polar, cylindrical, and spherical coordinate systems □ Equations of a straight line in the plane □ Plane and straight line in space □ Relative positions of lines in the plane. Relative positions of planes in space □ Second-order curves in the plane □ Equations of ellipse, parabola, and hyperbola in polar coordinates □ General equations of second-order curves in the plane □ Relative position of a second-order curve and a straight line □ Simplification of equations of second-order curves

	Second-order surfaces Cylindrical, conical, and ruled surfaces Straight-line generators of second-order surfaces
Examination forms	*Paper examination*
Study and examination requirements	*It is necessary to fully master the theoretical and methodological concepts of the subject, be able to accurately reflect the results of the analysis, conduct independent observations of the processes being studied, and complete the tasks and assignments given in the forms of current and intermediate control, and submit a test or written work for final control.*
Reading list	*1. Narmanov A.Ya. Analitik geometriya. O'zbekiston Respublikasi faylasuflar milliy jamiyati nashriyoti, 2008 y.* *2. Modenov P.S. Analiticheskaya geometriya. M. Izd-vo MGU, 1969.* *3. Baxvalov S.V., Modenov P.S., Parxomenko A.S. Analitik geometriyadan masalalar to'plami. T. Universitet, 2006.* *4. Ayupov Sh.A., Omirov B.A. Xudoyberdiyev A.X., Xaydarov F.H. Algebra va sonlar nazariyasi. Tafakkur gulshani. T. 2019.* *5. Xojiev J.X. Faynleyb A.S. Algebra va sonlar nazariyasi kursi. Toshkent. «Uzbekiston» , 2001 y.* *6. Kenneth Kuttler Elementary linear algebra 2012. Ventus Publishing Aps. ISBN 978-87-403-0018-5.* *7. Proskuryakov I.L. Sbornik zadach po lineynoy algebre. «Nauka», 2005 g*

REPUBLIC OF UZBEKISTAN, MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS

KARSHI STATE UNIVERSITY

ALGORITHMIC LANGUAGES AND PROGRAMMING

MODULE HANDBOOK

Field of knowledge: 500000 - Natural Sciences, Mathematics and Statistics

Field of education: 540000 - Mathematics and Statistics

Field of study: 60540200 - Applied Mathematics

MODULE REFERENCES

Module name:	Algorithmic languages and programming
Code, if applicable	ATDB118
Semesters in which the module is taught	1,2,3,4
Lecturer	Klicheva Firuza Gulmuratovna - Lecturer, Department of Applied Mathematics
Language	Uzbek
Relation to curriculum	Mandatory
Type of teaching, contact hours	Lecture, laboratory course
Workload	Total working load: 540 hours. 1st semester Contact hours: 150 hours; lecture - 30 hours.; practical – 30, Independent work: 90 hours. 2nd semester Contact hours: 120 hours; lecture - 30 hours.; practical – 30, Independent work: 60 hours. 3th semester Contact hours:150 hours; lecture - 30 hours.; practical – 30, Independent work: 60 hours 4th semester Contact hours:120 hours; lecture - 30 hours.; practical – 30, Independent work: 60 hours
Credit points	18
Recommended prerequisi	Computer literacy
Module objectives / intend learning outcome	The purpose of teaching the subject is to teach students the basics of creating a computer program that solves a given problem. To provide basic concepts about programming languages and environments. To teach how to create simple algorithms in the C# programming language. To teach the principles of object-oriented programming in the C# programming

	language. The task of the subject is to develop the skills of solving practical problems in high-level programming languages. To develop the skills of creating programs using object-oriented programming and generalizations in the C# programming language.
Content	Topic 1. Programming languages and their types. History of programming languages. Levels of programming languages. Modern programming languages and technologies. Topic 2. Algorithms and methods of their description: linear algorithms, branching algorithms. Linear algorithms, branching algorithms Topic 3: Algorithms and methods of their description: recursive algorithms. Recursive algorithms. Topic 4. C# and .Net Core platform. Structure of the C# programming language. Capabilities, advantages and specific features of the .Net Core platform. JIT (Just Run Time). Modern technologies and programs built on the platform. Topic 5. C# alphabet, identifiers, literals, variables and givens. Types and declaration of givens in the C# programming language. The concept of variable and immutable. Topic 6. Operations. Arithmetic, logical and bitwise operations. Arithmetic and logical operations. Operator types: unary and binary. Topic 7. Input-output on the console. Input-output functions Reading data from the input stream on the console, Read, ReadLine, ReadKey, Write, WriteLine methods, formatting data Topic 8: Expressions. Mathematical functions. Expression and instruction, precedence of operators, Math class and its methods Topic 9. Type conversion. Convert class and its methods Type conversion rules, Convert class and its methods Topic 10. Conditional operators. if, if-else, ?:. switch operator. if, if-else, ?:, switch operators, nested switch operator Topic 11. Repetition operators. for, various forms of for loop, nested loop, while, do-while, if-goto operators. Topic 12. Arrays. One-dimensional arrays. One-dimensional and multidimensional arrays. Topic 13. Characters. Creating and formatting strings. Characters and strings. String construction, character processing methods Topic 14: Standard library functions. Operations on strings. Formatting strings. Formatting numbers and dates in strings. Standard library functions.

	Topic 15. Declaring methods. Methods with parameters. Declaring methods. Methods with parameters and without parameters. Returning values from methods. Topic 16: Static methods. Returning values from methods. Recursive and overloaded methods. Static methods, method exit, Main method. Defining recursive methods. Overloadable methods. Topic 17. Value types and reference types. Array parameters of a method. ref and out keywords. Using keywords in methods. Declaring methods with array parameters. Returning array variables from methods. Declaring and using multi-parameter methods using the params keyword. Topic 18. Tuples. Enumerated types. Structures. Tuples. Enumerated types. Structures. Dynamic structures. Topic 19. Object-oriented programming principles Object-oriented programming principles. Class declaration. Objects Topic 20: Class declaration. Object creation. Constructors General form of a class, Object creation, constructors, destructors and properties Topic 21. Encapsulation. Inheritance. public, private, protected and internal keywords. Inheritance. Class tree. Using constructors in inheritance. Topic 22. Polymorphism. Abstract classes. Polymorphism. Virtual methods. Virtual properties. Hiding and redefining methods. Declaring abstract classes. Abstract data and methods. Redefining abstract methods in inherited classes. Topic 23. Operator overloading. Reloading arithmetic operators. Operator types: binary and unary. Reloading rules. Reloading arithmetic operators. Reloading keyword operators Topic 24. Interfaces. Declaring methods in interfaces, redefining and using them in their descendants. Topic 25. Copying and ordering interface objects. Copying and ordering interface objects. Topic 26. Generic types. Inheritance of generic types. Declaring and working with objects of generic classes. Inheritance of generic types. Topic 27. Exceptions. Exception handling. Exceptions. Exception types. Catching exceptions. Throwing exceptions. finally block. checked and unchecked keywords Topic 28. File. Text and binary files. Byte and string streams. File. Text and binary files. Byte and string streams. Topic 29: Formatted read and write functions. File read-write functions. File pointer control functions. Formatted read and write functions. File

	read-write functions. File pointer control functions. Topic 30: StreamWriter and StreamReader objects. File and FileInfo classes. Directory and DirectoryInfo classes. StreamWriter and StreamReader objects. File and FileInfo classes. Topic 31. Working with Common Controls and Containers in Windows Forms. Introduction to Windows Forms. Form properties. Events. Components. Application properties, settings. Creating an application layout. Topic 32: Working with menus in Windows Forms Working with MenuStrip, ContextMenuStrip, StatusStrip, ToolStrip elements Topic 33: Working with values and dialogs in Windows Forms. Topic 34. Delegates. Delegates. Generic delegates. Func and Action delegates. Anonymous methods Topic 35: Expressions in Lambda. Events. Expressions in Lambda. Parameter types in Lambda. Multiple parameter and parameterless lambda expressions. event keyword. Events. Event standard pattern. Event handling. Topic 36: Namespace, dynamic type definition. Namespace, using directive, preprocessor. Dynamic type definition , is, as, typeof keywords Topic 37. Collections. Collections. Lists. Queues. Collections. Ordered collections. Dictionaries. Topic 38. Graphics services. Graphics visualization services. Graphics transformations. Topic 39: Bitmap and Graphics classes. Using images, geometric objects. Colors. Working with vector images. Topic 40. Animations. Working with time. Topic 41: Introduction to WPF. Controls in WPF. WPF Fundamentals, XAML, Document Management in WPF, Controls Topic 42: WPF Events and Data Binding. Working with Events and DataBinding and DataContext. Topic 43: WPF Graphics Services. Graphics Fundamentals and Drawing Graphics in WPF. Topic 44: Resources and Animations in WPF. System Resources, Object Resources, and Animations. Topic 45: Styles and Templates in WPF. Creating a Control Pattern Using the Trigger Framework.
Study and	Written Examination: In this exam, the student is given 80 minutes to write

examination requirements and forms of examination	answers to the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are written for all questions – 5 (Excellent) 2. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the questions – 2 (Unsatisfactory)
Media employed	Completion of science assignments and successful submission of current, intermediate, and final control forms.
Reading list	**Main literature.** 1. A.E. Kholmurodov, M. Ch. Matanov Algorithmic languages and programming 2. (Part 1), Against 2022, 301 pages. 3. Troelsen Andrew, Djepix Philip | Programming language C# 7 and platform .NET and .NET Core. Williams. 2018 4. A. Troelsen, P. Japikse. Pro C# 8 with .NET Core. Foundational Principles and Practices in Programming. Apress, 2020 5. Albahari Ben, Albahari Joseph. C# 7.0. Directory. Full description. Per. s English-SPb: "Alfa-kniga", 2018, -1024 s. **Supplementary literature** 1. Yu.S. Magda C#. Yazyk programming Si Sharp. - Izd. DMK Press, 2013, 190 p. 2. Christian Nagel, Bill Ewen, Jay Glynn, Carly Watson, Morgan Skinner. C# 4.0 and platform .NET 4 for professionals. - Izd. Williams, 2011, 1440 p. 3. Christian Nagel. PROFESSIONAL C# 7 and .NET Core 2.0. Wrox, 2018. 4. Madrakhimov Sh.F., Ikramov A.M. A collection of problems on programming in C++. Study guide // Tashkent, National University of Uzbekistan, "Universitet" publishing house, 2017. 160 pages. 5. Shukurov O.M., Eshboyev E.A., Karayev F.K. Programming in Delphi and C++ Algorithmic Languages 2008. 160 pages **Electronic resources:** **1.** https://metanit.com/sharp/tutorial/ – Onlayn darslar **2.** https://www.tutorialsteacher.com/csharp/csharp-tutorials – Onlayn darslar **3.** https://www.codecademy.com/ – Onlayn darslar **4.** https://cs.msu.ru/sites/cmc/files/docs/_15_algoritmy_i_algoritmicheskie_yazyki.pdf
Reviewers	E.Eshboyev - Associate Professor, Department of Applied Mathematics, Karshi State University Z. Qurbonov - Associate Professor, Department of Applied Mathematics,

	Karshi State University
Confirmed place and time	Developed and approved by Karshi State University (Report №1 _____)

REPUBLIC OF UZBEKISTAN, MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS

KARSHI STATE UNIVERSITY

Mathematical analysis

MODULE HANDBOOK

Field of knowledge: 500000 - Natural Sciences, Mathematics and Statistics

Field of education: 540000 - Mathematics and Statistics

Field of study: 60540200 - Applied Mathematics

Module designation	MANB114 Mathematical analysis
Semester(s) in which the module is taught	*1*- Semesters (5 Credit), *2*- Semesters (4 Credit), *3*- Semesters (5 Credit)
Person is responsible for the module	*Baratov Bakhodir*
Language	*Uzbek language*
Relation to curriculum	*Compulsory (Core) Course*
Teaching methods	*Lecture, discussion, problem solving, quizzes, peer-feedback, practice, dialog.*
Workload (incl. contact hours, self-study hours)	*Workload for 1,2,3,4 ECTS (420 hours):* *Lectures: 90 hours* *Practical training 90 hours* *Self-Study and Independent Learning: 240 hours*
Credit points	*18*
Required and recommended prerequisites for joining the module	• *Elementary mathematics* • *Algebra* • *Geometry*
Module objectives/intended learning outcomes	*Upon successful completion of this module, students will be able to:* • *Solve both computational and theoretical problems in mathematical analysis, demonstrating a deep understanding of core concepts and techniques* • *Establish logical relationships between fundamental definitions, concepts, and theorems within mathematical analysis* • *Construct and present rigorous mathematical proofs for both classical results and newly formulated analogous statements* • *Apply a wide range of methods from mathematical analysis to investigate theoretical and applied problems* • *Select and combine appropriate analytical methods and techniques for solving complex mathematical tasks* • *Analyze and interpret abstract mathematical structures, ensuring logical consistency and*

	mathematical rigor *Demonstrate advanced skills in critical thinking, abstraction, and mathematical reasoning*
	1.
Content	*1.1. Sets and operations on them.* *1.2. Reflections and their types.* *1.3. Sequence of numbers and its limit.* *1.4. The concept of a function. Elementary functions* *1.5. Derivative of a function. Rules for calculating the derivative* *1.6. Higher-order derivative and differential of a function.* *1.7. Basic theorems* *1.8. Taylor's formula* *1.9. L'Hopital's rules* *1.10. The concept of an elementary function and the indefinite integral* *1.11. Properties of definite integrals. Calculation of definite integrals* *1.12. Surface of a plane figure and its calculation.* *1.13. Arc length and its calculation.* *1.14. Imperfect integrals with infinite limits.* *1.15. Imperfect integrals of an unbounded function.*
Examination forms	*Paper examination*
Study and examination requirements	*Students are required to:* • *Attend lectures and practical sessions regularly and actively participate in practical classes* • *Demonstrate a thorough understanding of theoretical concepts and the ability to apply them in problem-solving* • *Successfully complete all midterm assessment tasks* • *Achieve the minimum required score in continuous assessment to be admitted to the final examination* • *Pass the final written examination by demonstrating both theoretical knowledge and practical problem-solving skills*
Reading list	1. *A.Sadullayev, H.Mansurov, G.Xudayberganov, A.Vorisov, R.G‘ulomov, B.Abdullayevlarning “Matematik analiz kursidan misol va masalalar to‘plami” Toshkent. 2025.*

	2. *Demidovich B.P. Matematik tahlildan misol va masalalar to`plami: O`quv qo`llanma. Ruschadan tarjima - NamDU, 2019.* 3. *Kolmogorov A.N, Fomin S.V. Elementы teorii funksiy i funksionalnogo analiza. M. «Nauka», 1981.* 4. *Trenogin V.A., Pisarevskiy B.M., Soboleva T.S. Zadachi i uprajneniya po funksionalnomu analizu. Iz-vo «Nauka». M. 1984.* 5. *Eshqobilov Yu.X. O'lchovli to'plamlar, - Toshkent, O'zMU, 2011. .*

Module designation	DMMB109 Discrete Mathematics and Mathematical Logic
Semester(s) in which the module is taught	*1-Semester , 2-Semester*
Person is responsible for the module	*Oybek Xurramov*
Language	*Uzbek language*
Relation to curriculum	*Compulsory course*
Teaching methods	*Lecture, discussion, problem solving, quizzes, peer-feedback, practice, dialog.*
Workload (incl. contact hours, self-study hours)	*Workload for 1,2 ECTS (9 credits):* *Lectures: 60 hours* *Practical training 60 hours* *Self-Study and Independent Learning: 150 hours*
Credit points	*9 (5+4)*
Required and recommended prerequisites for joining the module	Algebra Working with numbers, expressions, and equations Solving linear and quadratic equations Foundations of Mathematics Set theory: set, subset, intersection, union Functions and relations: domain, codomain, various types of relations Logical foundations Mathematical symbols and logical concepts (∀, ∃, ∈, ∅) Understanding and writing simple mathematical proofs
Module objectives/intended	According to this program, many model problems are studied within the scope of this subject, which enables every

learning outcomes	bachelor who has deeply studied it to effectively apply the knowledge and skills they have gained in scientific research, in solving information technology problems, as well as in the education system.
Content	1. Sets and Operations on Them 2. Relations. Composition of Binary Relations. Function. 3. Special Binary Relations. Equivalence Relation. Ordered Sets. 4. Logical Connectives. Propositional Algebra. Truth Table. Formula, Subformula. 5. Equivalence of Formulas. Fundamental Equivalences of Propositional Algebra. 6. Derived Formulas. Complete Systems of Logical Operations. 7. Normal Forms. Perfect Disjunctive Normal Form. Perfect Conjunctive Normal Form. 8. Applications of Propositional Algebra Formulas. Relay-Contact Circuits. 9. Formal Axiomatic Theory. Propositional Calculus. 10. Axioms of Propositional Calculus. Deduction Theorem. 11. Gödel's Completeness Theorem. Consistency. 12. Elementary Boolean Functions. Their Representation Methods. Essential and Dummy Variables. 13. Concept of Formula. Equivalent Formulas. Dual Functions. 14. Normal Forms. Expanding a Function with Respect to Variables. 15. Complete Systems, Expanding a Boolean Function into a Zhegalkin Polynomial. 16. Important Closed Classes. Lemma on a Function That Is Not Self-Dual. 17. Lemmas on Non-Monotone and Non-Linear Functions. Post's Theorem and Its Consequences. 18. The Concept of Predicates. Logical Operations on Predicates. 19. Universal and Existential Quantifiers. 20. Formulas of Predicate Algebra. 21. Equivalence of Formulas in Predicate Algebra. 22. Normal Canonical Forms of Formulas. 23. Basic Elements of Combinatorics, Fundamental Combinations. 24. Input-Output Rule.

	25. Method of Recurrence Relations. Fibonacci Numbers. 26. Generating Functions. 27. Methods of Representing Graphs. Types of Graphs. 28. Graph Connectivity. Path, Chain, Cycle. Graph Metrics. Eulerian Graphs. Hamiltonian Graphs. 29. Directed Graphs. Transitive Graphs. Bicomponents of Graphs. 30. Graph Coloring. Chromatic Numbers.
Examination forms	*Paper examination*
Study and examination requirements	Students must complete all assignments, participate in practical classes, and pass the final examination. The final exam evaluates theoretical knowledge of probability theory and the ability to solve computational and applied problems.
Reading list	1.Kenneth H. Rosen, Discrete mathematics and its applications, 7-edition, The McGraw-Hill Companies, 2012 2.Mendelson E. Vvedenie v matematicheskuyu logiku. M.: Nauka, 1984 3.Yablonskiy S. V. Vvedenie v diskretnuyu matematiku. – M.: Nauka, 1986. 4.Yunusov A.S. Matematik mantiq va algoritmlar nazariyasi elementlari. T., 2008yu 5.Lavrov I. A., Maksimova L. L. Zadachi po teorii mnojestv, matematicheskoy logike i teorii algoritmov. M.: Fiz.-mat. literatura, 1995. 6.To‘raev X. Azizov I. Otaqulov S. Kombinatorika va graflar nazariyasi. 7. A.X. Xudoyberdiyev, Kombinatorika va graflar nazariyasi. Toshkent, 207. 8.Abulov M.O. Diskret matematika va matematik mantiq fanidan misollar va masalalar to`plami. Qarshi DU. 2020. 390 bet

Discrete Mathematics and Mathematical Logic

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

Russian language

MODULE HANDBOOK

Field of knowledge	100000	Humanities field
Field of education		
Field of study		for all Bachelor's degree programs

KARSHI - 2021

MODULE REFERENCES

Module name:	Uzbek (Russian) language
Code, if applicable:	UZTB105
Semesters in which the module is taught:	1,2 semester
Lecturer:	Xamrayeva Malika
Language	Russian
Relation to curriculum:	Compulsory
Type of teaching, contact hours:	practical
Workload:	Contact hours: 60 hours; practical – 60 hours Independent study - 90
Credit points:	5
Recommended prerequisites:	-

Module objectives **Intended learning outcome**	The acquisition of language knowledge, as well as the development and refinement of speech skills and abilities in areas relevant to learners, including academic, professional, and socio-cultural domains, taking into account the specificity of their field of study and the formation of certain aspects of the cultural component of communicative competence. The formation of a scientific and gumanitarnыy (humanistic) worldview, high moral and spiritual values, democratic culture, creative thinking, strong convictions, and socio-political engagement based on the ideas of national independence and democracy, as well as national and universal values, through the medium of the Russian language. **As a result of mastering the course, a bachelor's degree student should:** **know (have an understanding of how to):** construct a monologic statement in Russian on general language topics as well as on academic and professional subjects; express their thoughts fluently in both oral and written forms on professionally relevant topics; demonstrate command of the linguistic and speech norms of the modern Russian language within the professional field of their chosen specialty; conduct a dialogue and participate in a polylogue on a given topic; produce secondary academic texts (annotation, abstract, résumé). During the course, the students will: □ independently search for and utilize scientific information as a foundation for professional activity; □ work independently when preparing presentations, reports, and academic papers on professional topics; □ compose annotations and abstracts, selecting appropriate linguistic means in accordance with communicative intention and

	the context of communication.
Content	The subject of the sentence and its types of expression. Simple sentence. Types of sentences: declarative, interrogative, imperative. **Lexical topic:** Independence Day of the Republic of Uzbekistan. Gender of nouns. Noun as a part of speech. Singular and plural forms. Animate and inanimate nouns. Determining gender through agreement with other words. **Lexical topic:** Russian as a language of interethnic communication. Phonetic and orthoepic norms of the Russian language. Language norm. Rules for the use of linguistic means at a particular stage of language development. Consistency in pronunciation. Phonetics. **Lexical topic:** Our University. 4–5. Cases. Declension of nouns, pronouns, and ordinal numerals and their agreement. Nominative case. **Lexical topic:** The Moscow Kremlin. Genitive case. Forms of the genitive case in singular and plural nouns. Genitive case of personal, demonstrative, and possessive pronouns, adjectives, and numerals. **Lexical topic:** Moscow. Dative case. Forms of the dative case in singular and plural nouns. Dative case of pronouns, adjectives, and numerals. **Lexical topic:** Independent Uzbekistan – a state with a great past. Accusative case. Forms of the accusative case in singular and plural nouns. Accusative case of pronouns, adjectives, and numerals. **Lexical topic:** State Emblem. Instrumental case. Forms of the instrumental case in singular and plural nouns. Instrumental case of pronouns, adjectives, and numerals. **Lexical topic:** State Flag of the Republic of Uzbekistan. . Prepositional case. Forms of nouns, pronouns, adjectives, and ordinal numerals and their agreement. Prepositions expressing place and direction. **Lexical topic:** Interesting Facts. . Verbs: forms and government (past, present, future). Verbs of motion; aspect (perfective/imperfective). Agreement of verbs with nouns, adjectives, numerals, and pronouns. **Lexical topic:** I Study the Russian Language. . Numerals: categories and spelling. Cardinal and ordinal numerals. Declension of numerals. **Lexical topic:** World Day of the Sick (February 11). . Expression of spatial relations in simple and complex sentences. Adverbials of place. Prepositional constructions. **Lexical topic:** Mikhail Vasilyevich Lomonosov. . Expression of temporal relations in simple and complex sentences. Adverbials of time. Complex sentences with subordinate clauses of time. Use of prepositions (v, pri, vo vremya, v techenie, na protyajenii, v xode, v protsesse, do, pered, cherez, posle). **Lexical topic:** Avicenna – the first famous physician. . Expression of purpose relations in simple and complex sentences. Adverbials of purpose. Infinitive constructions. Subordinate clauses of purpose.

	Lexical topic: Education in Uzbekistan. . Expression of subject–predicate and object (complement) relations in simple and complex sentences. Direct and indirect objects. Transitive and intransitive verbs. **Lexical topic:** Stories about Alisher Navoi. . Expression of attributive relations in simple and complex sentences. Attributes: soglasovannыe i nesoglasovannыe (agreeing and non-agreeing modifiers). Declension of adjectives. **Lexical topic:** Maslenitsa Traditions. . Expression of cause-and-effect relations in simple and complex sentences. Participial constructions. Subordinate clauses of cause. **Lexical topic:** Abu Rayhan Beruni. . Expression of connection, comparison, contrast, and opposition. Coordinated sentence structures. Comparative degree of adjectives and adverbs. **Lexical topic:** Olympic Games. Achievements of Uzbek Athletes. . Expression of conditional and concessive relations in simple and complex sentences. Real condition. Subordinate concessive clauses. **Lexical topic:** Language as the most important means of communication. . Pronouns. Declension of pronouns: personal, possessive, negative, indefinite, determinative, demonstrative. **Lexical topic:** Culture of Communication. . Adverbs. Spelling of adverbs. Types of adverbs (qualitative and pronominal). **Lexical topic:** Native Language – My Pride and Glory. . Description of a person, object, and space. Portrait and characterization in literary and conversational styles. **Lexical topic:** What is Oil? . Lexical relations: polysemy, synonyms, antonyms, homonyms, paronyms. Phraseological units. **Lexical topic:** Navruz – a National Holiday. 25–26. Verbs of motion with prefixes. One-directional and multi-directional movement. Usage with prepositions. **Lexical topic:** Women's Day. . Official-business style. Legislative, administrative, and diplomatic substyles. Formal documents: autobiography, reference, power of attorney, receipt, application. **Lexical topic:** Ruler of Happy Constellations. . Literary (fictional) style. Functions of literary language. Stylistic devices (e.g., simile). **Lexical topic:** A.S. Pushkin – the Greatest Russian Poet. . Scientific style: lexical, morphological, and syntactic features. **Lexical topic:** Monument to Amir Temur. . Language means and conventions for writing annotation, abstract, and review. Structure of academic texts. **Lexical topic:** Bukhara – the Pearl of the East.

