### MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION TASHKENT UNIVERSITY OF INFORMATION TECHNOLOGIES NAMED AFTER MUHAMMAD AL–KHWARIZMI



# MODULE HANDBOOK

## Educational Program BA 60612000 – Info–communication engineering

Tashkent 2024

#### Table A – Curriculum of BA 60612000 – Info-communication engineering

| 1 <sup>st</sup> semester | 2 <sup>nd</sup> semester | 3 <sup>rd</sup> semester  | 4 <sup>th</sup> semester | 5 <sup>th</sup> semester | 6 <sup>th</sup> semester       | 7 <sup>th</sup> semester | 8 <sup>th</sup> semester |
|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|--------------------------------|--------------------------|--------------------------|
| PRG101                   | PRG102                   | EGS201                    | MPS201                   | ICT301                   | WNW301                         | PRI401                   | QPR402                   |
| Programming              | Programming              | Engineering               | Microproces-             | Information              | Wireless networks              | Programming in           | Qualification            |
|                          |                          | graphics                  | sors                     | coding theory            |                                | info                     | Practice 2               |
| 1 lectures               | 1 lectures               | 2/1 lectures              | 2/1 lectures             | 2/1 lectures             | 1 lecture                      | communications           |                          |
| 2/1 practical            | 2/1 practical            | 1 practical               | 1 practical              | 1 practical session      | 1/0 practical session          | 2/1 lectures             |                          |
| sessions                 | sessions                 | session                   | session                  |                          |                                | 1 practical session      |                          |
| 6 ECTS                   | 6 ECTS                   | 6 ECTS                    | 6 ECTS                   | 6 ECTS                   | 4 ECTS                         | 6 ECTS                   | 6 ECTS                   |
| PHY101                   | PHY102                   | CSF201                    | AIF201                   | SAS301                   | EMS301                         | Elective                 | GQW403                   |
| Physics I                | Physics I                | of Cyber                  | of artificial            | Signals and<br>systems   | Embedded<br>management systems | Subject<br>ITS407/ITS408 | Qualification            |
|                          |                          | Security                  | intelligence             | systems                  | inanagement systems            | 11010,,110100            | Work                     |
| 1 lectures               | 1 lectures               | 2/1.1                     | 2/1.1                    | 21                       | 2/11                           | 2/11-                    |                          |
| sessions and             | sessions and             | 2/1 lectures              | 2/1 lectures             | 1 practical session      | 2/1 lectures                   | 2/1 lectures             |                          |
| laboratory               | laboratory               | sessions                  | sessions                 | r praetical bession      | r praetical bession            | sessions                 |                          |
| 6 ECTS                   | AECTS                    | 6 ECTS                    | 6 ECTS                   | 8 ECTS                   | 6 ECTS                         | 6 ECTS                   | 14 ECTS                  |
| MTH101                   | MTH102                   | DSA201                    | Electromagnetic          | IMP301                   | IDP301                         | Elective                 | Elective                 |
| Calculus                 | Differential             | Data structure            | fields and               | Image processing         | Individual project             | Subject                  | Subject                  |
|                          | equations                | and algorithms            | waves                    |                          |                                | ITS409/ITS410            | ITS415/ITS416            |
| 2/1 lectures             | 1 lectures               | 2/1 lectures              | 2/1 lectures             | 2/1 lectures             | 2/1 practical sessions         | 2/1 lectures             | 2/1 lectures             |
| 1 practical              | 0/1 practical            | 1 practical               | 1 practical              | 1 practical session      | 1                              | 1 practical              | 1 practical              |
| sessions                 | sessions                 | sessions                  | session                  |                          |                                | sessions                 | sessions                 |
| 6 ECTS                   | 4 ECTS                   | 6 ECTS                    | 6 ECTS                   | 6 ECTS                   | 4 ECTS                         | 6 ECTS                   | 6 ECTS                   |
| AWR101                   | MTH103                   | EAC201                    | EAC202                   | Elective                 | QPR301                         | Elective                 | Elective                 |
| Academic                 | Discrete                 | Electronics and           | Electronics and          | Subject                  | Qualification<br>Practice 1    | Subject                  | Subject                  |
| witting                  | suuctures                | circuits i                | circuits ii              | 113505/113504            | Flactice 1                     | 113411/113412            | 11341//113410            |
| 2/1 practical            | 1 lectures               | 2/1 lectures              | 2/1 lectures             | 2/1 lectures             |                                | 2/1 lectures             | 1 lectures               |
| sessions                 | 0/1 practical            | 1 practical               | 1 practical              | 1 practical              |                                | 1 practical              | 0/1 practical            |
|                          | sessions                 | sessions                  | sessions                 | sessions                 |                                | sessions                 | sessions                 |
| 4 ECTS                   | 4 ECTS                   | 6 ECTS                    | 6 ECTS                   | 6 ECTS                   | 6 ECTS                         | 6 ECTS                   | 4 ECTS                   |
| FRL101                   | FRL101                   | MTH204<br>Drohohility and | Elective Subject         | Elective                 | Elective                       | Elective                 |                          |
| language I               | language II              | statistics                | 115201/115202            | GEN301/GEN302            | GEN303/GEN304                  | ITS413/ITS414            |                          |
|                          |                          |                           |                          |                          |                                |                          |                          |
| 2/1 practical            | 2/1 practical            | 2/1 lectures              | 2/1 lectures             | l lectures               | l lectures                     | 2/1 lectures             |                          |
| 505510115                | sessions                 | sessions                  | sessions                 | sessions                 | 0/1 practical sessions         | sessions                 |                          |
| A TI OTTO                |                          |                           |                          |                          |                                | ( DOTO                   |                          |
| 4 ECTS<br>HUM101         | 4 ECTS<br>HUM102         | 6 ECTS                    | 6 ECTS                   | 4 ECTS                   | 4 ECTS<br>Flective             | 6 ECTS                   |                          |
| The newest               | Religious                |                           |                          |                          | Subject                        |                          |                          |
| History of               | studies                  |                           |                          |                          | ITS305/ITS306                  |                          |                          |
| Uzbekistan               |                          |                           |                          |                          | 2/1 lectures                   |                          |                          |
| 1 lectures               | 1 lectures               |                           |                          |                          | 1 practical sessions           |                          |                          |
| 1 seminars               | 1 seminars               |                           |                          |                          |                                |                          |                          |
| 4 ECTS                   | 4 ECTS                   |                           |                          |                          | 6 ECTS                         |                          |                          |
|                          | HUM103                   |                           |                          |                          |                                |                          |                          |
|                          | Philosophy               |                           |                          |                          |                                |                          |                          |
|                          | 1 lectures               |                           |                          |                          |                                |                          |                          |
|                          | 1 seminars               |                           |                          |                          |                                |                          |                          |
|                          | 4 ECTS                   |                           |                          |                          |                                |                          |                          |
| 6 exams                  | 7 exams                  | 5 exams                   | 5 exams                  | 5 exams                  | 4 exams,                       | 5 exams                  | 2 exams,                 |
|                          |                          |                           |                          |                          | Course project                 |                          | Practice Report,         |
|                          |                          |                           |                          |                          | Practice Report                |                          | Attestation              |
| 30 ECTS                  | 30 ECTS                  | 30 ECTS                   | 30 ECTS                  | 30 ECTS                  | 30 ECTS                        | 30 ECTS                  | 30 ECTS                  |
|                          |                          |                           | тот                      | AL: 240 ECTS             |                                |                          |                          |

Subjects included in the curriculum of the educational program is divided into 6 main blocks, which are highlighted in the appropriate color:

Languages Humanities

General Fundamental

Core

Math and Science

## Table B – Elective subjects for the Educational program BA 60612000 – Info–communication engineering

| N⁰  | Code          | 1th subject  | 2nd subject   |
|-----|---------------|--|---|
| 1.  | ITS201/ITS202 | Fundamentals of building info-<br>communication systems and networks | Info-communication technologies                                     |
| 2.  | GEN301/GEN302 | Pedagogy. Psychology   | Ecology   |
| 3.  | GEN303/GEN304 | Power supply of information<br>communication systems                 | Life safety   |
| 4.  | ITS303/ITS304 | Fundamentals of network programming                                  | Programmable digital devices  |
| 5.  | ITS305/ITS306 | Modeling of Info communication systems                               | Methods of modeling data<br>transmission networks                   |
| 6.  | ITS407/ITS408 | Data communications  | Programming structure in telecommunications                         |
| 7.  | ITS409/ITS410 | Design of digital devices in signal<br>processors                    | Design of digital devices in programmable logic integrated circuits |
| 8.  | ITS411/ITS412 | Machine learning technologies in info-<br>communication systems      | Application of machine learning in info-communications              |
| 9.  | ITS413/ITS414 | Telecommunications Network<br>Management                             | Info-communication systems and networks                             |
| 10. | ITS415/ITS416 | Virtualization of network functions and services                     | Software configurable network                                       |
| 11. | ITS417/ITS418 | Network Smart Devices Software                                       | Info-communication intelligent<br>management systems                |