Study and examination requirements and forms of examination	**Oral Examination:** For this exam, the student is given 20 minutes for preparation to answer the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are provided for all questions – 5 (Excellent) 2. If answers are provided for all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not correspond to the questions – 2 (Unsatisfactory)
Media employed	The knowledge, qualifications, and skills acquired by students in the Russian language are based on the priority objectives defined in the Resolution of the President of the Republic of Uzbekistan No. PQ-5117 dated May 19, 2021, "On measures to bring the activities of popularizing foreign language learning in the Republic of Uzbekistan to a qualitatively new level," aimed at raising students' proficiency in the Russian language to the C1 level. The course is designed to develop the four core language skills—reading, listening, writing, and speaking—in an integrated manner, enhance communicative competence in various contexts, deepen both practical and theoretical knowledge of the Russian language, and ensure that students are able to effectively apply their acquired knowledge, skills, and competencies in real-life situations. The objective of the course is to equip students with the necessary language skills, in accordance with internationally recognized standards, to achieve a B1–B2 level of proficiency in the Russian language through an integrated approach, and to foster their communicative competence. In accordance with the rating system used to assess students' knowledge, skills, and competencies, mastery of the subject is evaluated on a point-based scale. Students' performance throughout the semester is graded on a scale from 1 to 5, including: • midterm assessment (grades 3–5); • final assessment (grades 3–5).
Reading list	**Main Literature** 1. Rozental, D. E., Golub, I. B., & Telenkova, M. A. *Modern*

	Russian Language. Moscow: Rol'f, 2003. 448 p. **Additional Literature** 1. *Constitution of the Republic of Uzbekistan*, April 30, 2023. 2. Mirziyoyev, Sh. M. Decree of the President of the Republic of Uzbekistan *"On the Strategy of Actions for the Further Development of the Republic of Uzbekistan for 2017–2021"*. // *Narodnoye Slovo*, February 8, 2017, No. 28. 3. Isakova, R. K. *Textbook on the Russian Language (for Independent Study)*. National University of Uzbekistan, Tashkent, 2017; Bulgakova, L. N., Zakharenko, I. V., Krasnykh, V. V. *My Friends – Cases*. Moscow: Russian Language, 2011. 4. Kamilova, M. G., et al. *Manual for Teaching the Russian Language*. Tashkent, 2009. 5. *Practical Course of the Russian Language* (ed. by Z. S. Tashtemirova). Tashkent, 2004. 6. Ahmedova, M. Kh. *Russian Language (Information Technology Specialization)*. Textbook. Tashkent University of Information Technologies, 2016. 7. Ermchenkova, V. S. *To Listen and to Hear: A Guide to Listening Comprehension*. St. Petersburg: Zlatoust, 2010. 8. *Methodological Manuals on the Language of the Specialty*. Tashkent: University, 2019. **Information Resources** 1. *Russian Encyclopedia. Alphabet*. Moscow, 2007 (electronic video materials). 2. http://ziyonet.uz/ru/library 3. http://ek.nuu.uz/ 4. e-mail: kursy@online.ru (teaching materials) 5. www.gramota.ru
Reviewers	**Saidova N.Z.** – Lecturer, Department of Russian Language and Literature **Supervisor:** Sadinova D.U. **Reviewers:** **Pardaeva D.R.** – Associate Professor, Department of Russian Language and Literature, PhD **Buranova Zh.A.** – Associate Professor, Department of Russian Language and Literature

Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

Physical education and sports

MODULE REFERENCES

Module name:	Physical education and sports
Code, if applicable:	JTSB102
Semesters in which the module is taught:	2
Lecturer:	Akbarov Sherzod Axrorovich
Language	Uzbek
Relation to curriculum:	Compulsory
Type of teaching, contact hours:	Practical
Workload:	60 hours Contact hours: 30 hours; Self-study: 30 hours
Credit points:	2
Recommended prerequisites:	Sports: volleyball, handball, football, gymnastics

Module objectives Intended learning outcome	The purpose of teaching a subject - the purpose of physical education of students is to form the physical culture of the individual, which in turn ensures the individual's readiness for social and professional activities, adherence to a healthy lifestyle, and the desire to regularly achieve physical fitness. The tasks of teaching a subject - to achieve the above goals, the following educational, educational, developmental and health-improving issues are envisaged: Understanding the role of physical culture in the formation of a person and preparing him for professional activity; Knowledge of the scientific and practical foundations of physical culture and a healthy lifestyle; Formation of a valuable attitude to physical culture, a healthy lifestyle, the desire for physical fitness, and the need to regularly engage in self-education and physical exercises;
Content	Practical lesson 1 Introduction. Determining the physical fitness of students. Teaching the technique of jumping from a standing position to a long jump. Practical lesson 2 Gymnastics. Row exercises. Row preparation. Turns in place and while moving. Movements in different directions. Re-lineups in place and while walking. Teaching the technique of passing and receiving the ball at short distances in a football game. Practical lesson 3 Gymnastics. Row exercises. Spreading and squeezing: with additional steps, with turns from the middle, with separations from the line according to height and circular turns. Rules of the football game. Two-way educational game.

	Practical lesson 4 Gymnastics. Row exercises. Spreading and squeezing: with additional steps, with turns from the middle, with separations from the line according to height and or improving circular turns. Rules of the football game. Two-way educational game. Practical lesson 5 Athletics. Running for short distances. Exercises for developing physical qualities (speed). Teaching the technique of running for 60-100 meters. Rules of the football game. Two-way educational game. Practical lesson 6 Athletics. Teaching the technique of running for short distances Running for 400 meters. Action games related to the football game. Two-way educational game Practical lesson 7 Athletics. Improving the technique of running for medium distances. Running for 500-1000 meters. Teaching national action games with relays. Practical lesson 8 Athletics. Improving the technique of running for long distances. Running for 3000-5000 meters. Teaching the elements of sports games through national and action games. Practical lesson 9 Volleyball game rules. Teaching volleyball players the initial, static, variable and basic, high and low stances. Teaching national movement games suitable for the sport of volleyball. Practical lesson 10 Volleyball game technique. Teaching the technique of putting the ball into the game from above. Two-way training game. Practical lesson 11 Volleyball game technique. Teaching the technique of passing the ball accurately from above with two hands. Two-way training game. Practical lesson 12 Volleyball game tactics. Teaching the tactics of one-man blocking and moving in defense. Two-way training game. Practical lesson 13 Basketball game. Improving ball carrying. Two-way training game. Practical lesson 14 Basketball game. Improving throwing the ball into the hoop from medium and close distances. Two-way training game. Practical lesson 15 Basketball game. Teaching how to catch a ball that has bounced from a shot. Two-way training game. Practical lesson 16 Rules of the handball game. Teaching the technique of catching, passing, hitting and carrying the ball. Two-way training game. Practical lesson 17 Handball. Attacking technique. Improving the technique of catching, passing, hitting and carrying the ball. Two-way training game. Practical lesson 18 Handball. Attacking technique. Sending the ball to the goal in various situations. Two-way training game. Practical lesson 19 Handball. Defensive technique. Improving the technique of catching, hitting, blocking the ball. Two-way training game. Practical lesson 20 Rules of the game of football. Teaching the technique of passing and receiving the ball at a short distance in a football game.

	Practical lesson 21 Improving the technique of passing and receiving the ball at a short distance in a football game. Two-way training game. Practical lesson 22 Teaching the technique of kicking the ball into the goal from a close distance in a football game. Two-way training game. Practical lesson 23 Improving the technique of kicking the ball into the goal from a medium and close distance in a football game. Two-way training game. Practical lesson 24 Rules of the game of badminton. Teaching the technique of putting the shuttlecock into the game and returning it in a badminton game. Practical lesson 25 Teaching the technique of returning the shuttlecock and stepping in defense in badminton. Practical lesson 26 Rules of the game of table tennis. Teaching the technique of hitting the ball. Practical lesson 27 Rules of the game of table tennis. Improving the technique of stepping in attack and defense. Practical lesson 28 National movement games. Teaching movement games that develop speed. Practical lesson 29 National movement games. Teaching movement games that develop endurance. Practical lesson 30 National movement games. Teaching movement games that develop strength.
Study and examination requirements and forms of examination	№ Indicators points Maximum score Qualifying score 1 The questions of the Final Control Work in the subject are compiled on the basis of practical exercises and independent study topics in a ratio of 50/50. 50 30 2 practical methods (general and special physical training) (25x2)=50 30 2 *for each question in the written or oral version (5x10)=50 30 for each test task in the test version (2x25)=50 30 TOTAL: 50 points
Media employed	-
Reading list	1. A.N.Normurodov.“Jismoniy tarbiya“ O‘quv qo‘llanma.Toshkent-bo‘stoni,2016 yil. 2. T.S.Usmanxodjayev “Milliy va harakatli o‘yinlar” Darslik

	Toshkent 2015-yil 3. Xurramov Jasur Qo‘yliyevich Sport o‘yinlarni o‘qitish metodikasi (Basketbol) Darslik. Qarshi 2022 yil. 4.Nuraliyeva O‘giloy Shomuratovna “Jismoniy tarbiya va sport” O‘quv qo‘llanma. Qarshi 2022 yil. 5.A.T.Jabborov Sport harakatli o‘yinlar o‘qitish metodikasi(Stol tennis) O‘quv qo‘llanma. Qarshi 2021 yil. 6.F.R.Eshpo‘latov Gimnastika va uni o‘qitish metodikasi darsi. O‘quv qo‘llanma. Qarshi 2021 yil. 7.E.O.Davronov. Qo‘l to‘pi . O‘quv qo‘llanma. Qarshi 2021 yil. 8.Yomg‘irov G‘affor Bobosherovich Sport va xarakatli o‘yinlar va uni o‘qitish metodikasi (Voleybol) Qarshi.2023-yil 9. Akbarov Sherzod Axrorovich “Jismoniy tarbiya va sport” O‘quv qo‘llanma. Qarshi 2024 yil.
Reviewers	Jabborov A. Jismoniy tarbiya va sport kafedrasi, dots. Xudoyberdiyev B. Sport faoliyati kafedirasi dots, PhD.
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

General physics

MODULE HANDBOOK

Field of knowledge: 500000 - Natural sciences, mathematics and statistics

Field of education: 540000 - Mathematics and Statistics

Field of education: 60540200 - Applied Mathematics

MODULE REFERENCES

Module name:	*General physics*
Code, if applicable:	UFZB205
Semesters in which the module is taught:	*3*
Lecturer:	*Intern teacher of the Department of General Physics Umarova Saida Uraqovna*
Language	*Uzbek*
Relation to curriculum:	*1. Compulsory*
Type of teaching, contact hours:	*Lecture, laboratory*
Workload:	*5 ECTS (150 hours): For the course load* *Classroom sessions* *lecture 30 hours* *laboratory 30 hours* *Independent study: 90 hours*
Credit points:	*5*
Recommended prerequisites:	*Mathematical analysis*
Module objectives **Intended learning outcome**	*As a result of mastering the subject, the student should:* *- know the meaning and content of physical phenomena, physical laws and physical processes and be able to use them;* *- be able to describe physical experiments, demonstrations and phenomena based on physical laws and principles;* *- have an idea of the limits of application of laws, principles, idealized models and schemes used in physics;* *- have the skills to solve and analyze problems of a general level,* *- have the ability to use mathematical calculation methods in calculating physical problems and experimental results in different measurement systems;* *- have the skills to apply physical laws and formulas to*

	non-standard problems.
Tarkib	MAIN THEORETICAL PART (lectures) The subject includes the following topics: Topic 1: Introduction. Physics as a science, its subject and research methods Interrelation of physics with mathematics and applied mathematics. Physical concepts. Methods of physical research. Topic 2: Kinematics of a material point. Mechanical motion. Concepts of space, time, path, displacement counting systems. Speed and acceleration in forward and rotational motion. Rectilinear, rectilinear and variable motion. Topic 3. Dynamics of a material point. Force. Addition of forces. Newton's laws. Law of universal gravitation. Gravity and body weight. Acceleration of free fall. Topic 4. Elastic and friction forces. Elastic force. Deformation. Types of deformation. Frictional force. Mechanical work and energy. Power Topic 5. Oscillatory motions and waves. Oscillations. Equation of free oscillations. Mathematical and physical pendulum. Transducer and forced oscillations. Waves. Topic 6. Fundamentals of molecular physics. Ideal gas model. Fundamentals of the molecular kinetic theory of gases. The basic equation of the kinetic theory of gases. Equation of state of an ideal gas. Ideal gas laws and temperature. Topic 7. Real gases. Concept of intermolecular interaction forces. Real gases Equation of state of a real gas. Diffusion. Topic 8. Laws of thermodynamics. Amount of heat. Amount of heat. Temperature. Internal energy of an ideal gas. Types of heat transfer. The first and second laws of thermodynamics. Application of the first law of thermodynamics to processes. The effect of changes in the heat balance in the atmosphere on the climate of the planet, the greenhouse effect. Reversible and Irreversible processes. Topic 9. Elements of fluid mechanics. Aggregate states of matter. Steady flow of fluid. Continuity equation. Bernoulli's equation. Laminar and turbulent flow.

	Topic 10. Properties of fluids. Structure and properties of fluids. Heat capacity of fluids. Surface tension and capillarity. Calorometry. Evaporation, condensation, melting and solidification. Topic 11. Physics of solids. Solid. Types of interatomic bonds in crystals. Thermal vibrations of atoms in crystals. Types of crystal lattices. Mechanism of thermal conductivity of crystals. Topic 12. Electrostatics. Electric charge. Law of conservation of charge. Coulomb's law. Electric field. Electric field strength. Potential. Topic 13. Conductors in an electrostatic field. Electric capacity. Capacitors. Electric field energy. Topic 14. Steady electric current and its laws. Electric current, current strength and current density. Laws of steady electric current. Electromotive force and voltage. Ohm's law for a non-uniform part of a circuit. Work and power of a steady current. Joule - Lenz's law. Branched circuits. Kirchhoff's rules. Electric current in various media. Electrolysis. Faraday's laws. Topic 15. Electromagnetism. Magnetic field of currents in a vacuum. Interaction of current elements, Ampere's law. Magnetic field induction and strength. Lorentz force. Magnetic properties of substances. Transformers. Topic 16. Laws of geometric optics and wave properties of light. Quantities characterizing light and their units. Law of refraction and reflection of light. Lens and its types. Topic 17: Wave theory of light. Interference of light. Coherent waves. Methods of producing interference. Concept of holography. Optical devices based on interference. Topic 18. Diffraction of light. Diffraction and dispersion of light. Diffraction grating. Thermal and chemical effects of light. Topic 19. Quantum properties of light. Quantum theory of light. Planck's formula. Photoelectric effect and its laws. Energy and momentum of photons. Topic 20. Bohr theory of the hydrogen atom. Elements of quantum mechanics of atoms and molecules. Quantum mechanics of atoms and molecules. Bohr theory for the hydrogen atom. Mendeleev's periodic table of chemical

	elements. Lasers and their principles of operation. Topic 21. Nuclear physics. Composition of the atomic nucleus and structural models of the nucleus. Nuclear forces. Mass defect and binding energy of the nucleus. Radioactivity. Radioactive radiation and its types. Topic 22. Elementary particle physics. The modern system of elementary particles. Muons, mesons and their properties. Cosmic rays. Classification of elementary particles. **The following topics are recommended for laboratory exercises:** 1. Determining the acceleration of gravity using a mathematical pendulum. 2. Determining the density of solids by the hydrostatic method. 3. Determining the coefficient of useful work of an inclined plane. 4. Studying the acceleration of objects moving with uniform acceleration 5. Determining the temperature of a water mixture. 6. Determining the surface tension coefficient of liquids by the drop method. 7. Measuring small resistances and determining the specific resistance of conductors. 8. Studying the parallel and series connection of conductors 9. Determining the focal length of lenses. 10. Determining the refractive index of glass
Media employed	Completion of science assignments and successful submission of current, intermediate, and final control forms
Study and examination requirements and forms of examination	**Oral Examination:** For this exam, the student is given 20 minutes for preparation to answer the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are provided for all questions – 5 (Excellent) 2. If answers are provided for all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not correspond to the questions – 2 (Unsatisfactory)
Reading list	*Referens* 1. DouglasC. Giancoli. Physics principles with applications.2014.pg- 917

	2. Jearl Walker, David Hallidey., R.Resnick. Fundamentals of physics. pg- 1450. ISBN 978-8808-08797-3. 2014. 3. I.V. Savelyev . Umumiy fizika kursi.T.1, T.2, T.3. Moskva. : Astrel. 2011. 537-b 4. D.V. Sivuxin. Umumiy fizika kursi. Moskva. : fiz. mat. lit. 2005. 531-b 5. K.P.Abduraxmanov, O‘.Egamov “Fizika kursi” darslik, Toshkent,2010y. 508-b 6. V.S. Volkenshteyn. Umumiy fizika kursidan masalalar to‘plami. 2008. Sankt-Petrburg.“Knijniy mir”. 324-b
Reviewers	B. Khayriddinov – Karshi State University, Professor of the Department of "General Physics" L. Meyliyev - Associate Professor of the Department of "General Physics" of Karshi State University.
Confirmed place and time	Developed and approved by Karshi State University (Report № _____)

Differential equations

Module designation	DFTB205
Semester(s) in which the module is taught	*3-semester (cridet 5)*
Person is responsible for the module	*Dusanova Umida*
Language	*Uzbek language*
Relation to curriculum	*Compulsory (Core) Course*
Teaching methods	*Lecture, discussion, problem solving, quizzes, peer-feedback, practice, dialog.*
Workload (incl. contact hours, self-study hours)	*Workload for 3 ECTS (150 hours):* *Lectures: 30 hours* *Practical training 30 hours* *Self-Study and Independent Learning: 90 hours*
Credit points	*Total Credits: 5* *ECTS: 5*
Required and recommended prerequisites for joining the module	• *Mathematical Analysis* • *Linear Algebra and Analytic Geometry* • *Basic methods of solving mathematical equations* • *Fundamentals of functions and their properties* • *Differential and Integral Calculus*
Module objectives/intended learning outcomes	*Upon successful completion of this module, students will be able to:* • *Solve both computational and theoretical problems in differential equations, demonstrating a solid understanding of fundamental concepts and solution techniques* • *Establish logical relationships between key definitions, concepts, and theorems in the theory of differential equations* • *Construct and present rigorous mathematical proofs for classical results and related problems in differential equations* • *Apply various methods of solving ordinary differential equations to both theoretical and applied*

	problems • *Select and combine appropriate analytical and numerical methods for solving different types of differential equations* • *Analyze and interpret solutions of differential equations, including their qualitative behavior and practical meaning* • *Demonstrate well-developed skills in critical thinking, mathematical modeling, and logical reasoning in the context of differential equations*
	2.
Content	*Differential equations with separable variables, homogeneous differential equations, and reducible-to-homogeneous differential equations.* *Cauchy problem for a first-order differential equation. The theorem on the existence and uniqueness of the solution.* *First-order differential equations not solved with respect to the derivative and methods of their integration. The theorem on the existence of solutions.* *n-th order differential equations. Methods for solving certain n-th order differential equations.* *Solving an n-th order homogeneous differential equation using a system of fundamental solutions. The Ostrogradsky–Liouville formula.* *n-th order non-homogeneous linear differential equations with constant coefficients.* *Systems of homogeneous differential equations with constant coefficients.* *Matrix exponential.* *Concept of stability. Stability of the solution of a linear homogeneous system of differential equations.*
Examination forms	*Paper examination*
Study and examination requirements	*Students are required to:* • *Attend lectures and practical sessions regularly and actively participate in practical classes* • *Demonstrate a thorough understanding of theoretical concepts and the ability to apply them in problem-solving* • *Successfully complete all midterm assessment tasks* • *Achieve the minimum required score in continuous assessment to be admitted to the final examination* • *Pass the final written examination by demonstrating both theoretical knowledge and practical problem-solving skills*

Reading list	*1. A.A'zam. Differensial tenglamalar., Toshkent, 2024.* *2. N.Dilmurodov. Oddiy differensial tenglamalar., Darslik,"Toshkent" 2019.* *3. N.Dilmurodov. Oddiy differensial tenglamalardan misollar, masalalar va topshiriqlar. O'quv qo'llanma,"Qarshi" 2020.* *4. P. A. Velmisov, Yu. V. Pokladova, T. B. Rasputko.* *Differensialnыe uravneniya. Uchebnoe posobie, Ulyanovsk, UlGTU-2017.*

Module designation	*2.* FANB205, Functional analysis
Semester(s) in which the module is taught	*3 semester (cridet 5)*
Person is responsible for the module	*Nodirov Shohruh*
Language	*Uzbek language*
Relation to curriculum	*Compulsory (Core) Course*
Teaching methods	*Lecture, discussion, problem solving, quizzes, peer-feedback, practice, dialog.*
Workload (incl. contact hours, self-study hours)	*Workload for 3 ECTS (150 hours):* *Lectures: 30 hours* *Practical training 30 hours* *Self-Study and Independent Learning: 90 hours*
Credit points	*Total Credits: 5* *ECTS: 3*
Required and recommended prerequisites for joining the module	• *Mathematical Analysis* • *Linear Algebra and Analytic Geometry*
Module objectives/intended learning outcomes	*Upon successful completion of this module, students will be able to:* • *Solve both computational and theoretical problems in functional analysis, demonstrating a deep understanding of core concepts and techniques* • *Establish logical relationships between fundamental definitions, concepts, and theorems within functional analysis* • *Construct and present rigorous mathematical proofs for both classical results and newly formulated analogous statements* • *Apply a wide range of methods from functional analysis to investigate theoretical and applied problems* • *Select and combine appropriate analytical methods and techniques for solving complex mathematical tasks* • *Analyze and interpret abstract mathematical structures, ensuring logical consistency and mathematical rigor*

	• *Demonstrate advanced skills in critical thinking, abstraction, and mathematical reasoning*
	3.
Content	*Sets and Operations on Sets* *Mappings and Cardinality of Sets* *Theory of Metric Spaces* *Systems of Sets: Rings, Algebras, and Semirings of Sets* *General Definition of Measure and Extension of Measures* *Measurable Functions and Their Properties* *Sequences of Measurable Functions and Types of Convergence* *Lebesgue Integral* *Limit Transitions under the Lebesgue Integral* • *Normed linear spaces and Banach spaces* • *Euclidean and Hilbert spaces* • *Bounded linear operators* • *Adjoint operators* • *Inverse operators*
Examination forms	*Paper examination*
Study and examination requirements	*Students are required to:* • *Attend lectures and practical sessions regularly and actively participate in practical classes* • *Demonstrate a thorough understanding of theoretical concepts and the ability to apply them in problem-solving* • *Successfully complete all midterm assessment tasks* • *Achieve the minimum required score in continuous assessment to be admitted to the final examination* • *Pass the final written examination by demonstrating both theoretical knowledge and practical problem-solving skills*
Reading list	1. *J.I. Abdullaev, R.N. G'anixo'jayev va b. Funksional analiz, Toshkent – Samarqand, 2009.* 2. *Sh. A. Ayupov va b. Funksional analizdan misol va masalalar, Nukus "Bilim", 2009.* 3. *Yu.X. Eshkabilov va b. Funksional analiz (misol va masalalar yechish) 1-qism, Toshkent, "Tafakkur bo'stoni", 2015.* 4. *Eshqobilov Yu.X. O'lchovli to'plamlar, - Toshkent, O'zMU, 2011.* 5. *Eshqobilov Yu.X. Lebeg integrali, - Toshkent, O'zMU, "Universitet", 2012.* 6. *Eshqobilov Yu.X., G'anixo'jayev R.N. Metrik*

	fazolar, - Toshkent, O'zMU, "Universitet", 2013.

Functional analysis

MINISTRY OF HIGHER EDUCATION, SCIENCE AND

INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

THEORETICAL MECHANICS
MODULE HANDBOOK

Field of knowledge	500 000	Science, mathematics and statistics
Field of education	540 000	Mathematics and statistics
Field of study	60540200	Applied mathematics

Karshi – 2021

MODULE REFERENCES

Module Name	**Theoretical mechanics**
Code (if applicable)	NZMB302
Semesters Taught	3
Lecturer	Yuldash Babajanov – Associate Professor of the Department of Industrial Engineering Karimova Salima – Lead Instructor Department of Industrial Engineering
Language of Instruction	Uzbek
Relation to Curriculum	Mandatory subject
Type of Teaching, Contact Hours	Lecture, Practical Sessions
Total Workload	150 hours
Contact Hours	90 hours (Lecture – 30 hours, Practical – 30 hours)
Self-study	90 hours
Credit Points	5
Recommended Prerequisites	Chemistry, Physics

Module objectives / intended learning outcome	CONTENT OF THE SUBJECT
	The main content of teaching this subject is for students to study the general laws of the mechanical motion of material bodies and the forces they exert on each other. The subject of theoretical mechanics is divided into three parts depending on the perspective from which mechanical problems are considered: **statics, kinematics, and dynamics**. The equilibrium of material bodies, the application and decomposition of forces acting on them, and the replacement of these forces by an equivalent system of forces with the same effect are studied in the **statics** section of theoretical mechanics. The study of the motion of bodies, considering only geometric aspects and without taking into account their mass or the forces acting on them, belongs to the **kinematics** section. **Dynamics** studies the motion of material bodies together with the forces that cause this motion. **Purpose of teaching the subject:** The purpose of teaching this subject is to provide students with the opportunity to study mechanical motions occurring in nature, to create new mechanisms used in production, to study and analyze the motion of celestial bodies, and, in general, to study physical processes in nature using the laws and principles of mechanics. **Tasks of the subject:** The tasks of the subject are to enable future specialists to independently solve various mechanical problems and issues that may arise in their future industrial and scientific-technical activities, to implement new modern technologies in the production process, to manage production processes, and to develop the worldview, general culture, and intellectual abilities of future engineers.

Content	Topics
	1. **Topic 1:** Introduction. Numbering system. Coordinate system. 2. **Topic 2:** Lagrange formalism. 3. **Topic 3:** Principle of relativity. 4. **Topic 4:** The first law of thermodynamics and thermodynamic processes. 5. **Topic 5:** Lagrange functions of physical systems. 6. **Topic 6:** Laws of conservation. 7. **Topic 7:** Integration of equations of motion. 8. **Topic 8:** Collision of particles. 9. **Topic 9:** Linear small oscillations. 10. **Topic 10:** Canonical formalism. 11. **Topic 11:** Hamilton–Jacobi method for describing a physical system. 12. **Topic 12:** Motion of a rigid body. 13. **Topic 13:** Calculation of the moments of inertia of a rigid body. 14. **Topic 14:** Equations of motion of a rigid body; Euler equations. 15. **Topic 15:** Concept of continuum mechanics. **III. Guidelines and Recommendations for Practical Classes** The department develops guidelines and recommendations for organizing practical classes. In these, students reinforce the knowledge and skills gained from the main lecture topics through practical problems and case studies. Additionally, based on textbooks and educational materials, students are recommended to: • Consolidate their knowledge, • Use reference materials, • Enhance their understanding through scientific articles and theses, • Solve problems, • Prepare presentations and visual aids on topics, • Use normative and legal documents as references. **Practical Tasks** 1. Problems related to the geometric equilibrium condition of intersecting force systems. 2. Dynamics of a point. 3. Construction of Lagrange functions and equations. 4. Finding equivalent Lagrange functions. 5. Laws of conservation. 6. Integration of equations of motion. 7. Kepler problems. 8. Particle collisions. 9. Small oscillations. 10. Canonical equations, Hamilton function. 11. Poisson brackets. 12. Hamilton–Jacobi equations

Study and examination requirements and forms of examination	**Written Examination:** In this exam, the student is given 80 minutes to write answers to the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are written for all questions – 5 (Excellent) 2. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the questions – 2 (Unsatisfactory)
Media employed	Completion of science assignments and successful submission of current, intermediate, and final control forms Completion of science assignments and successful submission of current, intermediate, and final control forms
Reading list 1	1. Rashidov T.R. et al. **Theoretical Mechanics.** Tashkent: VNESHINVESTPROM, 2020. 2. To‘rayev X., Tilavov A. **Theoretical Mechanics.** Vol. 1. Tashkent: Noshir, 2012. 3. Bukholts N.N. **Fundamental Course of Theoretical Mechanics.** Parts 1 & 2. St. Petersburg: Lan, 2021, 2023. – 448 pp. – 336 pp. (electronic version) 4. Shokhaydarova P. et al. **Theoretical Mechanics.** Tashkent: O‘qituvchi, 1990. 5. Meshersky I.V. **Collection of Problems in Theoretical Mechanics.** Tashkent: O‘qituvchi, 1989. 6. Tom W.B. Kibble, Frank H. Berkshire, **Classical Mechanics.** Imperial College Press, 2004. 7. Fayzullayev B. **Theoretical Mechanics.** Tashkent, 2023. **Additional Reading** 8. Herbert Goldstein, Charles Poole, John Safko, **Classical Mechanics.** Pearson New International Edition, USA, 2013. 9. Loitsyanski L.G., Lurie A.I., **Course of Theoretical Mechanics.** Vol. 1 & 2. Moscow: Nauka, 1983. 10. Yablonsky A.A., **Collection of Term Papers in Theoretical Mechanics.** Moscow: Nauka, 1985. 11. Kilchevsky N.A., **Course of Theoretical Mechanics.** Vol. 1 & 2. Moscow: Nauka, 1977. 12. Vasile Szolga, **Theoretical Mechanics. Lecture Notes and Sample Problems, Part One.** 2010. **Internet Resources** 1. www.gov.uz – Official portal of the Republic of Uzbekistan. 2. www.lex.uz – National database of legal documents of the Republic of Uzbekistan. 3. https://djvu.online/file/njpjNSfSY0iTmhtt//dhes.ime.mrsu.ru/studies/tot/Iit.html 4. https://library.samdpi.uz/ebooks/view?id=11764

	5. https://kutubxona.samduuf.uz/download/5
Reviewers	Anver Teymurkhanov – Associate Professor, Department of Industrial Engineering, PhD in Technical Sciences O. Eshqobilov – Professor, Karshi State University, Doctor of Technical Sciences
Confirmed place and time	The curriculum was approved by Karshi State University in 2021 by protocol No. 1 dated 30.08.2021 and authorized for confirmation.”

MODULE REFERENCES

Module name:	PHILOSOPHY
Code, if applicable:	FALB204
Semesters in which the module is taught:	4
Lecturer:	Tohir Qurbonov
Language	Uzbek
Relation to curriculum:	Compulsory
Type of teaching, contact hours:	Lecture, practical
Workload:	Total -120 Contact hours: 60 hours; lecture – 30 hours; practical – 30 hours Self-study: 60 hours
Credit points:	4
Recommended prerequisites:	Psychology History Religion

Module objectives Intended learning outcome	It is aimed at creating a generalized system of students' worldview and showing the human mind in it, forming a person's knowledge of the world, socio-political, moral, aesthetic and other relations, and teaching the skills of correct thinking. To properly organize professional activities based on the study of the most ancient and modern philosophical knowledge about the world, to increase social responsibility, to form a sense of involvement in state policy; to independently analyze social processes; To have an idea of the main ideas of ancient, medieval and modern philosophy, the role of Eastern philosophy in the development of society, the philosophical content of Western philosophical movements, the essence of the Western Renaissance, the influence of medieval Eastern science and philosophy on its formation, and the important features of Western philosophy of the New and most modern eras; The directions of new ontology, the social significance of gene ontology, bioontology, medical ontology, the relationship and differences between physical and philosophical ontology, the protection of human and social interests in the use of technologies in an information society, the role of the biosphere and noosphere in the ontology of nature, social ecology, and environmental education

	and upbringing are all known and can be used.
Content	Training format: lecture 1. Philosophy and its role in the life of society. 2. Stages of development of philosophical thought: Eastern philosophy. 3. Stages of development of philosophical thought: Western philosophy. 4. Philosophy of being (ontology) and development. 5. Philosophy of knowledge (epistemology). 6. Logic. 7. Forms of thought: concept, judgment and conclusion. 8. Philosophy of society. 9. Philosophy of man (Philosophical anthropology). 10. Philosophy of values (axiology). 11. Philosophy of morality (Ethics) 12. Philosophy of aesthetics (Aesthetics). 13. Philosophy of globalization and sustainable development. 14. World experience in combating corruption. 14. Anti-corruption policy of Uzbekistan. Form of classes: practical 1. Philosophy and its role in the life of society. 2. Stages of development of philosophical thought: Eastern philosophy. 3. Stages of development of philosophical thought: Western philosophy. 4. Philosophy of being (ontology) and development. 5. Philosophy of knowledge (epistemology). 6. Logic. 7. Forms of thought: concept, judgment and conclusion. 8. Philosophy of society. 9. Philosophy of man (Philosophical anthropology). 10. Philosophy of values (axiology).

	11. Philosophy of morality (Ethics). 12. Philosophy of sophistication (Aesthetics). 13. Philosophy of globalization and sustainable development. 14. World experience in combating corruption. 15. Anti-corruption policy of Uzbekistan.
Study and examination requirements and forms of examination	a) To receive a grade of 5, the student's level of knowledge must meet the following requirements: can fully explain the essence and content of the subject; maintains scientificity and logic in presenting the topics in the subject, avoiding scientific errors and confusion; has a clear idea of the theoretical or practical significance of the subject materials in the subject; can demonstrate the ability to think independently within the scope of the subject; can answer the questions asked clearly and concisely; has carefully prepared the outline; has completed independent assignments completely and clearly; has fully mastered the laws and other regulatory and legal documents related to the discipline; has published a scientific article on one of the topics related to the discipline; can interpret historical processes; b) To receive a grade of 4, the student's level of knowledge must meet the following requirements: understands the essence and content of the subject, does not allow scientific and logical confusion in explaining the topics in the subject; understands the practical significance of the content of the subject; performs the assigned tasks and assignments within the framework of the curriculum; can correctly answer the questions asked in the subject; has carefully formulated a subject outline; has fully completed independent assignments in the subject; has mastered laws and other regulatory documents related to the subject. c) To receive a grade of 3, the student's level of knowledge must meet the following criteria: has a general understanding of the subject; covers the topics of the subject in a narrow range, with some inconsistencies in the presentation; is not fluent in the presentation; if complex and confusing answers are given to questions on the subject; if the text on the subject is not well-structured. g) In the following cases, the student's level of knowledge may be assessed as unsatisfactory with a grade of 2: if preparation for the subject exercises is not carried out; if the student has no idea about the subject exercises;

	□ if it is noticeable that the texts on the subject have been copied from others; □ if serious errors and confusions are made in the text on the subject; □ if the questions asked about the subject are not answered; □ if the subject is not known.
Media employed	Some of the most effective methods of pedagogical technologies are the use of "Problem Situation", "FSMU", "Fish Skeleton", "Cluster" and "Why", "How" organizers in the educational process, presentation, brainstorming Blitz, discussion, question and answer technologies.
Reading list	1.Davronov Z., Shermuhamedova N, Qahharova M, Nurmatova M, Husanov B, Sultonova A. Falsafa. - Toshkent: TMU, 2019 Madaeva Sh. Shermuhamedova N. va boshqalar. Falsafa - o'quv qo‘llanmasi. - Toshkent: 2019 2.Muhammadjonova L.A., Abdulla Sher, Shodimetova G. Axloq falsafasi. - Toshkent: Vneshinvestprom, 2023 3.Saifnazarov I. Muxtorov A., Sultanov T., Usmonov F. Falsafa. Darslik. - T.: Innovatsion rivojlanish nashriyot - matbaa uyi, 2021.- 424 b. 4.Saifnazarov I.C, Abdullaxonova., Ernazarov D.Z. Filosofiya (Logika,Etika, Estetika) Uchebnoe posobie dlya vыsshix uchebnыx zavedeniy. LAMBERT Academik Publishing RU. 2019. -134 str 5.Shermuhamedova N. Falsafa. - Toshkent: Idris Abdurauf Nashr, 2021. 667-b.
Reviewers	**Taqrizchilar** Falsafa va sotsiologiya kafedrasi professori Choriyev S.A. SHDPI+Ijtimoiy fanlar kafedrasi dotsenti f.f.d.(DSc) Omonov B.N.
Confirmed place and time	Tasdiqlagan tashkilot va vaqti Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

"ALGORITHMS AND DATA STRUCTURES"

MODULE HANDBOOK

Field of knowledge: 500000 - Natural Sciences, Mathematics and Statistics

Field of education: 540200 - Mathematics and Statistics

Field of study: 60540200 - Applied Mathematics

MODULE REFERENCES

Module name:	Algorithms and Data Structures
Code, if applicable	ABSB204
Semesters in which the module is taught	4
Lecturer	Eshboyev Erkin Abdirashidovich - Associate Professor, Department of Applied Mathematics
Language	Uzbek
Relation to curriculum	Compulsory
Type of teaching, contact hours	Lecture, practical course
Workload	Total working load: 120 hours. Contact hours: 60 hours; lecture – 30, practical-30 Self-study: 60 hours.
Credit points	4
Recommended prerequisi	Computer literacy
Module objectives / intend learning outcome	Upon successful completion of this module, the student will be able to understand the fundamental concepts of algorithms, their structure, representation methods, types, and properties, as well as their role and importance in programming and problem solving. The student will gain knowledge about the principles of algorithmization and will be able to apply algorithmic thinking to solve computational and real-life problems. The student will understand different types of data and their various forms, learn how data types are declared and represented in programming languages, and understand how data is stored and organized in computer memory. The student will also become familiar with common data structures and their practical applications in programming. In addition, the student will acquire knowledge of basic algorithmic techniques such as searching and sorting methods and will be able to select and apply appropriate algorithms depending on the problem requirements. The student will develop the ability to analyze the efficiency and correctness of algorithms and understand their importance in designing efficient programs. The student will also gain practical skills in applying

	algorithmic models and analytical methods to study and model real-world processes. Based on mathematical reasoning and computational approaches, the student will be able to analyze problems, develop appropriate algorithmic solutions, and make informed decisions when solving complex tasks in computing and related fields. Furthermore, the module will help students develop logical thinking, problem-solving abilities, and programming skills that are essential for further study in computer science and software development.
Content	Topic 1. Variables and Their Types 1) Variables and their role in programming 2) Primitive data types 3) User-defined data types and data structures 4) Abstract Data Type (ADT) Topic 2. Algorithms 1) The concept of an algorithm 2) Formalization of the algorithm concept 3) Formal properties of algorithms Topic 3. Algorithm Analysis 1) Execution time analysis 2) Comparison of algorithms 3) Types of analysis 4) Asymptotic notations Topic 4. Linear Data Structures 1) Array 2) Dynamic arrays 3) Linked lists Topic 5. Singly Linked Lists 1) Traversing a singly linked list 2) Adding an element to a singly linked list 3) Deleting a node from a singly linked list Topic 6. Doubly Linked Lists 1) Traversing a doubly linked list 2) Adding a new node to a doubly linked list 3) Deleting a node from a doubly linked list Topic 7. The Concept of a Stack 1) Stack ADT 2) Stack implementation 3) Implementing a stack using a static array 4) Implementing a stack using a dynamic array 5) Implementing a stack using a singly linked list Topic 8. Queue

	1) Queue ADT 2) Basic queue operations 3) Deque Topic 9. Methods of Implementing the Queue ADT 1) Queue implementation using a circular array 2) Queue implementation using a dynamic circular array 3) Queue implementation using a singly linked list Topic 10. Circular Lists 1) Circular singly linked list 2) Circular doubly linked list Topic 11. Priority Queue 1) Priority Queue ADT 2) Priority Queue implementation Topic 12. Recursion 1) Concept of recursion 2) Recursion efficiency 3) Anagrams 4) Tower of Hanoi Topic 13. Tree 1) Basic properties of a tree 2) Binary trees 3) Types and properties of binary trees 4) Binary Tree ADT 5) Operations on a binary tree Topic 14. Operations on Trees 1) Classification of binary tree traversals 2) Prefix (Preorder) traversal 3) Infix (Inorder) traversal 4) Postfix (Postorder) traversal 5) Breadth-first traversal Topic 15. Classification of Sorting Algorithms 1) Sorting algorithms overview 2) Bubble sort 3) Selection sort 4) Insertion sort Topic 16. Efficient Sorting Algorithms 1) Shell sort 2) Merge sort 3) Quicksort Topic 17. Linear Sorting Algorithms 1) Counting sort 2) Radix sort 3) Bucket sort Topic 18. Searching Algorithms 1) Unordered linear search

	2) Ordered linear search 3) Binary search 4) Interpolation search 5) Binary search tree Topic 19. Binary Search Tree 1) Node search in a binary search tree 2) Efficiency of binary tree search 3) Inserting a node into a binary search tree 4) Removing a node from a binary search tree 5) Efficiency of binary search trees Topic 20. Heap 1) Types of heaps 2) Representing a heap 3) Converting a tree into a heap Topic 21. Operations on a Heap 1) Building a heap from an array 2) Getting the maximum element 3) Deleting the maximum element Topic 22. Algorithms for Working with a Heap 1) Adding an element to a heap 2) Printing heap elements 3) Clearing a heap 4) HeapSort algorithm Topic 23. Divide and Conquer Algorithms 1) Concept of divide and conquer 2) Examples of divide and conquer algorithms 3) Applications of divide and conquer Topic 24. Hash Tables 1) Key and dictionary concept 2) Hash functions 3) Creating a hash table Topic 25. Graph Data Structure 1) Concept of a graph 2) Directed graph 3) Undirected graph Topic 26. Graph Algorithms 1) Breadth-first search (BFS) 2) Weighted graphs 3) Dijkstra’s algorithm Topic 27. Greedy Algorithms 1) Greedy algorithm concept 2) Set-covering problem Topic 28. Applications of the Greedy Algorithm 1) Knapsack problem 2) Maximum coverage problem

	Topic 29. Dynamic Programming 1) Concept of dynamic programming 2) Knapsack problem 3) Word correction problem Topic 30. K-Nearest Neighbor Algorithm 1) Concept of KNN algorithm 2) Distance calculation methods 3) Applications of KNN algorithm
Study and examination requirements and forms of examination	Written Examination: In this exam, the student is given 80 minutes to write answers to the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are written for all questions – 5 (Excellent) 2. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the questions – 2 (Unsatisfactory)
Media employed	In this course, students will use lecture materials, programming environments, and visualization tools to understand and implement algorithms and data structures. Successful completion of the course requires timely submission of programming assignments, active participation in practical tasks, and passing both ongoing (midterm) and final assessments.
Reading list	**Main literature.** 1. Axo A., Xopkroft D., Ulman D. Strukturы dannых i algoritmы. «Vilyams», Moskva, 2010 2. Narzullayev U. X., Qarshiyev A. B.,Boynazarov I. M. Ma'lumotlar tuzilmasi va algoritmlar. "Tafakkur",Toshkent,2013 y. 3. Nazarenka P. A. Algoritmы i strukturы dannых.Ucheb. posobie Samara PGUTIYu. 2015.-196 s

	Supplementary literature 4. Senilov M.A. Metodicheskie ukazaniya dlya samostoyatelnoy rabotы studentov po dissipline «Strukturы i algoritmы obrabotki dannыx v EVM». - Ijevsk: Izd-vo IJGTU, 2008. 5. Babenko M.A., Levin M.V. Vvedenie v teoriyu algoritmov i struktur dannыx. - M.: FMOP, MSNMO, 2012. - 144 s. 6. Nazarenko P.A. Algoritmы i strukturы dannыx. Ucheb.posobie Samara. PGUTI,2015. -196 s. 7. Makarova N.V., Volkov V.B. Informatika:Uch. dlya vuzov. -SPb.: Piter, 2011.-576 s. **Information sources** 1. http://ETH Zurich / N. Wirth / Books / Compilerbau: Algorithms + Data Structures = Programs. 2. http://N. Wirth, Algorithms and Data Structures (1985 yedition, updated for Oberon in August 2004. Pdf at YeTH Zurich) 3. http://vvww.aleoritmv.info 4. www.ima.uz. -___O‘zbekiston Respublikasi Intelektual mulk agentligi 5. www.akadtmy.uz. – Fanlar akademiyasi 6. http://www.semi.rssi.ru – Rossiya Federatsiyasi Markaziy-iqtisodiy matematika instituti sayti. 7. http://www.nber.com___ – AQSh iqtisodiy tadqiqotlar milliy byurosi sayti. 8. http://www.webofscience.com_– Xalqaro ilmiy maqolalar platformasi. 9. http://www.scopus.com. -___Xalqaro ilmiy maqolalar platformasi. 10. http://www.elibrary.ru_– Rossiya ilmiy maqollar indeksi. 11. www.uzreport.com.- Novosti Uzbekistana 12. www.gov.uz www.lex.uz
Reviewers	O. Djabbarov - Head of the Department of Applied Mathematics, Associate Professor, Karshi State University Z. Qurbonov - Associate Professor, Department of Applied Mathematics, Karshi State University
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30.08.2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

Field of knowledge: 500000 - Natural Sciences, Mathematics and Statistics

Field of education: 540200 - Mathematics and Statistics

Field of study: 60540200 - Applied Mathematics

USE OF THE UZBEKI LANGUAGE IN THE FIELD

MODULE HANDBOOK

KARSHI - 2021

MODULE REFERENCES

Module name:	Use of the Uzbek language in the specialty
Code, if applicable:	UTSB202
Semesters in which the module is taught:	2
Lecturer:	Niyazova Dilbar, associate professor
Language	Uzbek
Relation to curriculum:	Compulsory
Type of teaching, contact hours:	practical
Workload:	60 hours Contact hours: 30 hours; practical – 30 hours Self-study: 30 hours
Credit points:	3
Recommended prerequisites:	"Uzbek language", "Fundamentals of business in the state language", "Speech culture", "Teacher's speech culture", "Practical grammar of the Uzbek language"

Module objectives Intended learning outcome	The purpose of teaching the subject is to consolidate and further expand the knowledge and skills acquired by students in the Uzbek language, to help them master the state language within the framework of their chosen specialty, to enrich their speech with professional terms, to ensure a high level of verbal literacy in the Uzbek language. Also, the aim is to form the ability of students to apply the knowledge and skills acquired in the subject in the process of communication and work, based on the communicative speech principle, so that they can work in everyday, scientific and professional spheres. The task of the subject is to improve the skills of independent speaking and writing in the Uzbek language on speech topics necessary for daily work and life, to form the skills of composing and modifying texts in various speech styles related to the specialty, to develop speech competence, to form the skills of effectively using professional terms in oral and written speech, to form the skills of composing, editing and analyzing professional texts, to form the skills of compiling professional documents, including filling out and formalizing electronic documents, to teach understanding information in the Uzbek language, and to express a critical and analytical attitude to it.
Content	**1. Lesson 1. 2 hours (Practical)** **The purpose and objectives of the field-oriented teaching of the Uzbek language** The fact that the Uzbek language is the State language of the Republic of Uzbekistan. The scientific, historical and social significance of the Law "On the State Language". Memorizing the "Hymn of Uzbekistan". Preparing a text on the topic "Uzbekistan is

	a single homeland!". Performing exercises and assignments. **2. Lesson 2. 2 hours (Practical)** **Expansion of the social functions of the Uzbek language: changes in society and language development** Phonetics is a branch of linguistics that studies speech sounds. Vowels and consonants. Their writing and pronunciation. Preparation of a text on the topic “Uzbek language - the state language”. Exercises and tasks. **3. Lesson 3. 2 hours (Practical)** **Norms of the Uzbek literary language** Phonetic, lexical-semantic norm. Orthographic, orthoepic norm, morphological and syntactic norms. Norms of word formation. Preparation of a text on the topic "National values - pride of the nation". Performing exercises and tasks on the topic. **4. Lesson 4. 2 hours (Practical)** **Spelling rules of the Uzbek-Latin alphabet. Punctuation marks in the Uzbek language.** Spelling of bases and suffixes. Adding and separating. Spelling of Bish letters. Rules for transferring. Use of punctuation marks. Conversation and preparation of a text on “Our history and our time”. Exercises and tasks on the topic. **5. Lesson 5. 2 hours (Practical)** **Speech styles and their characteristics.** Artistic style and its characteristics. Publicistic style and its characteristics. Oral-written style and its characteristics. Prepare a conversation and text on the topic “Book is our best friend”. Complete exercises and assignments on the topic. **6. Lesson 6. 2 hours (Practical)** **Scientific method. Lexical characteristics of specialized terms.Their use. Selection and study of specialized terms in the text.** Homonyms, synonyms and antonyms in the Uzbek language. Types of words according to the relationship of form and meaning. Homonyms, synonyms and antonyms, synonymic series. Features of the use of specialized terms. Dictionaries. Types of dictionaries. Encyclopedic and linguistic dictionaries. Preparing a text on the topic "Education in the modern world". Performing exercises and tasks on the topic. Preparing a text on the topic "The future is in the hands of educated youth". Performing exercises and tasks on the topic. **7. Lesson 7. 2 hours (Practical)** **Communicative qualities of expert speech.** Professional speech. Scientificity, accuracy, precision, purity of expert speech. Preparation of a conversation and text on the topic "Innovations in the 21st century". Performing exercises and tasks on the topic. **8. Lesson 8. 2 hours (Practical)** **Presentation speech on the subject.** Rules for creating a presentation on the subject. Translation of

	articles from newspapers. Preparation of a conversation and text on the topic “Global problems of our time”. Performing exercises and tasks on the topic.**9. Lesson 9. 2 hours (Practical)** **Language and style of business.** **Types of documents and their specific features.** Necessary parts of the document and their execution. **10. Lesson 10. 2 hours (Practical)** **Issues of conducting business in the state language in the field.** Organizational documents. **Lesson 11. 2 hours (Practical)** **Features of sectoral regulatory documents.** Types of regulatory documents. Conversation on the topic "Legal culture". Exercises and tasks on the topic **12. Lesson 12. 4 hours (Lecture / Practical)** **Professional information documents.** Types of information documents. Types of stylistically specific vocabulary.1) written speech vocabulary, 2) oral speech vocabulary. Preparation of a conversation and text on the topic "Higher education in Uzbekistan". Performing exercises and assignments on the topic. **13. Lesson 13. 2 hours (Practical)** **Professional service correspondence.** Types of service correspondence. Preparation of a conversation and text on the topic “From the life of our scientific institution”. Performing exercises and assignments on the topic. **14. Lesson 14. 2 hours (Practical)** **Documents related to employee activities and their execution in the state language.** Work book, collection of personal documents. **15. Lesson 15. 2 hours (Practical)** **Procedure for working with documents.** Registration of documents. Control over the execution of documents. Systematization of documents, Formation of a collection folder of documents. Preparation and execution of outgoing and internal documents

Study and examination requirements and forms of examination	Final control. The student must answer 5 questions in writing or 50 test questions. - 10 points are awarded for each written question. - 10-9 points if the essence of the question is fully revealed, the student has a creative approach to the topic, and a critical point of view is expressed. - 8-7 points if the essence of the question is revealed, the main facts are stated. - 6-5 points if the question is answered, but there are some shortcomings. - 4-1 point is awarded if the answers to the given question are very shallow and have many shortcomings. - 0 points are awarded for not answering the questions. - 1 point is awarded for each correct answer to the 50 test questions.
Media employed	Modern information and pedagogical technologies in teaching science: The following approaches are used in the design of science: Personally oriented education. This education, by its very nature, provides for the full development of all participants in the educational process. This implies, of course, when designing education, not the personality of a particular learner, but, first of all, an approach based on the goals of learning related to future professional activity. Systemic approach. Educational technology should embody all the features of a system: the logic of the process, the interconnection of all its links, and its integrity. Activity-oriented approach. Represents education aimed at the formation of the process qualities of a person, the activation and intensification of the learner's activity, the disclosure of all his abilities and capabilities, and initiative in the educational process. Dialogical approach. This approach implies the need to create psychological unity and mutual relations of the participants in the educational process. As a result, the creative activity of the individual, such as self-activation and self-expression, is enhanced. Organization of cooperative education. It implies the need to focus on democracy, equality, cooperation in subjective relations between the educator and the learner, the introduction of joint work in the formation of goals and content of activities and the assessment of achieved results. Problem-based education. One of the methods of activating the activity of the learner by presenting the content of education in a problematic way. This ensures the formation and development of objective contradictions of scientific knowledge and methods of its resolution, dialectical observation, and their creative application in practical activities.

	In teaching science, information (presentation, multimedia technologies) and modern educational technologies (developmental educational technologies, technologies aimed at the full mastery of science), interactive methods ("T-chart", "BBB", Concept analysis", "Brainstorming", "Cluster", "Zigzag", "Let's study together", FSMU, etc.) and "Case study" technology are used. In addition, the use of textbooks, study guides, and handouts is envisaged.
Reading list	1. Aminov M., Madvaliyev A., Mahkamov N. Mahmudov N., Odilov Y. Conducting business in the state language (practical manual). – Tashkent: Uzbekistan, 2021. –527 p. 2. Mahmudov N., Rafiev., Yuldoshev I. Speech culture and conducting business in the state language. (Textbook) – Tashkent: Cholpon, 2013. 3. Lutfullayeva D. The development of official and departmental work methods during the independence period. (Monograph.) – Tashkent, 2020. 4. Decree of the President of the Republic of Uzbekistan dated October 21, 2019 No. PF-5850 “On measures to radically increase the prestige and status of the Uzbek language as the state language” (National database of legal documents, 21.10.2019, issue 06/19/5712/3034) https://lex.uz/docs/4561730 5. Explanatory dictionary of the Uzbek language.
Reviewers	**Y.Ne’matova** – *Associate Professor of the Department of Uzbek Language and Literature* **D. Shodmonova** – *Associate Professor of the Department of Uzbek Language and Literature*
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

ARTIFICIAL INTELLIGENCE AND NEURAL NETWORK TECHNOLOGIES

MODULE HANDBOOK

Field of knowledge:	500000 - Natural Sciences, Mathematics and Statistics
Field of education:	540200 - Mathematics and Statistics
Field of study:	6540200 - Applied Mathematics

MODULE REFERENCES

Module name:	Artificial intelligence and neural network technologies
Code, if applicable	SINB311
Semesters in which the module is taught	4,5
Lecturer	Eshboyev Erkin Abdirashidovich - Associate Professor, Department of Applied Mathematics
Language	Uzbek
Relation to curriculum	Compulsory
Type of teaching, contact hours	Lecture, practical course
Workload	Total working load: 330 hours. 5th semester Contact hours: 90 hours; lecture - 30 hours.; practical - 60 Self-study: 100 hours. 6th semester Contact hours: 60 hours; lecture -30 hours.; practical - 30 Self-study: 80 hours
Credit points	4th semester – 6 . 5th semester - 5
Recommended prerequisi	Mathematics, Programming, Algorithms and Data Structures
Module objectives / intend learning outcome	Upon successful completion of this module, the student will be able to understand the fundamental concepts of Artificial Intelligence (AI) and Neural Network technologies, including the basic principles of intelligent systems, machine learning approaches, and the role of neural networks in modern data-driven applications. The student will gain knowledge of key AI techniques such as supervised and unsupervised learning, pattern recognition, and data modeling. The student will learn the theoretical foundations of neural networks, including neuron models, activation functions, network architectures, and training algorithms. They will understand how neural networks process information, learn from data, and make predictions or classifications in various application domains. In addition, the student will acquire practical skills in designing, implementing, and evaluating neural network models using modern programming tools and AI development frameworks. They will learn how to prepare datasets, train models, test their performance, and improve accuracy through parameter tuning and optimization techniques. The module will also introduce students to the application of AI and neural network technologies in solving real-world problems, such as image recognition, natural language processing, data analysis, and intelligent decision-making systems. Students will gain experience in applying AI methods to practical tasks and projects.