#### Syllabusses

| 1. Humanities                                   | 6  |
|---|----|
| 1.1. The newest history of Uzbekistan           | 6  |
| 1.2. Religious Studies                          |    |
| 1.3. Philosophy                                 | 10 |
| 2. Languages                                    | 12 |
| 2.1. Foreign language I (English language)      | 12 |
| 2.2. Foreign language II (English language)     | 14 |
| 2.3. Academic writing                           | 16 |
| 3. Math and Sciences                            |    |
| 3.1. Calculus                                   |    |
| 3.2. Physics I                                  |    |
| 3.3. Physics II                                 | 22 |
| 3.4. Differential Equations                     |    |
| 3.5. Probability and Statistics                 |    |
| 3.6. Discrete Structures                        |    |
| 4. General                                      |    |
| 4.1. Ecology                                    |    |
| 4.2. Pedagogy. Psychology                       |    |
| 4.3. Life safety                                |    |
| 4.4. Power supply for infocommunication systems |    |
| 5. Fundamental                                  | 39 |
| 5.1. Programming I                              |    |
| 5.2. Programming II                             | 41 |
| 5.3. Engineering graphics                       | 43 |
| 5.4. Fundamentals of Cyber Security             | 45 |
| 5.5. Data structures and algorithms             | 47 |
| 5.6. Electronics and circuits I                 | 49 |
| 5.7. Electronics and circuits II                | 51 |
| 5.8. Electromagnetic fields and waves           | 53 |
| 5.9. Fundamentals of artificial intelligence    | 55 |
| 6. Core   | 57 |
| 6.1. Microprocessors                            | 57 |
| 6.2. Information coding theory                  | 60 |
| 6.3. Signals and systems                        | 62 |
| 6.4. Wireless Networks                          | 64 |
| 6.5. Programming in infocommunication           | 66 |

| 6.6. Image processing  | 68  |
|--|-----|
| 6.7. Embedded management systems                                     |     |
| 6.8. Fundamentals of building infocommunication systems and networks |     |
| 6.9. Info-communication technologies                                 | 74  |
| 6.10. Fundamentals of network programming                            |     |
| 6.11. Programmable digital devices                                   |     |
| 6.12. Modeling of Info-communication systems                         | 81  |
| 6.13. Methods of modeling data transmission networks                 | 83  |
| 6.14. Data communications  | 85  |
| 6.15. Programming structure in telecommunications                    |     |
| 6.16. Design of digital devices in signal processors                 | 89  |
| 6.18. Machine learning technologies in infocommunication systems     |     |
| 6.19. Application of machine learning in info-communications         |     |
| 6.20. Telecommunications Network Management                          |     |
| 6.21. Info-communication systems and networks                        |     |
| 6.23. Software configurable network                                  | 103 |
| 6.24. Network Smart Devices Software                                 | 105 |
| 6.25. Info-communication intelligent management systems              | 107 |
| 6.26. Individual project   | 110 |
| 6.27. Qualification Practice 1 (Practical Training)                  | 112 |
| 6.28. Qualification Practice 2 (Pre-Graduation Work Practice)        | 114 |
| 6.29. Graduation qualification work                                  | 116 |