	Furthermore, the student will develop analytical thinking and problem-solving skills related to intelligent systems and machine learning models. Emphasis will be placed on understanding the strengths and limitations of AI technologies, as well as ethical considerations and responsible use of artificial intelligence. Finally, the module will prepare students for advanced study and research in Artificial Intelligence, Machine Learning, and Data Science, while also equipping them with the practical and theoretical knowledge necessary for professional work in modern intelligent technology development.
Content	Topic 1. Introduction to Artificial Intelligence and Neural Network Technologies 1) The concept of artificial intelligence 2) Understanding of intelligence 3) History of artificial intelligence 4) The role of AI in industry 5) Integration of artificial intelligence and computers Topic 2. The Role of Data in Artificial Intelligence 1) Data sources 2) Effective use of data 3) Availability of reliable information 4) Elimination of data shortages 5) Data coordination and extraction of useful information Topic 3. Image Comprehension Problems 1) Basic issues of image understanding 2) Stages of image recognition systems 3) Objects and their characteristics 4) Decision categories and problems Topic 4. Linear Decision Function 1) Linear decision functions 2) Decision functions in two-dimensional space 3) Minimum distance classifier 4) Linear shells of classified objects Topic 5. Algorithms Used in Artificial Intelligence 1) The concept of algorithms in AI 2) Algorithm design 3) Analysis of algorithm results Topic 6. One-Dimensional Linear Regression 1) General concepts 2) Value function 3) Mean square error function 4) Gradient descent Topic 7. Multidimensional Linear Regression 1) General concepts 2) Vector calculus Topic 8. Feature Scaling Methods 1) Normalization method 2) Standardization method

	3) Value function and gradient descent Topic 9. Value Function and Gradient Descent in Multivariate Regression 1) Value function in multivariate regression 2) Gradient descent method Topic 10. Polynomial Regression 1) General concepts 2) Transformation to multivariable linear regression Topic 11. Logistic Regression 1) General concepts 2) Sigmoid function 3) Decision boundaries 4) Value function Topic 12. Gradient Descent in Logistic Regression 1) Gradient descent method Topic 13. K-Means Clustering Method 1) K-means clustering concept 2) Normalization methods 3) Determining feature contribution 4) Selecting the value of k Topic 14. Neural Network Analysis 1) General information about neural networks 2) Working with data 3) Artificial neural networks Topic 15. Neural Network Architecture 1) General concepts 2) Types of neuron layers Topic 16. Multiclass Neural Networks and Softmax Function 1) Multiclass classification 2) Softmax function Topic 17. Forward and Backward Propagation Algorithms 1) Forward propagation algorithm 2) Hyperparameters 3) Value function 4) Backpropagation algorithm Topic 18. Decision Tree 1) General concept of decision trees 2) Data set entropy 3) Application of entropy in decision trees Topic 19. Machine Learning Using Decision Trees 1) General concepts 2) Problems solved using decision trees Topic 20. Variance in Machine Learning 1) General concepts 2) Application of variance Topic 21. Main Statistical Indicators 1) General statistical concepts 2) Key indicators Topic 22. Support Vector Machine Classification 1) General concepts 2) Matrix and vector transformations

	3) Application of support vectors Topic 23. Random Forest Classification 1) General concepts 2) Ensemble methods 3) Application of the random forest method Topic 24. Data Mining and Its Applications 1) Evolution of ICT and data mining 2) Applications of intelligent data analysis Topic 25. Data Mining for Solving Practical Problems 1) Data mining and big data 2) Deduction and induction methods Topic 26. Main Issues of Data Analysis Methods 1) Stages of intelligent data analysis 2) Patterns in data analysis Topic 27. Classification of Data Analysis Methods 1) Classification of methods 2) Comparative characteristics of main methods Topic 28. Basic Methods of Data Analysis and Interpretation 1) Preliminary data processing 2) Optimization of feature space Topic 29. Classification Problem 1) Concept of classification 2) Types of classification 3) Supervised nonparametric classification 4) Neural network classification Topic 30. Unsupervised Classification 1) Concept of unsupervised classification 2) Support vector classification 3) Decision tree methods
Study and examination requirements and forms of examination	Written Examination: In this exam, the student is given 80 minutes to write answers to the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are written for all questions – 5 (Excellent) 2. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the questions – 2 (Unsatisfactory)
Media employed	Completion of science assignments and successful submission of current, intermediate, and final control forms.
Reading list	**Main literature.**

	1. Potanov A.C. Technologies of Artificial Intelligence - SPb: SPbGU ITMO, 2010-218 p. 2. Intellectual Information Systems and Technologies: textbook / Yu.Yu.Gromov, O.G.Ivanova, V.V.Alekseev and others - Tambov; FGBOU VPO "TGTU" Publishing House, 2013. - 244 p. 3. Ignatiev N.A., Usmanov R.N., Madrakhimov Sh.F. Intellectual Analysis of Data // Textbook. Tashkent - 2018, 144 p. 4. Asadullayev R.G. Fuzzy logic and neural networks: Textbook / Belgorod, 2017. - 309 p. **Additional literature** 5. Jones M.T. Programming of Artificial Intelligence in Applications - M.:DMK Press, 2011. - 312 p. 6. Mirziyoyev Sh. M. We will build our great future together with our courageous and noble people. - Tashkent: "Uzbekistan," 2017. - 488 p. 7. Gavrilova T. A., Khoroshevsky V.F. Knowledge bases of intellectual systems. / Textbook. St. Petersburg: Piter, 2001. - 384 p. 8. Joshi, Pract. Artificial intelligence with examples on Python. : Trans. S Eng.- SPb. LLC "Dialektika," 2019. - 448 p. 9. Nikolaev A.B., Fominikh I.B. Intellectual analysis and data processing // Textbook for the course "Intellectual systems." M.:2003. - 117 p. **Information sources:** 1. http://lib.nuu.uz/ - Electronic Library of the National University of Uzbekistan 2. http://www.raai.org/library - Russian Association of Artificial Intelligence 3. http://www.intuit.ru - National Open University (Russia) 4. http://www.compteacher.ru/programming 5. http://www.intuit.ru 6. www.acm.timus.ru 7. www.codeforces.ru 8. www.ziyonet.uz 9. www.programmer.uz
Reviewers	A.E.Kholmurodov - Professor of the Department of "Applied Mathematics," Karshi State University

	F.Y. Shodiev - Senior Lecturer, Department of "Algorithms and Programming Technologies," Karshi State University.
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30.08.2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

COMPUTER GRAPHICS

MODULE HANDBOOK

Field of knowledge:	500 000 – Natural Sciences, Mathematics and Statistics
The field of education:	510 000 Mathematics and Statistics
Field of study:	605 40 200 - Applied Mathematics

MODULE REFERENCES

Module name:	Computer graphics
Code, if applicable	KGRB204
Semesters in which the module is taught	4
Lecturer	**Shoykulov Shodmonkul Qudratovich**- Associate Professor of the Department of Applied Matematics
Language	Uzbek
Relation to curriculum	Compulsory
Type of teaching, contact hours	Lecture, practical training
Workload	Total workload:120 Contact hours: - 60 h.; lectur - 30 h.; practical classes - 30 h. Individual training: 60 - h.
Credit points	4
Recommended prerequisites	Applied mathematics
Module objectives intended learning outcome	Able to understand and analyze complex phenomena occurring in electrical engineering, information technology or computer science using a broad and solid foundation in mathematics, science and engineering. ***Students understand and can explain*** the history of the development of the subject and the presentation of the goal and objective. ***Students must master*** the basics of graphic modeling - methods of projection formation, methods of projecting spatial objects onto a plane. ***Students are able to analyze*** the basic methods of transforming orthogonal projections, methods of forming surfaces, points and lines on a surface, mutual intersection of surfaces and their development and should know how to use them, drawing up design documentation. ***At the seminars, students perform*** views, sections and sections, designation and inscriptions, a system of state standards and, based on the requirements of a unified system of design documentation, the procedure for drawing up and engineering drawings and their rules, the procedure for reading and detailing assembly drawings, mastering the skills of performing assembly drawings. ***Students are able to determine*** independently the compilation of algorithms for solving positional and metric problems of geometric objects and their solution, having experience in compiling and reading drawings of engineering objects based on the requirements of state standards and a unified system of design documentation. ***When performing independent work,*** students study topics related to the discipline, in which they get an idea of all sections of the subject. To perform the following tasks in the learning process, students are required to actively participate in lectures and practical classes, as well as independent work,

	with literature, the use of Internet data and self-education under the supervision of a teacher.
Content	**1. Introduction to Computer Graphics** Introduction to the science of computer graphics. Purpose, tasks, creation, role, areas of application of computer graphics. Basic concepts of computer graphics. Entering and storing an image in computer memory, the concept of quality. Types of computer graphics. Raster, vector and fractal graphics **2. Modern devices and tools of graphics. Raster and vector graphics** Modern graphics devices and tools. Types of images. Organization of image input and storage in memory. Graphic formats. Raster formats. Cohen-Sutherland algorithm. Vector formats. Brezenham algorithm. Lossy and lossless compression. Group coding algorithm (RLE). LWZ compression algorithm. Fractal graphics. Huffman compression algorithm. Jpeg compression algorithm. Mpeg compression algorithm **3. Color in computer graphics. Color models and color controlling** The nature of light and color. Color models. RGB. CMY and CMYK color models. Lab. HSV, HLS. Grassman's law. Color matching systems. Color harmony **4. Technical support of computer graphics. Graphics input, output, and processing tools** Technical tools for working with images. Automation of image conversion to digital format. Scanner device and its types. Image recognition tools (OCR). FineReader. **5. Graphic editing and tools for creating simple graphic animations** Tools for creating graphic montage and simple graphic animations. Graphic montage and animation in Adobe Photoshop, Illustrator, After Effects, Canva, Powtoon, Pivot Animator **6. Methods and algorithms of 2D and 3D geometric modeling (OpenGL)** Coordinate method and basic algorithms. Transformation and projection. Screen coordinates and basic algorithms. Bezier line. Methods and algorithms for constructing three-dimensional graphics. Painting surfaces. Guro and Fong methods. Concept of a graphical interface for a programmer: OpenGL and DIRECTX **7. Programming graphics in popular programming languages** Software tools for working with images. Programming graphics in object-oriented programming languages. Graphics library. Building graphic objects in C, Visual Basic, PHP and Python. Building a graphic object (diagram) using Word, Excel, Power Point VBA. Maple. 2D and 3D graphic objects in mathematical systems **8. Computer Approach to Drawing Problems. Building graphics in AutoCad**

	Basic concepts of computational geometry: General concepts of discrete images and their representation on a computer. AutoCAD interface. Possibilities of constructing graphic objects in AutoCAD. Programming graphics in AutoCAD. Commands for drawing points, intersections, polygons, circles in AutoCAD and using them to create connections, basic commands for editing drawings and algorithms for their use. Possibilities of constructing three-dimensional models from graphic information in AutoCAD **9. Adobe Photoshop - raster graphics editor** Program interface. Working with raster graphics in Adobe Photoshop. Working with layers and color in Adobe Photoshop. Additional program features. **10. CorelDraw - vector graphics editor** Working with raster graphics in CorelDraw. Additional capabilities of CorelDraw. **11. 3D graphics** Basics of three-dimensional graphics and animation. 3D max Studio interface. Working with objects in 3D max Studio. Modeling and working with materials in 3D max Studio. Building animation. Lighting sources. Visualization
Study and examination requirements and forms of examination	Written Examination: In this exam, the student is given 80 minutes to write answers to the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are written for all questions – 5 (Excellent) 2. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the questions – 2 (Unsatisfactory)
Media employed	Fulfillment of tasks in the discipline and tasks issued in the forms of current, intermediate control, successful completion of the final control.
Reading list	1. John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley. Computer Graphics: Principles and Practice, Addison-Wesley, 2013, ISBN 0321399528, 978-0321399526, -1264 p. Thomas Akenine-Müller, Eric Haines, Naty Hoffman. Real-Time Rendering, Fourth Edition 4th Edition, A K Peters/CRC Press, 2018, ISBN 9781138627000, 978-1138627000, -1178 p. 3. Shoykulov Sh.K. Computer Graphics. Textbook. Karshi State University, 2024, -300 p. 4. https://www.cs.ox.ac.uk/teaching/courses/2024-2025/graphics/ - Computer Graphics course program at Oxford University (ARWU-6) 5. http://15462.courses.cs.cmu.edu/fall2021/ - Computer Graphics course program at Carnegie Mellon University

	(ARWU-105) 6. https://graphics.stanford.edu/courses/cs148-10-summer/ - Program of the Course in Computer Graphics and Image at Stanford University (ARWU-2) 7. Bonneel N., Coeurjolly D., Digne J., Mellado N. Code replicability in computer graphics // ACM Transactions on Graphics. - 2020. - Vol. 39, No. 4. - Article 107. DOI: 10.1145/3386569.3392413.
Reviewers	Z.M. Kurbanov- Associate Professor of the Department of "Applied Mathematics" of Karshi State University B.Kh.Shovaliev - Senior Lecturer of the Department of "Applied Mathematics" of Karshi State University
Confirmed place and time	Developed and approved by Karshi State University (Report №1 30.08.2021 y.)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

GENERAL PEDAGOGY

MODULE HANDBOOK

Field of knowledge	500 000	**Natural sciences, mathematics and statistics**
Field of education	540 000	Mathematics and statistics
Field of study	60540200	Applied Mathematics

KARSHI - 2021

MODULE REFERENCES

Module name:	General pedagogy
Code, if applicable:	UPDB304
Semesters in which the module is taught:	5
Lecturer:	Oysara Karakhanova, senior teacher
Language	Uzbek
Relation to curriculum:	elective
Type of teaching, contact hours:	Lecture, practical
Workload:	150 hours - soati Contact hours: 60 hours; auditoriya soati lecture – 30 hours; practical – 30 hours Self-study: 90 hours – mustaqil ta'lim
Credit points:	5
Recommended prerequisites:	General psychology

Module objectives Intended learning outcome	The purpose of teaching the subject is to equip future teachers with the theoretical and historical foundations of modern pedagogical science and knowledge of teaching skills, to teach them to rationally organize the educational process based on the requirements established by the Law of the Republic of Uzbekistan "On Education", to effectively use pedagogical heritage, and to demonstrate high pedagogical culture and techniques in real educational practice. As a result of mastering the subject, the student will acquire the following competencies: • motivational-cognitive - orientation to cognitive activity, awareness of educational and cognitive activity, creativity, behavior in non-standard situations, independence in solving educational tasks, interest and aspirations to master the profession of a teacher; • informational - working with information, protection from information attacks, mastering the culture of information consumption; • communicative - linguistic literacy, mastering the rules of literary and scientific style, mastering verbal and non-verbal speech skills, exchanging ideas, engaging in free dialogue in analyzing reality, expressing one's objective attitude to pedagogical reality; • awareness of the content and essence of the ideological-ideological-national idea, understanding the ideological landscape of the world, possession of ideological immunity, protection from ideological threats, understanding the personal and social essence of the national idea, clarifying the place of the national idea in

	pedagogical activity; • understanding the essence of reforms being carried out in the fields of citizenship - political, socio-economic, spiritual-educational, cultural, harmonious analysis of the national-cultural heritage, the past, present and future of the people, active participation in socio-political life. Show activity in projects carried out by local community life and self-government institutions, social movements; • spiritual and moral - mastering and applying the norms of behavior accepted in society, mastering high spiritual and moral qualities and turning them into the main criterion of pedagogical activity, combating spiritual threats, preparing for the organization of spiritual propaganda and agitation; • acmeological confidence in oneself and the environment surrounding one, full understanding of one's desires and needs, identifying the current opportunities and prospects for future creative development, the ability to reflect, identify, interiorize, change one's views, beliefs and attitudes; • • axiological - axiological assessment of pedagogical reality, understanding pedagogical phenomena as values, enjoying the pedagogical process, experiencing a sense of responsibility, understanding one's pedagogical position and readiness for pedagogical activity based on educational values.
Content	Topic 1: HISTORY OF PEDAGOGY AS A SCIENCE. EDUCATION IN PRIMITIVE COMMUNITY. EDUCATION AND PEDAGOGICAL IDEAS FROM THE MOST ANCIENT PERIODS TO THE 7TH CENTURY. EDUCATION, SCHOOL AND PEDAGOGICAL IDEAS IN CENTRAL ASIA FROM THE 7TH CENTURY TO THE FIRST HALF OF THE 14TH CENTURY. Topic 2: DEVELOPMENT OF PEDAGOGICAL IDEAS DURING THE EASTERN AWAKENING. DEVELOPMENT OF EDUCATIONAL AND MORAL IDEAS DURING THE EASTERN AWAKENING Topic 3: DEVELOPMENT OF EDUCATION, SCHOOL AND PEDAGOGICAL IDEAS IN MOVARAUNNAH IN THE SECOND HALF OF THE 14TH CENTURY AND IN THE 16TH CENTURY. Topic 4: DEVELOPMENT OF EDUCATION, SCHOOL AND PEDAGOGICAL IDEAS FROM THE 17TH CENTURY TO THE MIDDLE OF THE 19TH CENTURY. EDUCATION, SCHOOL AND PEDAGOGICAL IDEAS IN TURKESTAN IN THE 2ND HALF OF THE 19TH CENTURY - THE 1ST QUARTER OF THE 20TH CENTURY. Topic 5. EDUCATION SYSTEM AND DEVELOPMENT OF PEDAGOGICAL IDEAS IN UZBEKISTAN IN 1924-1991. EDUCATION SYSTEM OF INDEPENDENT UZBEKISTAN. DEVELOPMENT OF PEDAGOGICAL IDEAS IN THE YEARS OF INDEPENDENCE. Topic 6: HISTORY OF THE DEVELOPMENT OF WORLD PEDAGOGICAL SCIENCE FROM THE MOST ANCIENT

	PERIODS TO THE FIRST HALF OF THE 19TH CENTURY. PEDAGOGICAL THEORY OF Y.A. COMENIUS. Topic 7: EDUCATION SYSTEM OF THE COUNTRIES OF THE WORLD IN THE PRESENT PERIOD. TOPIC 8: HISTORY OF PEDAGOGICAL THOUGHT AND ISSUES OF TEACHER SKILLS IN SCHOOL PRACTICE. MAIN COMPONENTS OF PEDAGOGICAL SKILLS. Topic 9. Pedagogical competence in teacher activity. TOPIC 10: COMMUNICATIVE SKILLS AND INFLUENCE. CULTURE AND PSYCHOLOGY OF BEHAVIOR IN TEACHER ACTIVITY. TOPIC 11: PEDAGOGICAL TACT AND PEDAGOGICAL ETHICS TOPIC 12: CONCEPT OF PEDAGOGICAL TECHNIQUE. METHODOLOGY OF FORMING PEDAGOGICAL TECHNIQUE. TOPIC 13: SPEECH TECHNIQUE AND CULTURE. TOPIC 14: SCIENTIFIC ORGANIZATION OF TEACHER'S WORK. 15TH REPORT. SELF-EDUCATION AND WORK ON ONESELF. SYSTEM OF ACQUIRING PEDAGOGICAL EXPERIENCE. **Seminar topics** Topic 1: EDUCATIONAL ISSUES IN THE OLDEST WRITTEN MONUMENTS. THE SCIENCE OF HADITH AND ITS HERITAGE SIGNIFICANCE. Topic 2: PEDAGOGICAL IDEAS OF ABU NASR FORABI AND ABU ALI IBN SINO ON EDUCATION. Topic 3: EDUCATIONAL AND MORAL VIEWS OF YUSUF KHOS HAJIB, MAHMUD KASHGARI AND AHMAD YUGNAKI AND KAYKOVUS'S "QABUSNOMA" AND YOUTH EDUCATION. Topic 4: MIRZO ULUGH'BEK'S PEDAGOGICAL IDEAS AND CONTRIBUTIONS TO THE DEVELOPMENT OF EDUCATION. Topic 5: EDUCATIONAL AND MORAL VIEWS OF ABDURAHMON JOMII AND PEDAGOGICAL VIEWS OF ALISHER NAVAI. Topic 6: PEDAGOGICAL VIEWS OF NEW ENLIGHTENERS AND PEDAGOGICAL VIEWS OF ABDULLA AVLONI Topic 7: EXPRESSION OF CONCEPTUAL IDEAS ON THE SPIRITUAL AND MORAL FOUNDATIONS OF SOCIETY DEVELOPMENT AND THE FORMATION OF A HIGHLY SPIRITUAL PERSON IN THE WORKS OF THE FIRST PRESIDENT OF THE REPUBLIC OF UZBEKISTAN I.A. KARIMOV. Topic 8: PEDAGOGICAL SYSTEM OF JAN AMOS COMENIUS. PEDAGOGICAL SYSTEM OF KONSTANTIN DMITRIYEVICH USHINSKY. Topic 9 Global trends in the world education system of the 20th century. Topic 10: Ways to form pedagogical skills. The concept of

	communication. Topic 11: Communicative skills and pedagogical influence. Culture and psychology of communication in the work of a teacher Topic 12: The concept of tact and pedagogical tact. Conditions for using pedagogical tact. Topic 13. Pedagogical etiquette. Etiquette of behavior of a teacher. Topic 14. Pedagogical technique. Speech technique and culture. Topic 15. Self-education and work on oneself as the main condition for pedagogical skill.
Study and examination requirements and forms of examination	The following criteria are recommended for monitoring a student's mastery of the subject: a) To receive a grade of 5, the student's level of knowledge must meet the following requirements: fully covers the essence and content of the subject; maintains scientific and logical approach to the presentation of the subject's topics, avoiding scientific errors and confusion; has a clear idea of the theoretical or practical significance of the subject materials in the subject; can demonstrate the ability to think independently within the scope of the subject; can answer the questions posed clearly and concisely; has carefully prepared the outline; has completed independent assignments completely and clearly; has fully mastered the laws and other regulatory and legal documents related to the subject; has published a scientific article on one of the topics related to the subject; can interpret historical processes; b) to receive a grade of 4, the student's level of knowledge must meet the following requirements: understands the essence and content of the subject, does not allow scientific and logical confusion in presenting the topics in the subject; understands the practical significance of the content of the subject; performs the tasks and assignments assigned to the subject within the framework of the curriculum; can answer the questions asked in the subject correctly; has carefully formulated the subject outline; has completed independent assignments in the subject; has mastered the laws and other regulatory documents related to the subject. c) To receive a grade of 3, the student's level of knowledge must

	meet the following requirements: □ has a general understanding of the subject; □ if the subject topics are covered in a narrow range and some confusion is allowed in the presentation; □ if the presentation is not smooth; □ if complex and confusing answers are given to questions on the subject; □ if the text on the subject is not well-formed. d) In the following cases, the student's level of knowledge may be assessed with an unsatisfactory grade of 2: □ if preparation for the subject exercises is not carried out; □ has no idea about the subject; □ is clearly copying the subject texts from others; □ has serious errors and inaccuracies in the subject text; □ does not answer the questions asked about the subject; □ does not know the subject.
Media employed	• technology for organizing interactive lectures, seminars and practical classes; • modular learning technology; • problem-based learning technology; • cooperative learning technology; • reflexive learning technology; • art technologies; • web quest; • graphic and pictorial models (logical graph, frame model, basic outline, semantic network, mind map).
Reading list	1. Ayupova M. Logopediya. Darslik.- T.: “O’zbekiston faylasuflari milliy jamiyati nashriyoti”, 2007. - 560 b. 2. Abdullayeva, B.S., Xoliqov A.A., D.R. Farsaxonova va bosh. Umumiy pedagogika. Pedagogika nazariyasi, pedagogika tarixi. Darslik.- T.: 2021. -342 b. 3. Abdullayeva B.S., Xoliqov A.A., Sodiqov N.M. va bosh. Umumiy pedagogika. Pedagogik mahorat. Darslik.- T.: 2021. -204 b. 4. Akramova H. Defektologiya. Logopediya: O’quv –uslubiy qo’llanma, T.: 2021. -160 b. 5. Djamilova N, Xasanboyeva O. Pedagogika fanlarini o’qitish metodikasi; O’quv qo’llanma.-T.; 2021-180 b. 6. Berdiyeva G. Oila pedagogikasi. O’quv qo’llanma.- T.: “Voris nashriyoti”, 2021. – 208 b. 7. Hasanboyev J. va bosh. Pedagogika. Pedagogika nazariyasi va tarixi. Darslik.- T:”Noshir” 2011. - 448 b. 8. Ismoilova Yu. Umumiy pedagogika O’quv qo’llanma.- Qarshi fan va ta’lim nashriyoti 2022.- 424 b. 9. Jalolova R.M. Pedagogik mahorat. O’quv qo’llanma.- T.: Chinor fayzi, 2022. - 312b. 10. Karimjonov A. Pedagogik tizimni boshqarish asoslari. . O’quv qo’llanma-T.: 2008. -176 b. 11. Karaxanova O.Yu. Qiyosiy pedagogika. O’quv qo’llanma.-

	Qarshi: 2022. - 272 b. 12. Karaxanova O.Yu. Pedagogik texnologiya. O'quv qo'llanma.- Qarshi davlat universiteti: 2023. - 254 b. 13. Karaxanova O.Yu. Umumiy pedagogika. O'quv qo'llanma.- Qarshi davlat universiteti: 2024. - 250 b. 14. Mamedov K.Q. va bosh. Oligofrenopedagogika asoslari. O'quv qo'llanma.- T.: "O'qituvchi", 1994 .- 168 b. 15. Musurmonova O., N.J. Isaqulova M.T.Jumaniyozova va bosh. Umumiy pedagogika. O'quv qo'llanma II-qism. T.; 2020.-194 b. 16. Muhammadiyeva M.M. Sharq uyg'onish davri pedagogik fikr taraqqiyoti: O'quv qo'llanma.- Qarshi fan va ta'lim nashriyoti 2021. - 132 b. 17. Murodova Z. Umumiy pedagogika (pedagogika nazariyasi). O'quv qo'llanma.- Qarshi fan va ta'lim nashriyoti 2022. - 328 b. 18. Muhammadiyeva M.M. Xalq pedagogikasi. Darslik. Qarshi fan va ta'lim nashriyoti 2023. -276 b. 19. Oripova N.X., Aliqulova M.Sh. Oila pedagogikasi O'quv qo'llanma.- Qarshi fan va ta'lim nashriyoti 2023. - 240 b. 20. Safarova R., Pedagogika. Ensiklopediya. 11-jild, O'zbekiston milliy ensiklopediyasi Davlat milliy nashriyoti.-T.: 2015. -376 b. 21. Sultonov A. Ijtimoiy pedagogika. O'quv qo'llanma.- Qarshi: 2021. - 284 b. 22. Po'latova P.M. Maxsus Pedagogika. Darslik.- T.: "G'afur G'ulom nomidagi nashriyot matbaa ijodiy uyi", 2005. -224 b. 23. Rahmonova V.S. Defektologiya va logopediya asoslari. O'quv –uslubiy qo'llanma, T.: "O'qituvchi", 1991. – 110 b. 24. Rajabova L. Kasbiy pedagogika. O'quv qo'llanma.- Qarshi fan va ta'lim nashriyoti 2021. - 184 b. 25. Tolipov O'., Ro'ziyeva D. Pedagogik texnologiyalar va pedagogik mahorat. O'quv qo'llanma.- T.: 2021. -276 b. 26. Xudoyqulov X., Xolov O.. Tarbiyaviy ishlar metodikasi. O'quv qo'llanma.- T.: "Innovatsiya-Ziyo", 2020. – 164 b. 27. Xamidova. M.U. Maxsus pedagogika. O'quv qo'llanma.- T.: 2021. – 164 b. 28. Xodjayev B., Bozorova M., Murodova Z. va bosh. Pedagogik tadqiqotlarni modellashtirish. O'quv qo'llanma.- Qarshi fan va ta'lim nashriyoti 2021. - 216 b. 29. Xodjayev B.X., Begmatova S.N., Xo'jamqulov A. Umumiy pedagogika. O'quv qo'llanma.- Qarshi fan va ta'lim nashriyoti 2023. - 316 b. 30. Xujayarova N.S. Umumiy pedagogika (pedagogik mahorat) O'quv qo'llanma.- Qarshi fan va ta'lim nashriyoti 2023. - 124 b. 31. Yarmanova Yu. Maktabgacha pedagogika. O'quv qo'llanma.- Qarshi fan va ta'lim nashriyoti 2021. - 128 b. 32. Choriyeva F. Maktabgacha ta'limda pedagogik diagnostika. O'quv qo'llanma.- Qarshi fan va ta'lim nashriyoti 2021. - 140 b. 33. Shodiyev R. D..,Pedagogik konfelektologiya: Darslik.- Qarshi: "Nasaf", 2019. - 100 b. 34. Shodiyev R. D., M. Kazakova. Nasafiylarning pedagogik qarashlari: O'quv qo'llanma.- Qarshi: 2021. - 100 b. 35. Sharifzoda S.O', Yuldashev S.N., Jo'rayev A.R.va bosh. Pedagogika tarixi. O'quv qo'llanma.-T.; 2022. – 172 b.

Reviewers	Yuldoshev Ismoil Abruyevich - Dean of the Faculty of Pedagogy, Associate Professor Oripova Nodima Khalilovna - Head of the Department of Karshi State University, Doctor of Pedagogical Sciences, Professor
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

Equations of Mathematical Physics (for Applied Mathematics and Informatics)

Module designation	MFTB305
Semester(s) in which the module is taught	*Semester 5*
Person is responsible for the module	*Nuraliyeva Navbahor*
Language	*Uzbek language*
Relation to curriculum	*Compulsory (Core) Course*
Teaching methods	*Lecture, discussion, problem solving, quizzes, peer-feedback, practice, dialog.*
Workload (incl. contact hours, self-study hours)	*Workload for 6 ECTS (150 hours):* *Lectures: 30 hours* *Practical training 30 hours* *Self-Study and Independent Learning: 90 hours*
Credit points	*Total Credits: 5* *ECTS: 5*
Required and recommended prerequisites for joining the module	• *Mathematical Analysis* • *Algebra* • *Theory of Functions of a Complex Variable (Complex Analysis)* • *Linear Algebra and Analytic Geometry* • *Differential Equations*
Module objectives/intended learning outcomes	*Upon successful completion of this module, students will be able to:* • *Solve both computational and theoretical problems in functional analysis, demonstrating a deep understanding of core concepts and techniques* • *Establish logical relationships between fundamental definitions, concepts, and theorems within functional analysis* • *Construct and present rigorous mathematical proofs for both classical results and newly formulated analogous statements* • *Apply a wide range of methods from functional analysis to investigate theoretical and applied problems*

	• *Select and combine appropriate analytical methods and techniques for solving complex mathematical tasks* • *Analyze and interpret abstract mathematical structures, ensuring logical consistency and mathematical rigor* • *Demonstrate advanced skills in critical thinking, abstraction, and mathematical reasoning*
	4.
Content	• *Cauchy problem for the inhomogeneous heat transfer equation* • *Solving mixed problems for one-demisoinal heat transfer equation using the Fourier methods* • *Solving problems about harmonic functions and their properties* • *Inner Dirichlet and Neumann problems for the Laplace equation* • *Solving the Dirichlet and Neumann problems on a sphere for the Papuan and Poisson equations.* • *Green's function of the Dirikli problem Dolla than Green's function* • *Fourier transform of a function in one variable.* • *Generalized functions and their properties*
Examination forms	*Paper examination*
Study and examination requirements	*Students are required to:* • *Attend lectures and practical sessions regularly and actively participate in practical classes* • *Demonstrate a thorough understanding of theoretical concepts and the ability to apply them in problem-solving* • *Successfully complete all midterm assessment tasks* • *Achieve the minimum required score in continuous assessment to be admitted to the final examination* • *Pass the final written examination by demonstrating both theoretical knowledge and practical problem-solving skills*
Reading list	1. *O.S. Zikirov,Matematik fizika tenglamalari. Fan va texnologiya, Toshkent, 2017.* 2. *M.Salohiddinov., B.Islomov., Matematik fizika tenglamalari., Universitet, Toshkent., 2017.* 3. *Salohiddinov M., Matematik fizika tenglamal ari: darslik. — Toshkent: O‘zbekiston, 2022.* 4. *Vector Ivrii., Partial Differential Equations., Toronto,Ontario,Canada., 2026.*

MINISTRY OF HIGHER EDUCATION, SCIENSE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

THEORY PROBABILITY AND MATHEMATICAL STATISTICS

MODULE HANDBOOK

Field of knowledge:	500000 – Natural scienses, mathematics and statistics
The field of education:	540000 – Mathematics and statistics
Field of study:	60540200 – Applied mathematics

Module name:	Probability theory and Mathematical statistics
Code, if applicable	ENMB305
Semesters in which the module is taught	
Lecturer	Imomov A`zam Abduraximovich- Doctor of Physical and Mathematical Sciences (DSc), Head of the Department of Algebra and geometry
Language	Uzbek
Relation to curriculum	mandatory
Type of teaching, contact hours	Lecture, practical training
Workload (incl. contact hours, self-study hours)	Workload for 5 ECTS (5 credits): Lectures: 30 hours Practical training 30 hours Self-Study and Independent Learning: 90 hours
Credit points	*5*
Required and recommended prerequisites for joining the module	*Mathematical analysis, Algebra, Linear Algebra and Analytic Geometry*
Module objectives / intended learning outcome	After completing this course, students will be able to: solve theoretical and computational problems in probability theory; apply the basic concepts and methods of probability theory in practical problems; analyze random events and random variables; compute probabilities and expectations of random variables; establish relationships between probability theory and mathematical statistics.
Content	Topics included in the course: 1. Subject of probability theory. Stochastic experiments. Elements of combinatorics. Sample space of elementary events. Algebras and σ-algebras. Concept of probability. 2. Classical and geometric definitions of probability. Axioms of probability theory. Conditional probability. Independence of events. Total probability and Bayes formulas. 3. Sequence of independent experiments. Bernoulli scheme and formula. Binomial distribution. 4. De Moivre–Laplace local and integral limit theorems. Poisson theorem. Applications of the integral limit theorem. 5. Random variables and their distribution functions. Properties of distribution functions. Important distributions. 6. Discrete and continuous distributions. Density functions. Conditional distributions. 7. Numerical characteristics of random variables. Mathematical expectation. Conditional expectation

	8. Variance and its properties. Higher order moments. Correlation coefficient. 9. . Inequalities. Law of large numbers. 10. Conditions for the law of large numbers. Characteristic functions and their properties. 11. Main problems of mathematical statistics. Initial and sample sets. Grouped and interval series. Initial sample processing. 12. Empirical distribution function. Empirical indicators and their calculation. Glivenko's theorem. The concept of statistical estimation. Point estimates and methods of constructing estimates. 13. Confidence intervals for estimating the mathematical expectation of a normal distribution when the variance is known and unknown. 14. Confidence intervals for estimating the standard deviation of a normal distribution. 15. Related distributions: Chi-square, Student and Fisher distributions.
Study and examination requirements and forms of examination	Written Examination: In this exam, the student is given 80 minutes to write answers to the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are written for all questions – 5 (Excellent) 2. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the questions – 2 (Unsatisfactory
Media employed	Fulfillment of tasks in the discipline and tasks issued in the forms of current, intermediate control, successful completion of the final control.
Reading list	1.Sh.Q.Farmonov. “Ehtimollar nazariyasi”, Toshkent, “Universitet”, 2014. 2.Ross, Sheldon M. A first course in probability. Pearson Education, lnc.2010. 3.Robert B. Basic probability theory. Dover Publications, Inc.2008. 4.Jun Shao. Mathematical Statistics. Springer. 2007. 5.Ivchenko G.I., Medvedev Yu.I. Vvedenie v matematicheskuyu statistiku. M: LKI.2010. 6.Borovkov A.A.«Teoriya veroyatnostey», Moskva, «Lan», 2010 g. Str.705.

	7.A.A.Abdushukurov, T.A.Azlarov, A.A.Djamirzayev «Ehtimollar nazariyasi va matematik statistikadan misol va masalalar to‘plami» Toshkent, «Universitet», 2003 y.
Reviewers :	H.Meyliyev - Senior Lecturer of the Department of "Mathematical Analysis and Differential Equations" of the Karshi State University, , Candidate of Physics and Mathematics. M.Abulov - Associate Professor of the Department of " Algebra and Geometry" of the Karshi State University, Candidate of Physics and Mathematics.
Confirmed place and time	Developed and approved by Karshi state university (Report №1 _August 30_ 2021_)

MODULE REFERENCES

Module name:	General psychology
Code, if applicable:	UPSB304
Semesters in which the module is taught:	6
Lecturer:	Shamsiya Bekova
Language	Uzbek
Relation to curriculum:	Compulsory
Type of teaching, contact hours:	Lecture, seminar
Workload:	Total -120 Contact hours: 60 hours; lecture – 30 hours; sminar – 30 hours Self-study: 60 hours
Credit points:	4
Recommended prerequisites:	Pedagogy History Religion

Module objectives Intended learning outcome	The purpose of this course is to form general psychological knowledge in students, to analyze the essence of general psychological phenomena, situations and processes in the life of society, to analyze the development of the personality and the factors affecting it, its individual psychological characteristics, emotional and volitional qualities. - will have an idea of the history of the emergence and development of general psychology and the place of general psychology in the system of scientific knowledge, modern ideas about the subject of general and general psychology, the methodological foundations of conducting experiments, the specifics of applied research in general and general psychology; - will know and be able to use the basic methods of psychological research, the general scientific classification of psychological methods, testing in psychology, cognitive processes, intelligence, abilities, personality traits, and practical research of interpersonal relationships; - will have the skills to conduct general research, apply relevant methods of studying the personality, the validity of psychological experiments, and the process of conducting experiments. - will be able to fully master the theoretical and methodological concepts of the science, and correctly reflect the results of the

	analysis. - conducts independent observations of the processes being studied and performs tasks and assignments given in the forms of current and intermediate control, submits a written work for final control. - Knows the current requirements for teaching the subject of general psychology - Ensures the coherence and consistency of the content, tools, methods and forms of teaching general psychology - Effectively uses educational resources in classes - Has the skills to process, generalize and convey information on the content of the training to students - Uses modern innovative pedagogical technologies in classes - Has the skills to organize classes based on modern requirements for teaching general psychology lessons - Uses modern approaches and innovations in professional activities - Is aware of the achievements of science, research on the application of science to technology and production
Content	Lectures Lecture 1 Subject, goals and objectives of general psychology Lecture 2 Methods of general psychology Lecture 3 Phylogenetic development of the psyche and consciousness Lecture 4 Personality Lecture 5 Concept of activity Lecture 6 Psychology of communication Lecture 7 Mental processes (Attention) Lecture 8 Intuition, Perception Lecture 9 Intuition, Perception Lecture 10 Memory. Imagination. Lecture 11 Thinking Lecture 12 Emotional-volitional states of a person Lecture 13 Psychological characteristics (Temperament) Lecture 14 Character Lecture 15 Ability

	Seminars Seminar 1 Subject, goals and objectives of general psychology Seminar 2 Methods of general psychology Seminar 3 Phylogeny of the psyche and consciousness Seminar 4 Personality Seminar 5 Concept of activity Seminar 6 Psychology of communication Seminar 7 Mental processes (Attention) Seminar 8 Intuition Seminar 9 Perception Seminar 10 Memory. Imagination Seminar 11 Thinking Seminar 12 Emotion. Will Seminar 13 Temperament characteristics Seminar 14 Character structure and features Seminar 15 Ability
Study and examination requirements and forms of examination	a) To receive a grade of 5, the student's level of knowledge must meet the following requirements: can fully explain the essence and content of the subject; maintains scientificity and logic in presenting the topics in the subject, avoiding scientific errors and confusion; has a clear idea of the theoretical or practical significance of the subject materials in the subject; can demonstrate the ability to think independently within the scope of the subject; can answer the questions asked clearly and concisely; has carefully prepared the outline; has completed independent assignments completely and clearly; has fully mastered the laws and other regulatory and legal documents related to the discipline; has published a scientific article on one of the topics related to the discipline; can interpret historical processes; b) To receive a grade of 4, the student's level of knowledge must meet the following requirements: understands the essence and content of the subject, does not allow scientific and logical confusion in explaining the topics in the subject; understands the practical significance of the content of the subject; performs the assigned tasks and assignments within the framework of the curriculum;

	□ can correctly answer the questions asked in the subject; □ has carefully formulated a subject outline; □ has fully completed independent assignments in the subject; □ has mastered laws and other regulatory documents related to the subject. c) To receive a grade of 3, the student's level of knowledge must meet the following criteria: □ has a general understanding of the subject; □ covers the topics of the subject in a narrow range, with some inconsistencies in the presentation; □ is not fluent in the presentation; □ if complex and confusing answers are given to questions on the subject; □ if the text on the subject is not well-structured. g) In the following cases, the student's level of knowledge may be assessed as unsatisfactory with a grade of 2: □ if preparation for the subject exercises is not carried out; □ if the student has no idea about the subject exercises; □ if it is noticeable that the texts on the subject have been copied from others; □ if serious errors and confusions are made in the text on the subject; □ if the questions asked about the subject are not answered; □ if the subject is not known.
Media employed	Some of the most effective methods of pedagogical technologies are the use of "Problem Situation", "FSMU", "Fish Skeleton", "Cluster" and "Why", "How" organizers in the educational process, presentation, brainstorming Blitz, discussion, question and answer technologies.
Reading list	1. E.G'oziyev Psychology of Thought –Tashkent.: 1990. 2. Nishonova Z General psychology - Tashkent.: 1992. 3. G'oziyev E. General psychology -T.: Philosophers. 2010. - 541 p. 4. Karimov X Russian-Uzbek explanatory dictionary of psychological terms –T.: Science and Technology 2019 5. A.Jabborov Psychology of the individual –Karshi.: Science and Education Publishing House, 2023. 6. Beknazarova L Psychology – Karshi.: Intellect, 2023. 7. Jurayev B General psychology -Karshi.: Science-science-spirituality, 2024.
Reviewers	L. Beknazarova - Professor of the Department of Psychology E. Yoziyev - Associate Professor of the Department of Psychology
Confirmed place and time	The curriculum was approved and approved by the protocol No. 1 of Karshi State University dated "30" 08, 2021.

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

Process research and optimal management

MODULE HANDBOOK

Field of knowledge	500 000	Science, mathematics
Field of education	540 000	Mathematics and statistics
Field of study	60540200	Applied Mathematics

KARSHI – 2021

MODULE REFERENCES

Module name:	Process research and optimal management
Code, if applicable	JTOB305
Tegishli kurslar (mavjud bo‘lsa):	-
Semesters in which the module is taught	7
Lecturer	Khurramov Alisher Khasanovich, senior teacher
Language	Uzbek / English
Relation to curriculum	Compulsory
Type of teaching, contact hours	Lecture, practical training
Workload	Total study load: 120 hours Communication hours: 120 hours • lecture - 30 hours • seminar - 30 hours Independent study: 60 hours
Credit points	10
Recommended prerequisites	Linear Programming Problems. Dynamic programming. Creating a network plan. Transportation issue. The problem of play with nature.

Module objectives / intended learning outcome	The purpose of teaching the discipline is to study the theory of finding extremums of functions of one and many arguments, linear programming, dynamic programming, dynamic programming, differential equations, mathematical model construction, game theory, controlled object theory, algorithms for finding strategies and their applications, as well as to study processes - to provide knowledge of finding and applying complex scientific methods for solving problems in control systems; Extremums of functions of one and many arguments, Linear programming Dynamic programming DMathematical Model Construction Game Theory Theory of controlled objects Theory of finding algorithms for finding strategies Finding complex scientific methods for solving problems in control systems Differential equations
Content	**Lesson 1. 2 hours (Lecture / Practical)** Linear programming problems. **Lesson 2. 2 hours (Lecture / Practical)** Rectangular method. Simplex method. **Lesson 3. 2 hours (Lecture / Practical)** Dynamic programming. **Lesson 4. 2 hours (Lecture / Practical)** Application of the recurrence formula of dynamic programming. The issue of a reliable supplier. **Lesson 5. 2 hours (Lecture / Practical)** Creating a network plan. **Lesson 6. 2 hours (Lecture / Practical)** Creating a calendar plan. Problems of stochastic reserve management. **Lesson 7. 2 hours (Lecture / Practical)** Transportation problem. Types of transport issues. **Lesson 8. 2 hours (Lecture / Practical)** Determining the initial plan. Application of the potential method. **Lesson 9. 2 hours (Lecture / Practical)** Dynamic optimization problems. Examples of applying the network

	and boundary method. **Lesson 10. 2 hours (Lecture / Practical)** Marking method for finding the maximum flow. The Backpack Question. **Lesson 11. 2 hours (Lecture / Practical)** The problem of play with nature. Decision-making under risky conditions. **Lesson 12. 2 hours (Lecture / Practical)** Laplace, Minimax, Savage, and Hurwitz criteria. **Lesson 13. 2 hours (Lecture / Practical)** Game theory. The issue of family discussion. **Lesson 14. 2 hours (Lecture / Practical)** Bimatrix games. Application of optimality in the sense of Pareto, Slater, and Nash. **Lesson 15. 2 hours (Lecture / Practical)** Matrix games. **Lesson 16. 2 hours (Lecture / Practical)** Using methods for finding optimal strategies. Examples of finding equilibrium states **Lesson 17. 2 hours (Lecture / Practical)** Minimax Theorem **Lesson 18. 2 hours (Lecture / Practical)** The fundamental theorem of game theory. Proof of the theorem **Lesson 19. 2 hours (Lecture / Practical)** Service models. **Lesson 20. 2 hours (Lecture / Practical)** Information about public service systems. Use of public service formulas. **Lesson 21. 2 hours (Lecture / Practical)** Controlled objects. Controlled Markov chains. **Lesson 22. 2 hours (Lecture / Practical)** The Taxi Driver Problem. Problems related to simulation modeling. **Lesson 23. 2 hours (Lecture / Practical)** Optimal Management Issues. **Lesson 24. 2 hours (Lecture / Practical)** Problems reduced to linear systems. Simple equation of motion. **Lesson 25. 2 hours (Lecture / Practical)** Optimality methods. **Lesson 26. 2 hours (Lecture / Practical)** Principle of optimality. Application of Pontryagin's maximum principle. **Lesson 27. 2 hours (Lecture / Practical)** The principle of maximum is a necessary condition. **Lesson 28. 2 hours (Lecture / Practical)** Use of necessary and sufficient optimality conditions **Lesson 29. 2 hours (Lecture / Practical)** The Problem of Building Synthesis in Optimal Management. **Lesson 30. 2 hours (Lecture / Practical)** Synesizing function and its significance. Examples of constructing synthesizing functions.

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Study and examination requirements and forms of examination	**Oral Examination:** For this exam, the student is given 20 minutes for preparation to answer the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are provided for all questions – 5 (Excellent) 2. If answers are provided for all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not correspond to the questions – 2 (Unsatisfactory)
Media employed	Completion of academic assignments and successful completion of current, interim, and final control forms
Reading list	Main literature 1. M.Tukhtasinov. Process research. Textbook 2017. - 572 p. 2. H.A. Taha. Operations research. -2010, 9th Edition. 3. N. Mamadaliyev, M.Tuxtasinov Basic Issues of Variational Calculation and Optimal Management. Tashkent, University. 2013. - 188 p. 4. V.I. Blagodatskikh. Introduction to Optimal Management. Tashkent, 2019, -248 p
Reviewers:	Z.Kurbanov (Karshi State University, Associate Professor of the Department of "Applied Mathematics") I. Khurramov (Karshi State University, Teacher of the Department of "Applied Mathematics")
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

Numerical Methods

MODULE HANDBOOK

Field of knowledge	500000	Natural Sciences, Mathematics
Field of education	540 000	Mathematics and statistics
Field of study	60540200	- Applied Mathematics

KARSHI - 2021

MODULE REFERENCES

Module name:	Numerical Methods
Code, if applicable:	SUSB309
Semesters in which the module is taught:	6,7
Lecturer:	Djabbarov O.R. Head of the Department of Applied Mathematics, Doctor of Philosophy (PhD) in Physical and Mathematical Sciences, Associate Professor
Language	Uzbek
Relation to curriculum:	Compulsory
Type of teaching, contact hours:	Lecture, practical
Workload:	270 hours Contact hours: 120 hours; lecture – 60 hours; practical – 60 hours Self-study: 150 hours
Credit points:	9
Recommended prerequisites:	Mathematical Analysis Differential Equations Equations of Mathematical Physics Algebra

Module objectives Intended learning outcome	Purpose of teaching the course – The purpose of teaching the course "Numerical Methods" is to equip students with skills in applying various computational methods to solve mathematical problems, to develop algorithms, to analyze the quality and efficiency of algorithms, and to acquire competencies in using numerical methods. Course objectives – The objectives of the course include: identifying the type of a given problem, selecting or developing an appropriate computational method for solving the problem, implementing algorithms, correctly applying known algorithms, determining the stability of numerical methods, using modern high-level programming languages to create programs for solving problems, solving mathematical problems using personal computers, and analyzing computational results and making decisions based on them.

	During the course, topics such as approximation of functions, numerical differentiation and integration, numerical methods of algebra, and approximate solutions of differential equations are studied.
Content	**Mundarijasi** 1. Lesson 1. 4 hours (Lecture / Practical) Introduction and errors 2. Lesson 2. 4 hours (Lecture / Practical) Nonlinear equations (Newton, bisection) 3. Lesson 3. 4 hours (Lecture / Practical) Linear systems (Gauss, iterative) 4. Lesson 4. 4 hours (Lecture / Practical) Interpolation (Lagrange, Newton, spline) 5. Lesson 5. 4 hours (Lecture / Practical) Numerical differentiation 6. Lesson 6. 4 hours (Lecture / Practical) Numerical integration 7. Lesson 7. 4 hours (Lecture / Practical) ODE (Euler, Runge-Kutta) 8. Lesson 8. 4 hours (Lecture / Practical) Boundary value problems 9. Lesson 9. 4 hours (Lecture / Practical) Integral equations
Study and examination requirements and forms of examination	**Oral Examination:** For this exam, the student is given 20 minutes for preparation to answer the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are provided for all questions – 5 (Excellent) 2. If answers are provided for all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not correspond to the questions – 2 (Unsatisfactory)
Media employed	The teaching of the Numerical Methods module is supported by modern educational and digital technologies. The course uses multimedia tools to enhance students' understanding of numerical algorithms and computational processes. The following media and tools are employed: presentation slides (PowerPoint) for theoretical explanations;

	computer-based simulations and numerical experiments; mathematical software such as MATLAB, Python, and MathCAD; interactive problem-solving sessions using digital platforms; visual demonstrations of numerical methods and error analysis; online learning resources and electronic textbooks; programming environments for implementing numerical algorithms. The integration of these tools allows students to better understand abstract mathematical concepts, visualize numerical processes, and develop practical computational skills. The use of ICT ensures the development of analytical thinking, algorithmic reasoning, and independent problem-solving abilities. Students are encouraged to apply numerical methods in real-world problems using modern computational tools.
Reading list	Isroilov, M.I. *Computational Methods*. Part 1. Tashkent: O‘qituvchi, 2003. Isroilov, M.I. *Computational Methods*. Part 2. Tashkent: O‘qituvchi, 2008. Aloyev, R.D., Xudoyberganov, M.O‘. *Laboratory Exercises for the Course “Computational Methods”*. Tashkent: O‘zMU, 2008. 110 p. Ismatullayev, G‘.P., Kosbergenova, M.S. *Computational Methods*. Tashkent: Tafakkur-bo‘stoni, 2014.
Reviewers	O. Shukurov – Professor of the Department of Applied Mathematics, Doctor of Physical and Mathematical Sciences N. Eshqorayeva – Associate Professor of the Department of Applied Mathematics, Candidate of Technical Sciences
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

Mathematics and computer science teaching methodology

MODULE HANDBOOK

Field of knowledge	500000	Natural Sciences, Mathematics
Field of education	540 000	Mathematics and statistics
Field of study	60540200	- Applied Mathematics

KARSHI - 2021

MODULE REFERENCES

Module name:	Mathematics and computer science teaching methodology
Code, if applicable:	MIMB405
Semesters in which the module is taught:	**7**
Lecturer:	**Saidova Dilfuza, senior teacher**
Language	**Uzbek**
Relation to curriculum:	**Compulsory**
Type of teaching, contact hours:	**Lecture, seminar**
Workload:	**150 hours** **Contact hours: 60 hours; lecture – 30 hours;** **seminar– 30 hours** **Self-study: 90 hours**
Credit points:	**5**
Recommended prerequisites:	Elementary Mathematics Mathematical Systems Programming Technologies **Algorithmic Languages and Programming** **Mathematical Modeling**

Module objectives Intended learning outcome	"In the Republic of Uzbekistan, the 'Strategy for the Transition of the Republic of Uzbekistan to a Green Economy for the Period 2019–2030,' approved by the President of the Republic of Uzbekistan on October 4, 2019, serves as an important roadmap for ensuring sustainable development based on the 'green economy.' Important tasks of the transition to a 'green economy' include increasing the energy efficiency of the economy and the rational consumption of natural resources. These specified tasks are achieved through the modernization of digital technologies and the development of financial mechanisms. The purpose of teaching the subject is to develop students' skills to consider, study, and analyze various options for organizing teaching in mathematics and computer science. The task of the subject is to develop future mathematics and computer science teachers' methods and skills for solving problems that arise in teaching, to classify, to explain the effectiveness of the application of

	specific pedagogical technologies in testing and reinforcing knowledge, and similar objectives."
Content	1. Lesson 1. 2 hours (Lecture) The Subject, Goal, and Tasks of the Methodology of Teaching Mathematics. Scientific Methods in Teaching Mathematics. General Characteristics of Scientific Research Methods: Observation and Experiment, Comparison, Analysis and Synthesis, Generalization and Abstraction, Formalization. 2. Lesson 2. 2 hours (Lecture) Developing Mathematical Thinking. Mathematical Logic and Reasoning. Principles, Methods, and Forms of Teaching Mathematics. Methods and Forms of Teaching Mathematics: Heuristic Method, Abductive Teaching Method, Programmed Teaching Method, Individualized Teaching Method. 3. Lesson 3. 2 hours (Lecture) Organizing the Lesson Process in Classroom and Extracurricular Teaching. Clubs and Elective Courses. 4. Lesson 4. 2 hours (Lecture) Fundamental Concepts, Goals, and Objectives of the Methodology of Teaching Informatics. The Development of Teaching this Subject in Uzbekistan. The Continuous System of Teaching Informatics in Schools, Vocational Colleges, Academic Lyceums, and Higher Education Institutions. 5. Lesson 5. 2 hours (Lecture) Methodology for Teaching Operating Systems and the Main Topics of the Windows OS. Methodology for Teaching Informatics and Methods of Their Use. 6. Lesson 6. 2 hours (Lecture) The Modern Informatics Classroom and Its Equipment, Its Role, Goals, and Objectives in the Educational Process. Methodology for Using Pedagogical and Computer Technologies in Teaching MS Office Programs (MS Word, MS Excel, MS PowerPoint, MS Access, etc.). 7. Lesson 7. 2 hours (Lecture) Handouts in Teaching Informatics. Effective Use of Independent Education. Principles of Organizing Independent Assignments and Methodology for Preparing Model Instructions. Organizing Methods to Ensure the Effectiveness of Independent Education. 1. Lesson 1. 2 hours (Seminar) Problems in Teaching Mathematics and Informatics in General Education Institutions and Methods of Solving Them. 2. Lesson 2. 2 hours (Seminar) A Comparative Study of the Effectiveness of Applying Group and Traditional Teaching Technologies in Mathematics Instruction in Educational Institutions. 3. Lesson 3. 2 hours (Seminar) Methods of Teaching Mathematics and New Pedagogical Technologies. 4. Lesson 4. 2 hours (Seminar) The Purpose, Content, Methods, and Tools of Using Graphic Organizers to Increase Educational Effectiveness.