| 1.1. The newest               | history of Uzbekistan   |  |  |  |  |  |
|-------------------------------|---|--|--|--|--|--|
| Semestr:                      | 1   |  |  |  |  |  |
| Date of last<br>modification: | 31.08.2023  |  |  |  |  |  |
| Teachers:                     | Babadjanov Khasan Baxtiyorovich   |  |  |  |  |  |
| Component:                    | Compulsory  |  |  |  |  |  |
| Cycle:                        | Core  |  |  |  |  |  |
| ECTS:                         | 4   |  |  |  |  |  |
| Pre-requisities               | -   |  |  |  |  |  |
| Workload:                     | Types of classes Hours  |  |  |  |  |  |
|                               | Total   | 120  |  |  |  |  |
|                               | Lecture   | 30   |  |  |  |  |
|                               | Practical works   | 30   |  |  |  |  |
|                               | SAW (Student autonomous work) 60  |  |  |  |  |  |
|                               | Form of final control   | Exam   |  |  |  |  |
|                               | Final assessment method   | Testing  |  |  |  |  |
| Control forms:                | Current control, Mid-term control, Final control  |  |  |  |  |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total   | for 2 types of control,  |  |  |  |  |
| requirements                  | to obtain admission to the final control  |  |  |  |  |  |
| Final control                 | The final exam is taken in the form of a test, which contain  | s 25 questions, worth  |  |  |  |  |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total exar  | n time 60 minutes  |  |  |  |  |
| Short content:                | Understanding the essence and content of the historical path<br>during the years of independence, the significance of the changes<br>the modern history of Uzbekistan.  | traversed by the state<br>that have occurred in  |  |  |  |  |
| Goal:                         | reveal the essence and content of the fact that Uzbekistan<br>that have made a great contribution to the development of world<br>Uzbek people have a rich historical past and priceless cultural heritag<br>in the Republic of Uzbekistan during the years of independence, to r<br>content of fundamental reforms, as well as the study of the subject<br>students' awareness of their place in society, social lifestyle, self<br>people, awareness of such concepts as personality, citizen.   | is one of the regions<br>civilization, that the<br>ge, important changes<br>eveal the essence and<br>t should contribute to<br>-awareness of young   |  |  |  |  |
| Objective:                    | Make an excursion into the rich historical past, in particul<br>Uzbek statehood, reveal the essence and content of the history of U<br>of the 20th – beginning of the 21st centuries, explain to student<br>political and economic situation that developed in Uzbekistan on th<br>years of independence, reveal the essence of the state managem<br>political reforms, transformations in the spiritual sphere, highlight t<br>the foreign policy of the Republic of Uzbekistan during the years of<br>the main essence of the Action Strategy and the Developmen<br>Uzbekistan, educate students in the spirit of devotion and love for th<br>as form them national pride and spirit. | ar into the history of<br>Jzbekistan at the end<br>s the difficult socio-<br>ne eve and in the first<br>ent, socio-economic,<br>he main directions of<br>independence, reveal<br>nt Strategy of New<br>e Motherland, as well |  |  |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Know and understand the essence and content of the historic<br>the state during the years of independence, the significance of the<br>occurred in the modern history of Uzbekistan<br>LO 2. From the standpoint of historicism and objectivity, understa<br>the integration of Uzbekistan into the world community, ensuring<br>harmony and interreligious tolerance, the place and increase in<br>Republic of Uzbekistan in international rankings and indices   | ical path traversed by<br>he changes that have<br>and such processes as<br>g security, interethnic<br>the authority of the   |  |  |  |  |