	5. Lesson 5. 2 hours (Seminar) Principles and Methods of Teaching Mathematics. Innovative Educational Tools. 6. Lesson 6. 2 hours (Seminar) Organizing Mathematics Instruction and the Modern Mathematics Lesson. 7. Lesson 7. 2 hours (Seminar) The Continuity of Teaching Mathematics and Informatics in the National Education System of the Republic. 8. Lesson 8. 2 hours (Seminar) Engaging and Interactive Methods of Teaching Informatics. 9. Lesson 9. 2 hours (Seminar) Mechanisms for Organizing Independent Education and Methods for Monitoring Student Knowledge. 10. Lesson 10. 2 hours (Seminar) Methodology for Teaching Operating Systems and the Use of Windows. 11. Lesson 11. 2 hours (Seminar) Methodology for Teaching the Topic "Working with a Word Processor." 12. Lesson 12. 2 hours (Seminar) Methodology for Teaching the Topic "Working with MS Excel." 13. Lesson 13. 2 hours (Seminar) Methodology for Teaching the Topic "Creating Presentations." 14. Lesson 14. 2 hours (Seminar) Methodology for Teaching the Effective Use of the Internet System. 15. Lesson 15. 2 hours (Seminar) Methodology for Teaching the Topic "Algorithms" in Informatics.
Study and examination requirements and forms of examination	Oral Examination: For this exam, the student is given 20 minutes for preparation to answer the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are provided for all questions – 5 (Excellent) 2. If answers are provided for all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not correspond to the questions – 2 (Unsatisfactory)
Media employed	**EDUCATIONAL TECHNOLOGIES AND METHODS:** • Lectures; • Carrying out practical work based on real situations; • Writing essays, theses, and articles; • Solving situational tasks (case studies); • Process-oriented learning;

	• Participating in discussions; • Working in small groups; • Carrying out project work; • Completing independent work; • Preparing presentations; • Solving tests of various levels; • Conducting social surveys. • Working in groups; • Making presentations; • Individual projects; • Projects for teamwork and defense.
Reading list	1. Alikhonov, S. Methodology of Teaching Mathematics. Tashkent, 2011. – 304 p. 2. Tojiyev, M., Bobokayev, M., Khurramov, A. Project of Educational Activities for the Subject "Methodology of Teaching Mathematics." Educational and Scientific-Methodological Manual. Part 1. Tashkent, 2015. – 224 p. 3. Yo'ldoshev, U.Y., Boqiyev, R.R., Zokirova, F.M. Methodology of Teaching Informatics. Educational-Methodological Manual. – Tashkent: Aloqachi, 2004. 4. Yo'ldoshev, U.Y., Zakirova, F.M. Methods of Teaching Informatics. (Parts 1, 2). TSPU, Tashkent, 2004. **Additional References:** 1. The Constitution of the Republic of Uzbekistan in its new edition. May 1, 2023, No. O'RQ-837. 2. Mirziyoyev, Sh.M. Together We Will Build a Free, Prosperous, and Democratic State of Uzbekistan. Speech at the joint session of the chambers of the Oliy Majlis dedicated to the inaugural ceremony of the President of the Republic of Uzbekistan. Tashkent, – 56 p. 3. Mirziyoyev, Sh.M. We Will Build Our Great Future Together with Our Brave and Noble People. Tashkent: Uzbekistan. – 488 p. 4. Karamshuk, B. Preparing Presentation Elements. Dialectics, 2002. 5. Modern Teaching Methods in Higher Education Institutions: Educational-methodological manual. – Tashkent: Ministry of Higher and Secondary Specialized Education. Institute for Problems of Higher and Secondary Specialized Education, 2001. – 192 p. 6. Professional Pedagogy: Textbook for students studying in pedagogical specialties and directions. – Moscow, 1999. 7. Zaynalov, N.R., Parsayev, G.M., Usmanov, I.A. Information Technologies. Samarkand, 2003. 8. Krasnova, G.A., Belyaev, M.I. Technologies for Creating Electronic Learning Tools. Moscow: MSIU, 2001. – 224 p. 9. Kayumova, N.A. Technologies and Design of Teaching Informatics. Textbook. – Tashkent, 2021. – 185 p. 10. Karimov, Q.M., Jo'rayev, T.N. Laboratory Works on the Subject "Methodology of Teaching Informatics." Textbook. Qarshi: "Fan va ta'lim," 2021. – 124 p. 11. Karimov, Q.M. Methodology of Teaching Informatics. Textbook. Tashkent: "Fan va ta'lim," 2022. – 242 p.

Reviewers	Q. M. Karimov – Professor at the Department of Algorithms and Programming Technologies, Karshi State University A.M. Norov – Associate Professor at the Department of Algorithms and Programming Technologies, Karshi State University
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30.08. 2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

MATHEMATICAL MODELING
MODULE HANDBOOK

Field of knowledge	500 000	Natural Sciences, Mathematics and Statistics
Field of education	540 000	Mathematics and statistics
Field of study	60540200	Applied Mathematics

KARSHI - 2021

MODULE REFERENCES

Module name:	**Mathematical modeling**
Code, if applicable:	MMLB310
Semesters in which the module is taught:	7
Lecturer:	Xurramov Ismoil, teacher
Language	Uzbek
Relation to curriculum:	Compulsory
Type of teaching, contact hours:	Lecture, practical
Workload:	150 hours Contact hours: 60 hours; lecture – 30 hours; practical – 30 hours Self-study: 90 hours
Credit points:	5
Recommended prerequisites:	Differential equations Mathematical statistics

Module objectives Intended learning outcome	The purpose of teaching the discipline is to combine knowledge and skills on a number of theoretical and practical problems, such as identifying the most effective among the methods that can be applied to solve problems based on conceptual knowledge and skills for constructing and researching mathematical models of specific practical problems, assessing the suitability of created or existing methods. The task of the discipline is to construct mathematical models of processes occurring in various fields, demonstrate their adequacy and solve them, and visually represent the course of the process on a computer. To achieve this goal, the discipline fulfills the tasks of forming students' theoretical knowledge, practical skills, a methodological approach to economic phenomena and processes, and a scientific worldview.
Content	**Lesson 1. The process of abstraction of public opinion. (Lecture and practical)** Difference between abstract and concrete thinking, Degrees of abstraction in thinking, The role of consciousness in the process of abstraction, The importance of the abstraction process in the development of society, Methods of developing the abstraction

	process. **Lesson 2. Basic requirements for mathematical models. Methods of constructing mathematical models. (Lecture and practical)** Types of Mathematical Models, Requirements for Accounting in the Development of Mathematical Models, Verification and Generalization of Mathematical Models, Use and Improvement of Mathematical Models, Analysis and Evaluation of Mathematical Models, Areas and Applications of Mathematical Models. **Lesson 3. Methods of constructing and studying mathematical models. (Lecture and practical)** Mathematical models and their types, Process of creating mathematical models, Methods of analyzing mathematical models, Numerical methods of solving mathematical models, Evaluation of results obtained from mathematical models, Implementation of conclusions obtained from mathematical models. **Lesson 4. Conformity between the mathematical model and its real object. Theoretical and practical research of mathematical models, their adequacy. (Lecture and practical)** The Essence and Types of Mathematical Models, Structure and Main Properties of Mathematical Models, Requirements for the Adequacy of Mathematical Models, Statistical Analysis and Interpretation of Mathematical Models, Practical Application of Mathematical Models and Their Effectiveness. **Lesson 5. Using conservation laws and other methods in process modeling. (Lecture and practical)** How are the laws of conservation of nature manifested?, How can the laws of conservation of nature be applied to modeling processes?, What other methods can be used?, What are the advantages of these methods?, Let's examine the application of methods through specific examples. **Lesson 6. Law of Conservation of Energy. (Lecture and practical)** What is energy and its types, Principles of the Law of Conservation of Energy, Energy exchange and conversion processes, Methods of increasing energy efficiency, Use of

	additional energy sources, Energy saving and its rational use. **Lesson 7. Law of Conservation of Momentum. Method of analogy in mathematical modeling. (Lecture and practical)** Law of Conservation of Momentum and its Mathematical Expression, Application of the Law of Conservation of Momentum in Nature and Technology, The Essence of Mathematical Modeling and the Method of Analogy, Creating Mathematical Models Based on the Method of Analogy, The Importance of the Method of Analogy in Solving Problem Situations. **Lesson 8. Building mathematical models using the hierarchy principle. (Lecture and practical)** The Essence and Importance of the Hierarchy Principle, Stages of Constructing a Mathematical Model Based on the Hierarchy Principle, Advantages of the Hierarchy Principle in Constructing Mathematical Models, Examples of Constructing Mathematical Models, Improvement of Mathematical Models Based on the Hierarchy Principle, Practical Application of Mathematical Models Based on the Hierarchy Principle. **Lesson 9. Demographic models. (Lecture and practical)** General data, Study of population growth models, Use of statistical data, Impact of socio-economic factors, Forecasting demographic changes. **Lesson 10. Model of the "predator-prey" system interaction. (Lecture and practical)** Key concepts in the model and their interrelationships, Equilibrium between predators and prey, Environmental impact on the predator-prey system, System imbalance: causes and consequences. **Lesson 11. Model of the arms race between two states. (Lecture and practical)** What is the arms race?, Main types of actions of the arms race, Negative consequences of the arms race, Mechanisms for overcoming the arms race. **Lesson 12. Biological models. (Lecture and practical)**

	Introduction to Biological Models, Connection between Mathematics and Biology, Application of Population Models, Application of Ecosystem Models. **Lesson 13. Model of the equilibrium of matter and energy. (Lecture and practical)** The Essence of Equilibrium of Matter and Energy, Basic Concepts of Equilibrium of Matter and Energy, Physical Models and Their Differences, Mathematical Expression of Equilibrium of Matter and Energy. **Lesson 14. Macro-model of economic growth**. **(Lecture and practical)** Foundations of Economic Growth, Factors Determining Economic Growth, Capital Investments and Economic Growth, Economic Growth and Value Added. **Lesson 15. Macro-model of market economy equilibrium. (Lecture and practical)** Money Market Equilibrium, Capital Market Equilibrium, Macroeconomic Equilibrium and Policies, Deviations and Inequalities). **Lesson 16. Deterministic and stochastic mathematical models. (Lecture and practical)** The Concept of Deterministic Models and Their Main Properties, Stochastic Models and Mathematical Representation of the Randomness Factor, Comparative Analysis of the Deterministic and Stochastic Approaches, Under What Conditions Which Model is Advisable to Use, Criteria for Selecting an Appropriate Model for Practical Processes. **Lesson 17. Dynamic systems and their mathematical models**. **(Lecture and practical)** The concept of a dynamic system, discrete and continuous dynamic models, modeling of time-developing processes, spatial trajectories and their interpretation, forecasting real processes using dynamic models. **Lesson 18. Modeling based on ordinary differential equations. (Lecture and practical)** The role of ordinary differential equations in the model, Problems with initial conditions, Application of ODT models to physical, biological, and economic processes, Comparison of

	analytical and numerical solutions, Interpretation of model results. **Lesson 19. Partial differential equations modeling. (Lecture and practical)** The Concept and Types of DTS, Models of Diffusion, Thermal, and Wave Processes, The Role of Boundary and Initial Conditions, Analysis of Space-Time Processes, Significance in Practical Problems. **Lesson 20. Analysis of stability and equilibrium states. (Lecture and practical)** Concept of equilibrium points, Stable and unstable states, basics of Lyapunov's methods, causes of equilibrium disruption, significance of stability analysis in modeling. **Lesson 21. Optimization problems and their mathematical models. (Lecture and practical)** Concept and objective function of optimization, Limited and unlimited optimization, Linear and nonlinear models, Problems of optimal resource allocation, Application in economic and technical processes. **Lesson 22. Elements of game theory and modeling. (Lecture and practical)** Concept of strategic decisions, zero-sum and non-zero-sum games, Nash equilibrium, game model in socio-economic processes, mathematical representation of the decision-making process. **Lesson 23. Network models and their application. (Lecture and practical)** Concepts of graphs and networks, networks in transport and logistics models, Flow model, minimum road and maximum flow problems, application in information and economic systems. **Lesson 24. Discrete models and recursive relationships. (Lecture and practical)** Discrete time processes, modeling based on recurrent formulas, discrete models for population and economic processes, differences from continuous models, advantages in calculations. **Lesson 25. Numerical modeling and computational experiments. (Lecture and practical)** The essence of numerical modeling, methods of discretization, construction of computational algorithms, computer implementation of the model, analysis of numerical results and

	error estimation. **Lesson 26. Model parameter determination and identification problems. (Lecture and practical)** Concept of Parameter, Methods of Model Adaptation, Use of Experimental and Statistical Data, Identification Problems, Ways to Improve Model Accuracy. **Lesson 27. Analysis of uncertainty and sensitivity in identification problems and models. (Lecture and practical)** Sources of uncertainty in the model, the concept of sensitivity, the impact of parameter changes on results, risk and error assessment, significance in decision-making. **Lesson 28. Modeling of complex systems. (Lecture and practical)** Concept of a complex system, Multifactorial models, Interconnected processes, Hierarchical and modular approaches, Application to socio-economic and technical systems. **Lesson 29. Interdisciplinary modeling and integrated approach. (Lecture and practical)** The Essence of Interdisciplinary Modeling, Physics-Biology-Economics Integration, Problems of Building Complex Models, Integration of Different Scientific Methods, Role in Modern Scientific Research. **Lesson 30. Analysis of mathematical modeling results and decision making. (Lecture and practical)** Interpretation of model results, Compilation of forecasts and scenarios, The role of the model in decision-making, Development of recommendations based on the model, Practical effectiveness of mathematical modeling.

Study and examination requirements and forms of examination	**Oral Examination:** For this exam, the student is given 60 minutes for preparation to answer the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are provided for all questions–5 (Excellent) 2. If answers are provided for all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not correspond to the questions – 2 (Unsatisfactory)
Media employed	The knowledge, qualifications and skills acquired by students in a foreign language are based on the priority tasks defined in the Resolution of the President of the Republic of Uzbekistan No. PQ-5117 dated May 19, 2021, "On measures to bring the activities of popularizing foreign language learning in the Republic of Uzbekistan to a qualitatively new level," to raise students' proficiency in a foreign language (English) to the B2 level. It also aims to develop the four core language skills - reading comprehension, listening comprehension, writing, and speaking - in an integrated manner, enhance communication abilities in various contexts, improve both practical and theoretical knowledge of the target language, and ensure that students can freely apply their acquired knowledge, skills, and competencies in real-life activities. The task of the subject is to provide students with the necessary language skills, in accordance with internationally recognized standards, to achieve a B1-B2 level of proficiency in the target foreign language through an integrated approach, and to develop their communicative competence. Based on the rating system for monitoring the level of knowledge, skills and qualifications of the student, the mastery of the subject by the student is presented in points. The progress of students in the subject during the semester is assessed from 1 to 5 grades, of which: Interval grading exam - grades 3-5 and Final grading exam - grades 3-5.
Reading list	1. Samarskiy A.A., Mikhailov A.P. Mathematical Modeling: Ideas. Method. 11th episode. - 2nd ed., revised. M.: FIZMATLIT, 2005. -320 p. 2. Muzafarov Kh.A., Baklushin M.B., Abduraimov M.G., Mathematical Modeling. Tashkent, University. 2002. 3. Israilov M.I. Calculation Methods. Parts I, II. T.. 2003.2008. 4. A.A. Samarsky. Theory of Difference Schemes. Science. M.: 1989. - 616 p.

	5. Samarskiy A.A., Mikhailov A.P. Mathematical Modeling: Ideas. Method. 11th episode. - 2nd ed., revised. M.: FIZMATLIT, 2005. -320 p. 6. M. I. Israilov. Calculation methods. Part 2. T.: Economics-Finance, 2008. - 320 p. 7. Aripov M.M., Matyakubov A.S. Asumptotic behavior of self-symbolic solutions of the nonlinear Klein-Gordon type equations and systems. Tashkent: University, 2011. 108 p.
Reviewers	N.Eshkarayeva - Associate Professor of the Department of "Applied Mathematics" of Karshi State University, Candidate of Technical Sciences) D.Shovaliev - Senior Lecturer of the Department of "Applied Mathematics" of Karshi State University
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

INCORRECT AND INVERSE PROBLEMS

MODULE HANDBOOK

Field of knowledge	500 000	Natural Sciences, Mathematics and Statistics
Field of education	540 000	Mathematics and statistics
Field of study	60540200	Applied Mathematics

KARSHI - 2021

MODULE REFERENCES

Module name:	Incorrect and inverse problems
Code, if applicable:	NTMB404
Semesters in which the module is taught:	8
Lecturer:	Xurramov Ismoil, teacher
Language	Uzbek
Relation to curriculum:	Compulsory
Type of teaching, contact hours:	Lecture, practical
Workload:	120 hours Contact hours: 60 hours lecture – 30 hours practical – 30 hours Self-study – 60 hours
Credit points:	4
Recommended prerequisites:	Mathematical modeling Numerical methods

Module objectives Intended learning outcome	The purpose of teaching the discipline is to develop students' theoretical foundations of ill-posed and inverse problems, methods for solving ill-posed and inverse problems, and the ability to implement software for the numerical solution of these methods. The task of the discipline is to form in students theoretical and practical skills, knowledge of the correctness or incorrectness of the problem, demonstration of the conditional correctness of ill-posed problems, methods for solving ill-posed problems, methods for solving inverse problems, numerical solution of inverse and ill-posed problems. The main goal of fundamental reforms in the field of education is the transfer of knowledge based on world standards and the training of competitive personnel. Therefore, the subjects taught in the field of 60540200 - Applied Mathematics in the education system are also considered modern subjects. This model program is an updated and revised program with modern knowledge, in which special attention is paid to the theoretical and practical aspects of science.
Content	**Lesson 1. Concept of a correct problem. (Lecture)** Difference between abstract and concrete thinking, Degrees of abstraction in thinking, The role of consciousness in

	the process of abstraction, The importance of the abstraction process in the development of society, Methods of developing the abstraction process. **Lesson 2. Definition of ill-posed and inverse problems and examples of them. (Lecture)** Types of Mathematical Models, Requirements for Accounting in the Development of Mathematical Models, Verification and Generalization of Mathematical Models, Use and Improvement of Mathematical Models, Analysis and Evaluation of Mathematical Models, Areas and Applications of Mathematical Models. **Lesson 3. The inextricable connection of ill-posed and inverse problems with practice. (Lecture)** Mathematical models and their types, Process of creating mathematical models, Methods of analyzing mathematical models, Numerical methods of solving mathematical models, Evaluation of results obtained from mathematical models, Implementation of conclusions obtained from mathematical models. **Lesson 4. The concept of conditional correctness. (Lecture)** The Essence and Types of Mathematical Models, Structure and Main Properties of Mathematical Models, Requirements for the Adequacy of Mathematical Models, Statistical Analysis and Interpretation of Mathematical Models, Practical Application of Mathematical Models and Their Effectiveness. **Lesson 5. The concept of a regularizing family and the regularization parameter. (Lecture)** How are the laws of conservation of nature manifested?, How can the laws of conservation of nature be applied to modeling processes?, What other methods can be used?, What are the advantages of these methods?, Let's examine the application of methods through specific examples. **Lesson 6. Stability estimate of ill-posed problems. (Lecture)** What is energy and its types, Principles of the Law of Conservation of Energy, Energy exchange and conversion processes, Methods of increasing energy efficiency, Use of additional energy sources, Energy saving and its rational use. **Lesson 7. System of algebraic equations with poorly conditioned linear equations. (Lecture)**

	Law of Conservation of Momentum and its Mathematical Expression, Application of the Law of Conservation of Momentum in Nature and Technology, The Essence of Mathematical Modeling and the Analogy Method, Creating Mathematical Models Based on the Analogy Method, The Importance of the Analogy Method in Solving Problem Situations. **Lesson 8. Integral equations of the first kind. (Lecture)** The Essence and Importance of the Hierarchy Principle, Stages of Constructing a Mathematical Model Based on the Hierarchy Principle, Advantages of the Hierarchy Principle in Constructing Mathematical Models, Examples of Constructing Mathematical Models, Improvement of Mathematical Models Based on the Hierarchy Principle, Practical Application of Mathematical Models Based on the Hierarchy Principle. **Lesson 9. Ill-posed problems of mathematical physics. (Lecture)** General data, Study of population growth models, Use of statistical data, Impact of socio-economic factors, Forecasting demographic changes. **Lesson 10. Inverse problems for parabolic equations. (Lecture)** Key concepts in the model and their interrelationships, Equilibrium between predators and prey, Environmental impact on the "predator-prey" system, System imbalance: causes and consequences. **Lesson 11. Inverse problems for hyperbolic equations. (Lecture)** What is the arms race?, Main types of actions of the arms race, Negative consequences of the arms race, Mechanisms for overcoming the arms race. **Lesson 12. Ill-posed boundary value problem for a parabolic equation that changes direction with respect to time. (Lecture)** Introduction to Biological Models, Connection between Mathematics and Biology, Application of Population Models, Application of Ecosystem Models. **Lesson 13. Ill-posed boundary value problem for a**

	differential equation of mixed type. (Lecture) The Essence of Equilibrium of Matter and Energy, Basic Concepts of Equilibrium of Matter and Energy, Physical Models and Their Differences, Mathematical Expression of Equilibrium of Matter and Energy. **Lesson 14. Differential equations with first-order operator coefficients. (Lecture)** Foundations of Economic Growth, Factors Determining Economic Growth, Capital Investments and Economic Growth, Economic Growth and Value Added. **Lesson 15. Differential equations with second-order operator coefficients. (Lecture)** Equilibrium of the money market, Equilibrium of the capital market, Macroeconomic equilibrium and policies, Deviations and inequalities). The following topics are recommended for practical exercises: 1. **Solving and verifying the correctness of mathematical models corresponding to practical problems using the method of factoring**. (Practical) Existing problems in constructing mathematical models and ways to solve them, Applications of natural laws using mathematical models. 2. **Solution of the Cauchy problem for the Laplace equation and the inverse Cauchy problem for the heat transfer equation using the Fourier method and proof of its incorrectness.** (Practical) Goals and objectives of formalization, Statistical and dynamic methods of formalization. 3. **Building a solution to the inverse problem for parabolic, hyperbolic, and elliptic equations**. (Practical) The essence and significance of the variational principle in mathematics, Application of the variational principle in creating mathematical models. 4. **Reduction of ill-posed problems to a correct one.** (Practical)

	Stages of constructing mathematical models based on the hierarchical principle, Effectiveness of using the hierarchical principle through examples. 5. **Violation of the correctness conditions in the Dirichlet problem for the wave equation**. (Practical) The significance of mathematical models for engineering, economics, and other fields. 6. **Stability estimate of the solution of the inverse Cauchy problem for parabolic equations**. (Practical) Methods for determining the correspondence between a mathematical model and a real object. 7. **Stability estimate of the Cauchy problem solution for elliptic equations**. (Practical) Ways to solve problems related to demographic models. 8. **Calculation of the measure of conditionality of systems of linear algebraic equations. Creating an example of a CHATS of poorly conditioned equations**. (Practical) Directions for improving biological models. 9. **Approximate solution and programming of poorly conditioned CHATS using the method of finding and regularizing solutions. (Practical)** Relationships between tour companies and hotels, Relationships between tour companies and tourist providers. 10. **Solving mathematical models corresponding to the computed tomography problem in specific cases. (Practical)** The concept of equilibrium and its main features, proposals for solving the problems of equilibrium and stability. 11. **Approximate solution and programming of Fredholm and Volterra integral equations of the first kind by the method of regulation**. (Practical) The role of mathematical models in the analysis of economic processes. 12. **Approximate solution and program of the inverse Cauchy problem for a parabolic equation and the Cauchy problem for an elliptic equation by the methods of normalization and quasi-inverse.** (Practical) Comparison of the selected concepts with the results of the experiment.

	13. Finding a regulated solution of the inverse problem for parabolic and hyperbolic equations and creating a program. (Practical) Key factors in increasing and decreasing population size. **14. A parabolic equation with a change in direction over time (Practical)** Approximate solution and programming of the boundary value problem for a differential equation of mixed type.Problems related to the relationship between **.** **15. Economic cooperation between states. (Practical)** Solving boundary value problems for scalar equations corresponding to first and second-order differential equations with operator coefficients. Using statistical methods in solving problems in the field of finance and economics.
Study and examination requirements and forms of examination	**Oral Examination:** For this exam, the student is given 60 minutes for preparation to answer the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are provided for all questions – 5 (Excellent) 2. If answers are provided for all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not correspond to the questions – 2 (Unsatisfactory)
Media employed	The knowledge, qualifications and skills acquired by students in a foreign language are based on the priority tasks defined in the Resolution of the President of the Republic of Uzbekistan No. PQ-5117 dated May 19, 2021, "On measures to bring the activities of popularizing foreign language learning in the Republic of Uzbekistan to a qualitatively new level," to raise students' proficiency in a foreign language (English) to the B2 level. It also

	aims to develop the four core language skills - reading comprehension, listening comprehension, writing, and speaking - in an integrated manner, enhance communication abilities in various contexts, improve both practical and theoretical knowledge of the target language, and ensure that students can freely apply their acquired knowledge, skills, and competencies in real-life activities. The task of the subject is to provide students with the necessary language skills, in accordance with internationally recognized standards, to achieve a B1-B2 level of proficiency in the target foreign language through an integrated approach, and to develop their communicative competence. Based on the rating system for monitoring the level of knowledge, skills and qualifications of the student, the mastery of the subject by the student is presented in points. The progress of students in the subject during the semester is assessed from 1 to 5 grades, of which: Interval grading exam - grades 3-5 and Final grading exam - grades 3-5.
Reading list	**Main literature** 1. Buchheim A.L. Introduction to the Theory of Inverse Problems. Novosibirsk, Nauka. 1988. 184 pp. 2. Kabanikhin S.I. Inverse and Irreversible Problems. Siberian Scientific Publishing House, Novosibirsk, 2008. 3. Lavrentyev M.M., Romanov V.G., Shishatsky S.P., Ill-posed Problems of Mathematical Physics and Analysis. Moscow: Nauka, 1980. 4. Fayazov K.S. Methods of solving ill-posed problems of computational mathematics, mathematical physics, and analysis. Tashkent. UzNU, University, 2001. 130 pp. 5. Bakushinsky A.B., Goncharsky A.V. Iterative methods for solving ill-posed problems. Moscow: Nauka, 1989. 6. Mirziyoyev, Sh.M. *Together We Will Build a Free and Prosperous, Democratic State of Uzbekistan*. Speech at the joint session of the chambers of the Oliy Majlis dedicated to the inauguration of the President of the Republic of Uzbekistan, Tashkent, 2016. -56p. 7. Mirziyoyev Sh.M. Critical analysis, strict discipline, and personal responsibility should be the daily rule of every leader. Report at the expanded meeting of the Cabinet of Ministers dedicated to the main results of the country's socio-economic development in 2016 and the most important priorities of the economic program for 2017. - 104p. 8. Mirziyoyev Sh.M. Ensuring the Rule of Law and Human Interests - a Guarantee of the Country's Development and People's Well-being. Report at the solemn ceremony dedicated to the 24th anniversary of the adoption of the Constitution of the Republic of Uzbekistan. December 7, 2016 - Tashkent, Uzbekistan, 2017. - 48p.

	9. A. A. Samarskiy, V.A. Galaktionov, S.P. Kurdyumov, A.P. Mikhailov. Expansion modes in problems for quasilinear parabolic equations. - M.: Nauka. Physics-mathematics ed., 1987. - 480p. 10. A. N. Tikhonov, A.A. Samarsky. Equations of Mathematical Physics. Nauka M, 1972.
Reviewers	N.Eshkarayeva - Associate Professor of the Department of "Applied Mathematics" of Karshi State University, Candidate of Technical Sciences) D.Shovaliev - Senior Lecturer of the Department of "Applied Mathematics" of Karshi State University
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30. 08. 2021)

Theory of functions of a complex variable

Module designation	*1.KUFB404, Theory of functions of a complex variable (TFCV)*
Semester(s) in which the module is taught	*Semester 8*
Person is responsible for the module	*Nodirov Shohruh*
Language	*Uzbek language*
Relation to curriculum	*Compulsory (Core) Course*
Teaching methods	*Lecture, discussion, problem solving, quizzes, peer-feedback, practice, dialog.*
Workload (incl. contact hours, self-study hours)	*Workload for 4 ECTS (120 hours):* ***Lectures:*** *30 hours* ***Practical training:*** *30 hours* ***Self-Study and Independent Learning:*** *60 hours*
Credit points	*Total Credits: 4* *ECTS: 4*
Required and recommended prerequisites for joining the module	• *Mathematical Analysis* • *Algebra* • *Linear Algebra and Analytic Geometry* • *Functional analysis*
Module objectives/intended learning outcomes	*Upon successful completion of this module, students will be able to:* • *Solve both computational and theoretical problems in TFCV, demonstrating a deep understanding of core concepts and techniques;* • *Establish logical relationships between fundamental definitions, concepts, and theorems within TFCV;* • *Construct and present rigorous mathematical proofs for both classical results and newly formulated analogous statements* • *Apply a wide range of methods from TFCV to investigate theoretical and applied problems* • *Select and combine appropriate analytical methods and techniques for solving complex mathematical*

	tasks • *Analyze and interpret abstract mathematical structures, ensuring logical consistency and mathematical rigor* • *Demonstrate advanced skills in critical thinking, abstraction, and mathematical reasoning*
	5.
Content	• *Complex numbers, forms of a complex number, complex plane* • *Functions of a complex variable and their continuity* • *Differentiability of a function* • *Conformal mappings* • *Elementary functions* • *Joukowsky function* • *Integral of functions of a complex variable, its properties, and relation to contour integrals* • *Power series* • *Properties of holomorphic functions* • *Elements of residue theory*
Examination forms	*Paper examination*
Study and examination requirements	*Students are required to:* • *Attend lectures and practical sessions regularly and actively participate in practical classes* • *Demonstrate a thorough understanding of theoretical concepts and the ability to apply them in problem-solving* • *Successfully complete all midterm assessment tasks* • *Achieve the minimum required score in continuous assessment to be admitted to the final examination* • *Pass the final written examination by demonstrating both theoretical knowledge and practical problem-solving skills*
Reading list	1. *G.Xudoyberganov, B.A.Shoimqulov, Kompleks o`zgaruvchili funksiyalar nazariyasi, Toshkent: O`zMU nashriyoti 2023. Jild 1. 200 bet.* 2. *Tuychiev T.T., Tishabaev J.K., Djumabaev D.X., Kitmanov A.M., Kompleks o‘zgaruvchili funksiyalar nazariyasi fanidan mustaqil ishlar, T. “Mumtoz so‘z”, 2018.* 3. *Sadullaev A., Xudoyberganov G., Mansurov X. T., Vorisov A. K., Tuychiev T. T. Matematitk analiz kursidan misol va masalalar to‘plami (kompleks analiz) 3 qism. T. “O‘zbekiston”, 2000.* 4. *Shabat B. V. Vvedenie v kompleksnыy analiz. M. URSS, 2015.* 5. *Volkovskiy L. I., Luns G. A., Aramanovich I. G. Sbornik zadach po teorii funksiy kompleksnogo peremennogo. M. «FIZMATLIT», 2002.*

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

Theory of functions of complex variables

MODULE HANDBOOK

Field of knowledge	500 000	Natural Sciences, Mathematics and Statistics
Field of education	540 000	Mathematics and statistics
Field of study	60540200	Applied Mathematics

KARSHI - 2021

MODULE REFERENCES

Module name:	Programming technologies
Code, if applicable	DTX25611
Semesters in which the module is taught	5,6
Lecturer	Eshboyev Erkin Abdirashidovich - Associate Professor, Department of Applied Mathematics
Language	Uzbek
Relation to curriculum	Elective
Type of teaching, contact hours	Lecture, practical course
Workload	Total working load: 330 hours. Contact hours: 90 hours; lecture - 30 hours.; practical – 60 hours; laboratory-60 hours Self-study: 180 hours.
Credit points	11
Recommended prerequisi	Computer literacy
Module objectives / intend learning outcome	Upon successful completion of this module, the student will be able to understand the fundamental concepts of programming technologies, including software development life cycle, programming paradigms, and modern programming tools and frameworks. The student will gain knowledge of programming language syntax, semantics, and best practices, and will be able to design, implement, and debug programs efficiently. The student will learn to work with different programming paradigms such as procedural, object-oriented, and functional programming, and will understand how to choose the appropriate paradigm and technology depending on the problem domain. The student will become familiar with software development tools, integrated development environments (IDEs), version control systems, and libraries that support modern software development. In addition, the student will acquire skills in problem analysis, algorithm design, and program implementation using structured and modular approaches. They will be able to develop and maintain software solutions, test and validate programs, and optimize code for performance and

	reliability. The student will also develop practical experience in applying programming technologies to real-world projects, including database interaction, user interface design, and application deployment. Emphasis will be placed on writing clean, maintainable, and efficient code while adhering to software engineering principles. Furthermore, the module will help students enhance their logical thinking, problem-solving abilities, teamwork skills, and adaptability to emerging technologies, preparing them for advanced studies in computer science, software engineering, and professional programming careers.
Content	**Topic 1. Programming Technologies and Their Stages of Development** 1) The Initial Approach 2) The Structured Approach 3) The Object-Oriented Approach to Programming 4) The Component-Based Approach and CASE Technologies **Topic 2. Designing Complex Software** 1) Design principles 2) Project development process **Topic 3. The Software Life Cycle** 1) Stages of software development 2) Evolution of a software module 3) Software quality assessment **Topic 4. The Software Technological Process and Modularity** 1) The concept of software manufacturability 2) Modules and their properties **Topic 5. Top-Down and Bottom-Up Processes** 1) Organizing processes in software development **Topic 6. Structured and Unstructured Programming** 1) Structured programming 2) Unstructured programming **Topic 7. Defensive Programming and Structured Control** 1) Programming with error protection 2) Structured control **Topic 8. Problem Statement and Planning** 1) Problem analysis and statement 2) Estimation and planning

	Topic 9. Management and Testing 1) Organizing management processes 2) Testing for quality assurance **Topic 10. Teamwork and the Psychology of Programming** 1) Teamwork in version control 2) Collaboration and programming psychology **Topic 11. Organizing a Team of Programmers** 1) Organizing a program development team 2) Case study: Microsoft's programmer team **Topic 12. Software Documentation and Subsequent Stages** 1) The documentation process 2) Reengineering **Topic 13. Quality Management** 1) Principles of software quality management **Topic 14. The ISO Standard and Models** 1) ISO standard overview 2) Capability Maturity Model for software **Topic 15. CASE Technologies** 1) Concepts and applications of CASE technologies
Study and examination requirements and forms of examination	Written Examination: In this exam, the student is given 80 minutes to write answers to the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are written for all questions – 5 (Excellent) 2. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the

	questions – 2 (Unsatisfactory)
Media employed	Completion of science assignments and successful submission of current, intermediate, and final control forms.
Reading list	**Main literature.** 6. Zhogolev, E. A. Tekhnologiya programmirovaniya [Programming Technology] - M.: Nauchnyy mir, 2004. - 216 p. 7. Smirnov, A. A. Tekhnologii programmirovaniya: uchebno-prakticheskoe posobie [Programming Technologies: An Educational and Practical Manual] / A. A. Smirnov. - M.: Evraziyskiy otkrytyy institut, 2011. - 192 p. 8. Kamaev, V. A. Tekhnologii programmirovaniya [Programming Technologies] / V. A. Kamaev, V. V. Kosterin. - M.: Vysshaya shkola, 2005. - 359 p. 9. Rudakov, A. V. Tekhnologiya razrabotki programmnykh produktov: uchebnik [Technology of Software Product Development: A Textbook] / A. V. Rudakov. - 6th ed., stereotype.- M.: Akademiya, 2011. - 208 p. 10. Svetlov, N. M. Informatsionnye tekhnologii upravleniya proektami: uchebnoe posobie [Information Technologies for Project Management: A Textbook] / N. M. Svetlov, G. N. Svetlova. - 2nd ed., rev. and add. - M.: INFRA-M, 2011. - 232 p. 11. Gnidenko, I. G. Tekhnologii i metody programmirovaniya: uchebnoe posobie dlya studentov vysshikh uchebnykh zavedeniy, obuchayushchikhsya po inzhenerno-tekhnicheskim napravleniyam [Programming Technologies and Methods: A Textbook for Students of Higher Educational Institutions in Engineering and Technical Fields] / I. G. Gnidenko, F. F. Pavlov, D. Yu. Fedorov; [Saint Petersburg State University of Economics]. - Moscow: Yurayt, 2021. - 233, [2] p. 12. Fedotova, E. L. Informatsionnye tekhnologii i sistemy: uchebnoe posobie dlya studentov vysshikh uchebnykh zavedeniy, obuchayushchikhsya po napravleniyu podgotovki 09.03.03 "Prikladnaya informatika" [Information Technologies and Systems: A Textbook for Students of Higher Educational Institutions in the Field of Study 09.03.03 "Applied Informatics"] / E. L. Fedotova. - M.: FORUM: INFRA-M, 2021. - 351 p. **Supplementary literature** 1. Gvozdeva, T. V. Proektirovanie informatsionnykh sistem: uchebnoe posobie [Information Systems Design: A Textbook] / T. V. Gvozdeva, B. A. Ballod. -

	Rostov-n/D: Feniks, 2009. - 508 p. 2. Ivanova, G. S. Tekhnologiya programmirovaniya: Uchebnik [Programming Technology: A Textbook] / G. S. Ivanova. - M.: KnoRus, 2011. - 336 p. 3. Kotlyarov, V.P. Fundamentals of Software Testing: Textbook / V.P. Kotlyarov. - M.: Internet-University of Information Technologies, 2009 - 285p. 4. Soldatov, V.P. Management of Software Projects / V.P. Soldatov. - M.: BINOM, 2010 - 384p. **Electronic resources:** **5.** http://mycsharp.ru/ **6.** https://docs.microsoft.com/ru-ru/dotnet/csharp/index **7.** http://ci-sharp.ru/ **8.** http://nullpro.info/ **9.** https://metanit.com/
Reviewers	O. Djabbarov - Head of the Department of Applied Mathematics, Associate Professor, Karshi State University Z. Qurbonov - Associate Professor, Department of Applied Mathematics, Karshi State University
Confirmed place and time	Developed and approved by Karshi State University (Report № 1 30.08.2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

Course Title: “Python Programming Language”
CURRICULUM

Field of knowledge	500 000	Natural Sciences, Mathematics and Statistics
Field of education	540 000	Mathematics and statistics
Field of study	60540200	Applied Mathematics

2021 y

Course / Module Code: PDT25611	Academic Year: 2023–2024	Semester: 5,6	Credits: Semester 5 – 5 credits Semester 6 – 6 credits
Course / Module Type: Elective	**Language of Instruction:** Uzbek		**Weekly Class Hours:**

	Course Title	Classroom (Contact) Hours	Independent Study (Hours)	Total Workload (Hours)
1	**Python Programming Language**	6-Semester- 150	6-Semester-180	330

2

I. Course Content

The main objective of the course **"Problem Solving Using the Python Programming Language"** is to provide students with sufficient knowledge of the Python programming language, to teach them how to develop software for applied problems arising in computer-based modeling based on this knowledge, and to form fundamental skills necessary for mastering specialized disciplines.

The objectives of the course include studying the algorithmic foundations of problem solving, understanding the principles of computer operation, classification of programming languages, representation of data and commands in a computer, programming in Python through the application of various technologies, object-oriented programming, and working in visual programming environments. These constitute the core tasks of the course.

II. Main Theoretical Part (Lecture Classes)

The course includes the following topics:

Topic 1: Python programming language and its development environment.
History of the language, rules for installing Python, working in the Python environment.

Topic 2: Operators in Python and working with them.
Mathematical functions, arithmetic and logical operators.

Topic 3: Conditional statements in Python.
If-else, if-elif-else statements.

Topic 4: Loop statements in Python.
Working with for and while loops.

Topic 5: Arrays in Python.
Concept of arrays. One-dimensional and multidimensional arrays.

Topic 6: Functions in Python.
Scope of variables. Recursion.

Topic 7: Working with characters and strings in Python.
Character comparison, text searching, string manipulation.

Topic 8: Python modules.
Copy, Sys, Random, Time, Keyword modules.

Topic 9: Working with files in Python.
Writing to files, reading from files, modifying files.

Topic 10: Classes in Python.
Objects and classes. Object initialization.

Topic 11: Pandas library in Python.
Importing the Pandas library, working with *.CSV files using Pandas, analysis of DataFrames in Pandas.

Topic 12: NumPy library in Python.
Importing the NumPy library, creating arrays in NumPy, data types in NumPy, working with random numbers in NumPy, working with *.CSV files using NumPy.

	Topic 13: Matplotlib library in Python. Importing the Matplotlib library, Matplotlib Pyplot, plotting function graphs, histograms, charts, and others. **Topic 14: Graphic primitives.** Turtle library, drawing graphic primitives. **Topic 15: Working with the Tkinter module in Python**. Creating buttons, working with drawings, working with images, creating animations. **III. Guidelines and Recommendations for Practical Classes** For practical classes, the following topics are recommended: 1. Working with the Python programming language and its development environment. 2. Operators in Python and working with them. 3. Developing programs using conditional statements in Python. 4. Developing programs using loop statements in Python. 5. Working with arrays in Python. 6. Working with functions in Python. 7. Working with characters and strings in Python. 8. Python modules. Working with the Copy, Sys, Random, Time, and Keyword modules. 9. Working with files in Python. 10. Working with classes and objects in Python. 11. Working with the Pandas library in Python. 12. Working with the NumPy library in Python. 13. Working with the Matplotlib library in Python. 14. Working with graphic primitives. 15. Working with the Tkinter module in Python. The purpose of practical classes is to consolidate theoretical knowledge acquired in programming and to apply it to solving various types of problems. While some practical classes are conducted in classrooms through problem solving on the board, the majority of them should be carried out directly on computers. **IV. Independent Study and Individual Assignments** The following topics are recommended for independent study: 1. Preparation for practical classes. 2. Working with vectors and matrices in Python. 3. Working with tabular data in Python. 4. Working with the BeautifulSoup library. 5. Working with the Gensim library. 6. Working with the Keras library. 7. Application of the Matplotlib, Plotly 4.0, and Bokeh libraries. 8. Working with databases in Python. For topics studied independently, students are recommended to prepare written reports and present them in the form of presentations.
3	**V. Learning Outcomes / Professional Competencies** **Students should know:** Within the scope of tasks carried out in the process of mastering the course **"Problem Solving Using the Python Programming Language,"** a bachelor graduate should: – have an understanding of information and methods of its storage, processing, and transmission; mathematical and software support of computing systems and the features of their application in scientific fields, industry, and education; computer software and types of software; object-oriented programming and its characteristics; structured, object-oriented, and generalized programming paradigms; model–view–controller technologies; program optimization and generalization; application of modular principles in programming; utilization of achievements in computer technologies within the mathematical and software support of modern computing systems; as well as current trends and traditions in the development of programming.

4	**VI. Teaching Technologies and Methods** **The following teaching technologies and methods are used:** • lectures; • individual assignments; • group work; • individual projects; • team-based projects with presentation and defense.
5	**VII. Requirements for Earning Credits** To obtain course credits, students must complete all assignments and tasks provided within the framework of current and interim assessments, and successfully pass the written final examination.

6	**Core References** 8. Saidov D.Y. Python tilida dasturlash, o'quv qo'llanma, Toshkent, 2020, 138 b. 9. Vasilev A. N. Python na primerax. Prakticheskiy kurs po programmirovaniyu. — SPb. Nauka i Texnika, 2016. — 432 st. 10. Eric Matthes Python Crash Course, a hands-on, Project-Based, Introduction to Programming, ISBN-13: 978-1-59327-603-4, 2016, 562 11. Madraximov Sh.F., Ikramov A.M., Babajanov M.R. C++ tilida programmalash bo'yicha masalalar to'plami. O'quv qo'llanma // Toshkent, O'zbekiston Milliy Universiteti, "Universitet" nashriyoti, 2014. - 160 bet. **Supplementary References** 12. I. A. Xaxaev - Praktikum po algoritmizatsii i programmirovaniyu na Python, Alt Linuks, 2010. – 126 st. 13. Abramov S.A., Gnezdelova Kapustina Ye.N. i dr. Zadachi po programmirovaniyu. - M.: Nauka, 1988. **Information Sources** 14. http://www.dasturchi.uz – dasturlash bo'yicha yozma va video ma'ruzalar o'qish va sertifikat olish imkoniyati mavjud 15. http://www.ziyonet.uz – dasturlash asoslari bo'yicha referatlar topish mumkin. 16. http://www.metanit.com – Python dasturlash tillari, Django texnologiyasi bo'yicha ma'ruzalar, dasturlar namunasini olish mumkin 17. www.mohirdev.uz – dasturlash bo'yicha yozma va video ma'ruzalar o'qish imkoniyati mavjud
7	The curriculum was approved and authorized for confirmation by Protocol No. 1 of the meeting of Karshi State University dated August 30, 2021.
8	**Person Responsible for the Course/Module:** **A. Bozorov – Lecturer, Department of Applied Mathematics, Karshi State University**
9	**Reviewers:** **F. Qorayev – Lecturer, Department of Applied Mathematics, Karshi State University** **B. Shovaliyev – Senior Lecturer, Department of Applied Mathematics, Karshi State University**

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

NETWORK TECHNOLOGIES AND ADMINISTRATION

MODULE HANDBOOK

Field of Knowledge: 500000 – Natural Sciences, Mathematics and Statistics
The field of education: 540000 – Mathematics and Statistics
Field of study: 60540200 - Applied Mathematics

MODULE REFERENCES

Module name:	Network technologies and administration
Code	TTA2705

Semesters in which the module is taught	7
Lecturer	B.Kh.Shovaliyev – Senior Lecturer of the Department of "Applied Mathematics"
Language	Uzbek
Relation to curriculum	Choice
Type of teaching, contact hours	Lecture, practical
Workload	Total study load: 150 hours, Contact hours: -60 hours; lecture – 30 hours; practical – 30 hours. Independent study: 90 hours.
Credit points	5
Recommended prerequisites	Mathematics, programming

Module objectives / intended learning outcome	The purpose of teaching the discipline is to teach students ways to overcome industry-specific problems encountered in their professional field, to provide them with sufficient knowledge to become specialists as future

	subject teachers. The tasks of computer network science are: to provide information about computer networks; to demonstrate the role of information technologies in the life of each person and the development of society; to reveal the capabilities of regional, local, and global computer networks; to form the concept of how and for what purposes data from computer networks should be used; to teach how to generate data placed on a global network. **As a result of mastering the course, the student:** - knowledge of computer networks, technical means of telecommunications, types of modern information services, distance learning and its capabilities, knowledge of the network operating system; - types of computer networks and their capabilities, regional, global and local computer networks, email, distance learning, ways of organizing telecommunications, network services. Network technology: concept of network technology, bridges and gateways, network topologies, data transmission protocols, IP, TCP, and UDP protocols. - Network operating systems. Local computer networks, their organization and operation. Must have skills in the capabilities of the local area network of the Intranet computer network, the principles of operation in the network operating system, methods of organizing work on the Internet, and placing data on the Internet; - They must have skills in working with the Internet; working with telecommunication tools; working with email; working with a local computer network.
Content	**Topic 1. History of computer networks. Communication channel and communication processor, information transmission environment**. Goals and Objectives of Network Technology. The characteristic of the information transmission medium is the main description of information, syntactic, semantic, and pragmatic dimensions of information. **Topic 2. Telecommunication systems** Telecommunication systems. Modulation and demodulation, modems. Network architecture and structure, input and output devices. Computer ports and connectors. **Topic 3. Computer network architecture** Computer network architecture, topology, network system model. Familiarization with the devices used for information exchange. Types and capabilities of cables.

	Topic 4. Local network types Types of local networks. Features of Ethernet and Fast Ethernet networks. Tokin-Ring Network. Package length. **Topic 5. Computer network protocols** Computer network protocols. Computer network protocols. Internet network. Internet connection methods. The concept of address on the Internet and its types **Topic 6. TCP/IP stack protocols** TCP/IP stack protocols. TCP/IP Protocol. HTTP protocol. FTP Protocol. POP3 and SMTP protocols **Topic 7. IP Network Interconnection Protocol** IP - Inter-network Interaction Protocol. IP Protocols of a Computer Network. The role of the IP protocol in the Internet. The concept of address on the Internet and its types. **Topic 8. The Internet is a global computer network.** The Internet is a global computer network. Structure and systematization of addresses on the Internet. Ways of organizing data exchange. **Topic 9. Internet services and their types** Internet services and their types. Mobile Internet Technologies. Electronic mail service. Mail servers and clients. Record and email address. Browsers and their types **Topic 10. System administration** Disk recovery programs. Working with system configurations. Resource Monitoring. Optimize the disk. Clear disk.Manage computer **Topic 11. Cloud technologies** About cloud technologies. Cloud computing system. Distribution models. Service models and major suppliers **Topic 12. Blockchain technology and ways to use it** The concept of blockchain. Areas of application of blockchain technology. Advantages of blockchain technology **Topic 13. Network security** The issue of ensuring network security. Using cross-sectional screen programs. Using the Kerio Control program and its capabilities.

Study and examination requirements and forms of examination	Written Examination: In this exam, the student is given 80 minutes to write answers to the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are written for all questions – 5 (Excellent) 2. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the questions – 2 (Unsatisfactory)
Media employed	Completion of science assignments and successful submission of current, intermediate, and final control forms
Reading list	1. M Aripov, B.Begalov va boshqalar. Axborot texnologiyalari. O'quv qo'llanma T.: "Noshir", 2009. 2. S.S.G'ulomov va boshqalar. Axborot tizimlari va texnologiyalari. Darslik. T. "Sharq", 2000 y. 3. Begbutayev A.E., Yusupov R.M. Tarmoq texnologiyalari. O'quv qo'llanma. –O'zbekiston Respublikasi Oliy va o'rta maxsus ta'lim vazirligi – Toshkent, 2019, 238 bet. 4. Constitution of the Republic of Uzbekistan in the new edition. May 1, 2023. No O'RQ - 837 5. M.Aripov, A.Madraximov. Informatika, information texnologiyalar. Darslik, T:TDYuI., 2004. 6. S.K.Ganiyev, M.M.Karimov,K.A.Tashev. Axborot xavfsizligi.Toshkent: "Fan va texnologiya", 2016 7. A.R.Maraximov. Internet va undan foydalanish asoslari(o'quv qo'llanma). Toshkent 2001. "ABL-Soft" jamiyati, 2013 y.
Reviewers	Z.M. Kurbonov -Karshi State University, Associate Professor, Department of Applied Mathematics E.A. Eshboyev - Karshi State University, Associate Professor, Department of Applied Mathematics

Confirmed place and time	Developed and approved by Karshi State University (Report №1 30.08.2021

MODULE REFERENCES

Module name:	Elementary mathematics
Code, if applicable:	EM2705
Semesters in which the module is taught:	7 - semester
Lecturer:	Makhmasoatov Muhiddin, assistant teacher
Language	Uzbek
Relation to curriculum:	elective
Type of teaching, contact hours:	Lecture, practical
Workload:	150 hours Contact hours: 60 hours; lecture – 30 hours; practical – 30 hours Self-study: 90 hours
Credit points:	5
Recommended prerequisites:	Mathematics Algebra Geometry

Module objectives Intended learning outcome	Purpose of the subject: To form mathematical thinking in students, develop analytical thinking based on fundamental knowledge, and introduce them to the basic concepts and methods necessary for general mathematical disciplines. Elementary mathematics belongs to the complex of natural and mathematical sciences, and students study it in the VII semester. The main task of elementary mathematics is to form students' logical and algorithmic thinking skills, to teach them to apply the knowledge they have gained to solve modern practical problems, to teach them to construct mathematical models of various natural processes and analyze them, to make optimal solutions by drawing correct conclusions based on the analysis, and to form knowledge and skills in students that fully meet the requirements of the DTS in Elementary Mathematics.
Content	II.I. The subject includes the following topics: Topic 1. The subject of elementary science and mathematical works General about science. The relationship between elementary and higher mathematics. Historical factors Topic 2. Introduction to set theory and the foundations of the concept of number. Topic 3. Arithmetic operations and equations on fractions

	Topic 4. Algebraic expressions and operations on them Topic 5. Algebraic equations Topic 6. Modular equations and systems Topic 7. Irrational equations and systems of equations Topic 8. Logarithms and operations on them Topic 9. Logarithmic equations and systems of equations Topic 10. Inequalities Topic 11. Trigonometric equations and inequalities Topic 12. Derivative of a function and its properties Topic 13. Definite and definite integrals Topic 14. Vectors Topic 15. Circular bodies III. Instructions and recommendations for practical exercises Topic 1. The subject of elementary science and mathematical works General information about science. The relationship between elementary and higher mathematics. Historical factors Topic 2. Introduction to set theory and the basics of the concept of number. Topic 3. Arithmetic operations and equations on fractions Topic 4. Algebraic expressions and operations on them Topic 5. Algebraic equations Topic 6. Modular equations and systems Topic 7. Irrational equations and systems of equations Topic 8. Logarithms and operations on them Topic 9. Logarithmic equations and systems of equations Topic 10. Inequalities Topic 11. Trigonometric equations and inequalities Topic 12. Derivative of a function and its properties Topic 13. Indefinite and definite integrals Topic 14. Vectors Topic 15. Circular bodies

	The lessons can be conducted using active and interactive tools, and appropriate pedagogical and information technologies can be used. IV. Independent learning and independent work Recommended topics for independent learning: 1. Number theory and operations on natural numbers 2. Fractions and simple problems 3. Algebraic fractions of rational degrees 4. Systems of equations 5. Visible equations and systems 6. Arithmetic and geometric progressions 7. Angles, lines and triangles 8. Perpendicular lines 9. Polynomials It is recommended that students prepare abstracts and present them on independently thought-up topics.
Study and examination requirements and forms of examination	**Written Exam:** In this exam, the student is given 90 minutes to prepare to answer the questions. The answers to the questions are evaluated as follows: 1. If all questions are answered in detail and completely – 5 (Excellent) 2. If all questions (some of them partially) are answered or 2/3 of the questions are answered completely – 4 (Good) 3. If some of the questions or 2/3 of the questions are answered partially – 3 (Satisfactory) 4. If no answers are given or the answers do not correspond to the questions – 2 (Unsatisfactory)
Reading list	1. Muhammadaminov A.A. "Methods of verification and proof in elementary mathematics: theory and practice" Modern Education and Development, 2024, 16(11), 343-346. 2. K.Muhammedov "Handbook on elementary mathematics" "Sharq" publishing house, Tashkent, 2008 3. M.I. Skanavi "Collection of problems in mathematics" Tashkent, 1975

	4. A.U. Abdukhamidov, H.A. Nasimov, U.M. Nosirov "Fundamentals of algebra and mathematical analysis" "O'qituv" publishing house, Tashkent, 2007-2008
Reviewers	N.Eshkarayeva - Associate Professor of the Department of "Applied Mathematics" of Karshi State University, Ph.D.) B.Shovaliyev - Teacher of the Department of "Applied Mathematics" of Karshi State University
Confirmed place and time	Developed and approved by Karshi State University (Report № 30.08.2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

ICT literacy

MODULE HANDBOOK

Field of knowledge: 500000 - Natural sciences, mathematics and statistics

The field of education: 540000 - Mathematics and statistics

Field of study: 60540100 - Mathematics
60540200 - Applied mathematics
60610100 - Computer Science and Programming Technologies

MODULE REFERENCES

Module name:	ICT literacy
Code, if applicable	AKTS2802

Semesters in which the module is taught	8
Lecturer	Valiyeva Shakhzoda Tuychiyevna - Intern-teacher of the Department of Applied Mathematics
Language	Uzbek
Relation to curriculum	Selection
Type of teaching, contact hours	Practical course
Workload	Total working load: 60 hours. Contact hours: 14 hours; practical classes - 16 hours. Independent work: 30 hours.
Credit points	2
Recommended prerequisi	Computer literacy
Module objectives / intend learning outcome	The purpose of teaching science is to form in students the skills of conscious and effective use of modern information technologies, artificial intelligence, information security, cloud services and online learning platforms. To provide technological knowledge that serves to increase the level of digital culture, personal information security, data processing and digital literacy. The task of science is to form in students the skills of conscious, safe and effective use of digital technologies. Through this science, students will acquire the necessary digital literacy in searching, processing and sharing information. Also, the skills of correct use of ICT tools in education, professional activities and everyday life are developed.
Content	The main theoretical part (lecture session) The subject includes the following topics: **Topic 1.** Digital literacy and digital thinking. Mobile devices, IoT and their role in our lives. About the modern concept of ICT, digital mindset, fake news and digital culture. **Topic 2.** Fundamentals of using tools such as artificial intelligence and ChatGPT. Fundamentals of AI, language models, digital assistants and their role in education. **Topic 3.** Data analysis and visualization: Basic concepts. Simple analytical graphs based on Excel and Google Sheets, table analysis. **Topic 4.** Cloud technologies and online offices: Google Workspace, OneDrive. User-friendly features, online storage and collaborative editing of documents. **Topic 5.** Information security and personal data protection. Password policy, phishing, two-factor authentication and security culture. **Topic 6.** ICT tools in distance and hybrid education: Moodle, Zoom, MS Teams. Technological integration in the educational process, webinars and interactive platforms. **Topic 7.** Digital portfolio, online presentation and personal

	branding Digital portfolio, online presentations, personal branding.
Study and examination requirements and forms of examination	a) To receive a grade of 5, the student's level of knowledge must meet the following requirements: can fully explain the essence and content of the subject; maintains scientificity and logic in presenting the topics in the subject, avoiding scientific errors and confusion; has a clear idea of the theoretical or practical significance of the subject materials in the subject; can demonstrate the ability to think independently within the scope of the subject; can answer the questions asked clearly and concisely; has carefully prepared the outline; has completed independent assignments completely and clearly; has fully mastered the laws and other regulatory and legal documents related to the discipline; has published a scientific article on one of the topics related to the discipline; can interpret historical processes; b) To receive a grade of 4, the student's level of knowledge must meet the following requirements: understands the essence and content of the subject, does not allow scientific and logical confusion in explaining the topics in the subject; understands the practical significance of the content of the subject; performs the assigned tasks and assignments within the framework of the curriculum; can correctly answer the questions asked in the subject; has carefully formulated a subject outline; has fully completed independent assignments in the subject; has mastered laws and other regulatory documents related to the subject. c) To receive a grade of 3, the student's level of knowledge must meet the following criteria: has a general understanding of the subject; covers the topics of the subject in a narrow range, with some inconsistencies in the presentation; is not fluent in the presentation; if complex and confusing answers are given to questions on the subject; if the text on the subject is not well-structured. g) In the following cases, the student's level of knowledge may be assessed as unsatisfactory with a grade of 2: if preparation for the subject exercises is not carried out; if the student has no idea about the subject exercises; if it is noticeable that the texts on the subject have been copied from others; if serious errors and confusions are made in the text on the

	subject; if the questions asked about the subject are not answered; if the subject is not known.
Media employed	Students are required to develop skills and competencies in the study of computer technologies, the production of future experiments, and the application of information and communication technologies in the study of technology.
Reading list	**Main literature.** 1. T.Yu. Yagay. Information technologies. Textbook. T.: TDTU, 2020. 2. A. Karimov, M. Kadirov and others. Information technologies. Textbook. T.: "Science and Technology", 2021. 3. B.B. Mahmudov. Cloud technologies and their role in education. Textbook. T.: TDPU, 2021. **Supplementary literature** 1. The Constitution of the Republic of Uzbekistan in the new edition. May 1, 2023. No. ORQ - 837 2. Resolution of the President of the Republic of Uzbekistan dated April 28, 2020 No. PF-4699 “On measures for the widespread introduction of the digital economy and electronic government”. 3. Information technologies: textbook / L.N. Demidov, V.B. Ternovskov, S.M. Grigoriev, D.V. Krakhmalev. – Moscow: KNORUS, 2017. – 222 p. 4. S. Russell, P. Norvig. Artificial intelligence: a modern approach. 4th ed. Pearson, 2021. 5. 3.R. Anderson. Information security engineering. 3rd ed. Wiley, 2020. 6. 4.G.Kh. Akhmadova. Digital branding and media literacy. Textbook. T.: TDYU, 2023. **Information sources** 1 http://www.gov.uz – Portal of the Government of the Republic of Uzbekistan. 2 http://www.aeroculture.com - Information resource on agriculture 3 http://www.ziyonet.uz — Portal of the information and educational network of Uzbekistan 4 http://www.ict.gov.uz - Website of the Coordinating Council of the Cabinet of Ministers for the Development of Computerization 5. http://www.agro.uz - Website of the Ministry of Agriculture
Reviewers	**Z.Kurbonov** - Karshi State University, Associate Professor of the Department of "Applied Mathematics" **Sh.Shoykulov** - Karshi State University, Associate Professor of the Department of "Applied Mathematics"
Confirmed place and time	Developed and approved by Karshi State University (Report №1 30.08.2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

OPTICAL COMMUNICATION SYSTEMS

MODULE HANDBOOK

Field of knowledge:	500 000 – Natural Sciences, Mathematics and Statistics
The field of education:	510 000 Mathematics and Statistics
Field of study:	605 40 200 - Applied Mathematics

MODULE REFERENCES

Module name:	Optical communication systems
Code, if applicable	OAT2806
Semesters in which the module is taught	8
Lecturer	**Shoykulov Shodmonkul Qudratovich**- Associate Professor of the Department of Applied Matematics
Language	Uzbek
Relation to curriculum	Compulsory
Type of teaching, contact hours	Lecture, practical training
Workload	Total workload:180 Contact hours: - 90 h.; lectur - 46 h.; practical classes - 44 h. Individual training: 90 - h.
Credit points	6
Recommended prerequisites	Applied mathematics
Module objectives intended learning outcome	Ability to understand and analyze complex phenomena occurring in electrical engineering, information technology, or computer science, drawing on a broad and solid foundation in mathematics, natural sciences, and engineering. Students **understand** and can explain the history of the subject, as well as the purpose and objectives. Students should master the fundamentals of optical communications, including network formation methods, methods in optical communication systems for data transmission, the prospects for the development of optical communication systems and networks, the structure and operating principles of optical communication systems, the design devices and components used in them, optical communication networks, optical access networks, ensuring the quality and security of information transmission, methods for increasing the noise immunity and throughput of communication channels during data transmission, as well as preparation for successfully solving problems in the design, technical operation, and research of optical communication systems and networks. **The goal of this course** is to familiarize students with the principles of constructing multi-level optical communication systems, the characteristics of optical communication networks, and multi-user access systems, namely: time division multiplexing, frequency division multiplexing, and code division multiplexing. The objective is to familiarize students with the principles of organizing optical communication networks and familiarize them with existing multi-user access systems. After completing this course, students should: - **understand** what a fiber-optic communication system is, how optical communication networks are constructed, the

	principles of multi-level communication networks, and methods for implementing various multi-user access systems; - **be able** to assess the applicability of fiber-optic communication systems and the specifics of network operation at different levels in the network hierarchy; - **possess** communication network design skills, understand the features of various multi-user access systems, and make an informed choice of channel multiplexing method.
Content	**1. Introduction to optical communication systems** Optical communication systems, basic definitions and concepts, history of development, descriptions, structural principles and classification. Evolution of optical communication systems. Basic concepts. Analog and digital signals. Channel multiplexing **2. Classification and structure of optical communication systems** Classification of optical communication systems, principles of structure of optical communication systems, principles of structure of open optical communication systems, principles of structure of fiber-optic communication systems, methods of organizing a two-way fiber-optic communication system, methods of densifying a fiber-optic communication system line, issues of synchronization of information flows in fiber-optic communication systems, basic concepts of synchronization and its types, basic control schemes in clock synchronization networks, basic concepts of types of synchronization sources, accuracy parameters and main errors of reference sources. **3. Optical fibers and cables** Optical fibers and cables. Optical fiber and its structure. Types of optical fibers and their characteristics. Single-mode and multi-mode optical fibers. Stepped, gradient and special refractive index optical fibers. Standards of optical fibers. Laws of light propagation along an optical fiber. The process of refraction of light. Total internal reflection. Numerical aperture. Interaction of light with the medium of an optical fiber. Substances formed in an optical fiber. Critical frequency and normalized frequency of the substance. Fiber-optic communication cables. Optical cables. Classification of optical cables. Structural elements of optical cables. Basic elements. Basic designs of optical cables **4. Basic physical parameters of optical fibers** The laws of light propagation along an optical fiber, the process of refraction of light, total internal reflection, numerical aperture, the interaction of light with the medium of an optical fiber, modes formed in an optical fiber, critical frequency and normalized frequency of the mode, mode field diameter, number of modes in a multimode optical fiber, the phenomenon of fading in an optical fiber, specific losses of an optical fiber, cable losses, the phenomenon of dispersion in an optical fiber and its types, intermodal dispersion, chromatic dispersion, material dispersion, dispersion associated with the

	properties of the waveguide, polarized mode dispersion, dispersion reduction methods, fiber optic cables and their types. **5. Light sources used in optical communication systems** Requirements for light sources used in optical communication systems and their types, structure and working mechanism of light-emitting diodes, main characteristics and parameters, volt-ampere, spectral characteristics, radiation pattern, degradation, heterostructured and super-emitting light-emitting diodes, application in fiber-optic communication systems, laser diodes, quantum devices, operating principle, types of laser diodes, single-mode lasers, distributed feedback semiconductor laser diodes, distributed Bragg mirror lasers, optoelectronic transmitter module of fiber-optic communication systems and its components. **6. Photodetectors used in optical communication systems** Tolali optik aloqa tizimlarida qo‘llaniladigan fotoqabulqilgichlarga qo'yiladigan talablar, yarimo'tkazgichli fotoqabulqilgichlarning turlari, xarakteristikalari va parametrlari, fotodiod, uning tuzilishi, ish mexanizmi, xarakteristikalari va parametrlari, p-i-n fotodiodi, geteroo‘tishli fotodiod, shottki to‘siqli fotodiod, ko'chkili fotodiod, fototranzistorlar, optik uzatish tizimlarida qo'llaniladigan fotoqabulqilgich turlarining qiyosiy tavsifi, tolali optik aloqa tizimlarining optoelektron qabul qiluvchi moduli va uning tarkibiy qurilmalari **7. Optical amplifiers** Optical amplifier and its types, characteristics and parameters of fiber optic amplifiers, optical amplifiers based on Raman scattering of light, semiconductor optical amplifiers, their characteristics and parameters, comparative description of optical amplifiers, methods for determining and calculating the parameters of optical amplifiers, methods of using optical amplifiers **8. Optical modulators** Methods of internal and external modulation of the light flux, physical foundations of light radiation modulation, optical modulator and its types, electro-optic modulators, acousto-optic modulators, magneto-optic modulators, modulation process in spectrally dense optical communication systems, processes of receiving an intensity-modulated optical signal by a photoreceiver and methods for their evaluation **9. Devices for inputting and outputting light from optical fibers** Basic parameters of passive optical devices, devices for introducing and removing light radiation into and from an optical fiber, fiber optic connectors and their types, optical splitters: tree and star splitters, splitter, parameters of fiber optic splitters, applications of fiber optic splitters **10. Optical attenuators, optical filters, isolators, and**

	circulators Optical attenuators, optical filters, Fabry-Perot resonator filters, thin-film dielectric layer filters, filters based on the use of polarization switching of light radiation in liquid crystals, optical isolators, optical circulators **11. Optical multiplexers and demultiplexers** Optical multiplexers and demultiplexers, their types, optical multiplexers/demultiplexers based on thin-film filters, optical multiplexers/demultiplexers based on diffraction gratings, multiplexers based on fiber Bragg gratings, some issues related to the use of optical multiplexers/demultiplexers, inverse multiplexing in fiber optic communication systems **12. Optical switches** Basic concepts, main functions of optical switches, main parameters of optical switches, main types of optical switches, structure of large-scale optical switches, functional suitability and efficiency of multi-cascade optical switches, structural architecture of large-scale optical switches **13. Linear section of fiber-optic communication systems** Line tract of digital fiber optic communication systems, main devices used in the line tract of digital fiber optic communication systems. repeaters, their types: regenerators and optical amplifiers, regeneration of optical signals. structure and operating principle of the regenerator, line codes of digital fiber optic communication systems, requirements for line codes, types of line codes and their formation **14. Fiber-optic communication networks** Infocommunication services, requirements for optical communication networks, types of optical communication networks, optical communication networks, simple multi-wavelength communication line, optical networks with channel switching, broadcast optical network, passive wave routing optical network, active wave routing optical network, packet switching optical network, bit-sequential switching optical network, parallel bit-sequential optical network, principles of constructing optical communication networks based on optical switches **15. Technical operation of fiber-optic communication systems and networks** Organization of the technical operation process, Organization of the technical operation and management system, Principles and prospects for the development of optical communication systems, Developments aimed at creating communication systems and networks based on all-photon technology, Optical locks, Light-controlled switching connectors, Bistable optical devices controlled by light, Devices for shaping digital light streams without the use of electronics, Light-controlled fiber lasers, Fiber lasers based on forced comb scattering
Study and examination requirements and forms of examination	Written Examination: In this exam, the student is given 80 minutes to write answers to the questions. The answers to the questions are graded as follows:

	4. If detailed and complete answers are written for all questions – 5 (Excellent) 5. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 6. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the questions – 2 (Unsatisfactory)
Media employed	Fulfillment of tasks in the discipline and tasks issued in the forms of current, intermediate control, successful completion of the final control.
Reading list	1. Yunusov N.Yu., Isayev R.I., Mirazimova G.Kh. Fundamentals of optical communication. Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan - T.: NMIU named after Cholpon, 2014, -368 p. 2. Govind P.Agrawal. Fiber-optic communication systems. Third edition. A.John Willey & Sons, Inc., Publication. 2002. - 563p. 3. Mirazimova G.Kh. Fundamentals of optical communication: Textbook/PhD Isayev R.I. under the editorship of the responsible. - TATU, 2006. 4. Mirazimova G.Kh., Yunusov N.Yu. Optical communication systems. Methodical manual for performing laboratory work. T.: "Communicator", 2017. - 196 p. 5. Isayev R.I., Mirazimova G.Kh., Ibatova D.Kh. Methodological manual for practical exercises in the subject "Optical communication systems". Part 1 / TATU. Tashkent, 2021. 94 pages 6. Isayev R.L, Mirazimova G.Kh., Ibatova D.Kh. Methodological manual for practical exercises in the subject "Optical communication systems". Part 2 / TATU. Tashkent, 2021. 111 pages
Reviewers	Z.M. Kurbanov- Associate Professor of the Department of "Applied Mathematics" of Karshi State University B.Kh.Shovaliev - Senior Lecturer of the Department of "Applied Mathematics" of Karshi State University
Confirmed place and time	Developed and approved by Karshi State University (Report №1 30.08 2021 y.)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

MATHEMATICAL SYSTEMS

MODULE HANDBOOK

Field of knowledge: **500000– Natural sciences, mathematics and statistics**

The field of education: **540000 – Mathematics and statistics**

Field of study: **60540200 – Applied Mathematics**

MODULE REFERENCES

Module name:	MATHEMATICAL SYSTEMS
Code, if applicable	MTZ2806
Semesters in which the module is taught	8
Lecturer	Shukurov Amon Musurmonovich - professor,

	professor of department "Applied Mathematics"
Language	Uzbek
Relation to curriculum	Compulsory
Type of teaching, contact hours	Lecture, practical training
Workload	Total workload: 180 hours, Contact hours: - 90 hours; lecture - 30 hours; seminar - 60 hours. Independent education: 90 hours.
Credit points	6
Recommended prerequisites	Fundamental concepts.
Module objectives / intended learning outcome	The purpose of teaching the subject "Mathematical Systems" is to teach students how to solve problems in mathematical analysis, algebra, differential equations, mathematical physics equations, calculation methods, and mathematical modeling using computers. The task of the subject is to teach students how to solve specific problems using the theoretical knowledge obtained.
Content	1. History of the creation of mathematical systems. Purposes, tasks and capabilities of mathematical systems. 2. Standard types of data in the Maple system. Variable and expression. Tools for performing operations such as opening brackets, factoring polynomials, simplifying and combining expressions, compacting similar terms, and saving fractions from irrationality. 3. Tools for performing substitutions and type conversions in expressions and calculating them. Functions and polynomials, operations on them. 4. Sequence of expressions. List and set type data. Operations on lists and sets. 5. Types of equations and inequalities. Solving equations and inequalities. Solving trigonometric equations and inequalities. Methods for solving systems of linear equations. 6. Elements of linear algebra. Operations on vectors and matrices. Eigenvalues and eigenvectors of a matrix. 7. Differentiation and integration tools. Differentiation operator. Checking the properties of a function. 8. Graphics environment and its use system. 2-D (two-dimensional) graphics environment. 9. 3-D (three-dimensional) graphics environment. Animation environment. 10. Tools for analytical and numerical solution of ordinary differential equations and their systems. Commands for solving initial-boundary problems for special differential equations. 11. Differentiation and integration of multivariable functions.

	12. Series. Expansion of functions into power and Taylor series. 13. Calculation of infinite sums and products. 14. Maple programming language. Maple language operators. 15. Arrays and procedures in Maple.
Study and examination requirements and forms of examination	Written Examination: In this exam, the student is given 80 minutes to write answers to the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are written for all questions – 5 (Excellent) 2. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the questions – 2 (Unsatisfactory)
Media employed	Completing the assignments in the subject and successfully passing the current, intermediate, and final control forms.
Reading list	1. Shukurov A.M. Mathematical systems and their applications, Toshkent, “Turon-iqbol” Publishing House, 2021 y., 216. 2. Velmisov P.A., Kireev S.V. Differential equations in MathCAD, Ulyanovsk, 2016, 109 3. Korolkov O.G., Chebotarev A.S., Shcheglova Yu.D. Maple in examples and tasks. Voronezh, 2011, 82 s. 4. Shukurov A.M., Musurmonova M.O. Collection of examples and exercises in the science of mathematical systems. Karshi, “Nasaf” Publishing House, 2019 y., 104 5. Aladyev V.Z., Khunt Yu.Ya., Shishakov M.L. Fundamentals of Computer Science: Textbook. – M.: “Filin” Publishing House, 1998, 496 6. Aladyev V.Z., Shishakov M.L., ARM MATHEMATICS, M.: “Laboratory of Basic Knowledge” Publishing House, 2000. 751 7. Govorukhin V., Sibulin V., Introduction to Maple. Mathematical package for everyone - Moscow: Mir Publishing House,1997 8. Okhorzin V.A. Applied Mathematics in the MathCAD System, Study Guide. – St. Petersburg: Lan Publishing House, 2008.-352 9. Dyakonov V.P. Maple 9.5/10 in mathematics, physics and education, M.: SOLON - Press, 2006. – 720 s.
Reviewers:	Djabborov O.R. (KSU, Head of the Department of "Applied Mathematics") Eshqorayeva N.G. (KSU, Professor of the Department of "Applied Mathematics")

Confirmed place and time	Developed and approved by Karhi state university (Report №1 _August 30,_ 2021)

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN

KARSHI STATE UNIVERSITY

SPLINE FUNCTION METHOD

MODULE HANDBOOK

Field of knowledge:	**500000–**	**Natural sciences, mathematics and statistics**
The field of education:	**540000 –**	**Mathematics and statistics**
Field of study:		**60540200 – Applied Mathematics**

MODULE REFERENCES

Module name:	SPLINE FUNCTION METHOD
Code, if applicable	SFM2705

Semesters in which the module is taught	7
Lecturer	Shukurov Amon Musurmonovich - professor, professor of department "Applied Mathematics"
Language	Uzbek
Relation to curriculum	Compulsory
Type of teaching, contact hours	Lecture, practical training
Workload	Total workload: 150 hours, Contact hours: - 60 hours; lecture - 30 hours; seminar - 30 hours. Independent education: 90 hours.
Credit points	5
Recommended prerequisites	Fundamental concepts.
Module objectives / intended learning outcome	The main goal of teaching the subject "Spline Function Method" is to approximate functions given in tabular form using spline functions and to create spline functions that approximate the given tabular function, and to teach students such applications as finding the derivatives of the tabular function at points other than the nodes, calculating definite integrals approximately, and solving boundary value problems approximately. The task of the subject is to develop in students the ability to create algorithms for constructing various spline functions, to create computational programs based on them, and to use them.
Content	1. About modern computing machines, mathematical systems and numerical methods. The problem of approximating functions. 2. Interpolation formulas. Lagrange and Newton formulas. 3. Methods for solving systems of linear algebraic equations. Driving method. 4. The concept of a spline function. Cubic splines through moments. 5. Cubic splines through slopes. 6. Boundary conditions and algorithm for calculating coefficients. 7. The concept of a B-spline function. Algorithm for constructing it. 8. Polynomial spline functions. 9. Rational spline functions.

	10. The concept of two-dimensional spline functions. 11. Parametric splines. 12. Applications to calculating definite integrals using splines and numerical differentiation. 13. Numerical solution of boundary value problems using splines. 14. Approximate calculation of double integrals using two-dimensional splines. 15. Concept of the finite element method.
Study and examination requirements and forms of examination	Written Examination: In this exam, the student is given 80 minutes to write answers to the questions. The answers to the questions are graded as follows: 1. If detailed and complete answers are written for all questions – 5 (Excellent) 2. If answers are provided to all questions (some of them partially) or complete answers are given for 2/3 of the questions – 4 (Good) 3. If answers are given to some of the questions or partial answers are provided for 2/3 of the questions – 3 (Satisfactory) 4. If no answers are provided or the answers do not match the questions – 2 (Unsatisfactory)
Media employed	Completing the assignments in the subject and successfully passing the current, intermediate, and final control forms.
Reading list	1. Ahlberg J., Nilsson E., Walsh J. Spline Theory and Its Applications. Moscow: Mir Publishing House, 1972. 316 2. Zav'ialov Yu. S., Kvasov B. I., Miroshnichenko V. L. Methods of spline functions. Moscow: "Science" Publishing House, 1980. 352 s. 3. Vasilenko V.A. - Spline functions. Theory, algorithms, programs. Moscow: Nauka, 1983. 4. Isroilov M.I. Calculation methods. Tashkent, “Uzbekistan” Publishing House, 2000. 5. Abdukhamidov A., Khudaynazarov S. Exercises and laboratory work on calculation methods. “Uzbekistan” Publishing House, 1995. 6. Shukurov A.M. Mathematical systems and their applications, Tashkent, “Turon-Iqbol” publishing house, 2021 y., 216 7. Stechkin S. B., Sobbotin Yu. N. Splines in computational mathematics, Moscow, Nauka, 1986. 8. Grebennikov A. I. The spline method in numerical

	analysis. Moscow: Moscow State University Press, 1979. 9. Ismatullaev G.P., Juraev G.U. Methodological guide to calculation methods. Tashkent, University. 2005.
Reviewers:	Djabborov O.R. (KSU, Head of the Department of "Applied Mathematics") Eshqorayeva N.G. (KSU, Professor of the Department of "Applied Mathematics")
Confirmed place and time	Developed and approved by Karhi state university (Report №1 _August 30,_ 2021)