#### 1. Humanities

| Teaching<br>methods:        | <ul> <li>LO 3. Have the skins to study the problems of the modern instory of Ozbekistah, apply the idea of national independence in strengthening the worldview, be able to express your attitude to the processes taking place around you, understand the place of history in the development of the worldview of society and people and be able to connect the events of today with important events of history;</li> <li>LO 4. Have a deep knowledge of the modern history of Uzbekistan, have your own scientific opinion on spiritual, national and universal issues and be able to substantiate them, have an active life position based on the ideas of national independence.</li> <li>In the conditions of the credit system of education, classes are conducted mainly in active and creative forms. Among the effective pedagogical methods and technologies that promote active involvement of students in the search and management of knowledge, the acquisition of experience in independent problem solving should be emphasized:</li> <li>technology of problem- and project-based learning;</li> <li>technologies of educational and methods);</li> <li>case-study method (analysis of situations);</li> <li>game technologies, in which students participate in business, role-playing, simulation games;</li> <li>information and communication (including distance learning) technologies.</li> <li>In order to develop critical thinking among students, such methods as "Prediction with one questions" "Cluster" "Cross-discussion" "INSERT" "Eisbone" method "I know"</li> </ul> |  |   |   |   |  |
|-----------------------------|---|--|---|---|---|--|
|                             | open questions<br>I found out, I v<br>during practica   | ", "Cluster", "Cross-discussion", "INSER<br>vant to know" hands-on activities, gamific<br>al classes.  | RT", "Fishbon<br>cation and othe  | e" meth<br>ers are                              | nod, "I k<br>actively                                 | now,<br>used                             |
| Assessment of the student's |   | Type of task   | Number of points<br>(max)   |   | Total   |  |
| knowledge:                  | Current control   | Practical works (1-10)<br>Independent work   | 30<br>10  | 40  |   |  |
|                             | Mid-term<br>control   | Written work   | 10  |   | 100   |  |
|                             | Final control   | Exam (Testing)   | 50  |   |   |  |
| Topics of<br>lectures:      | <ul> <li>Introduction. Subject, goals and objectives of the academic discipline "Modern History of Uzbekistan", its theoretical and methodological principles.</li> <li>Formation of Uzbek statehood and stages of its development.</li> <li>Socio-political processes in Uzbekistan on the eve of achieving independence.</li> <li>Historical significance of the formation of the independent Republic of Uzbekistan. A unique path of Uzbekistan to freedom and progress.</li> <li>Formation of the foundations of a democratic civil society in Uzbekistan, political reforms.</li> <li>Socio-economic changes in Uzbekistan during the years of independence.</li> <li>Spiritual and cultural progress in Uzbekistan during the years of independence.</li> <li>Republic of Karakalpakstan during the years of independence.</li> <li>Uzbekistan and the world community.</li> <li>From action strategy to development strategy.</li> </ul>  |  |   |   |   |  |
| Literature:                 | 1. Action strategy<br>Spirituality, 2017. 2<br>New history of Uzb<br>history of Uzbekist<br>Strategy". Decree o   | on five priority areas of development of the Republi<br>2. History of independent Uzbekistan. Responsible edito<br>ekistan. Project manager and editor. M.A. Rakhimov<br>an. Editors: R.H. Murtazayeva, A.A. Ermetov, A.A.<br>f the Republic of Uzbekistan No. PF-60 dated 28.01.202 | c of Uzbekistan i<br>or A. Sabirov Ta<br>Tashkent: Literary<br>Odilov Tashker<br>2. | n 2017-2<br>shkent: A<br>sparks, 2<br>nt, 2023. | 2021 Tas<br>Academy, 20<br>2018. 4. The<br>5. "Develo | shkent:<br>013. 3.<br>e latest<br>opment |

| 1.2. Religious S              | 1.2. Religious Studies  |   |  |  |  |  |
|-------------------------------|---|---|--|--|--|--|
| Semestr:                      | 2   |   |  |  |  |  |
| Date of last<br>modification: | 31.08.2023  |   |  |  |  |  |
| Teachers:                     | Makhkamova Nadira Rakhmanovna   |   |  |  |  |  |
| Component:                    | Compulsory  |   |  |  |  |  |
| Cycle:                        | Core  |   |  |  |  |  |
| ECTS:                         | 4   |   |  |  |  |  |
| Pre-requisities               | -   |   |  |  |  |  |
| Workload:                     | Types of classes  | Hours   |  |  |  |  |
|                               | Total   | 120   |  |  |  |  |
|                               | Lecture   | 30  |  |  |  |  |
|                               | Practical works   | 30  |  |  |  |  |
|                               | SAW (Student autonomous work)   | 60  |  |  |  |  |
|                               | Form of final control   | Exam  |  |  |  |  |
|                               | Final assessment method   | Testing   |  |  |  |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |  |  |  |  |
| Final control                 | The final exam is taken in the form of a test, which contain  | s 25 questions, worth   |  |  |  |  |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total exar  | n time 60 minutes   |  |  |  |  |
| Short content.                | mastering this discipline, the student gains the skills to commun<br>different ideological positions. Religious studies through its mea-<br>realization of freedom of conscience, that is, the choice of religion of  | icate with people of<br>ns contributes to the<br>or free thought.   |  |  |  |  |
| Goal:                         | Is to form theoretical knowledge about the content and esseminds of students and youth, about the religious image of the world, a of religious and philosophical views, about the process of globa religious movements, about the formation of skills in the fight consequences of such concepts as religious fanaticism, extremise struggle for the security of the state and society  | ence of religion in the<br>about the relationship<br>ilization and modern<br>against the negative<br>m and terrorism, the   |  |  |  |  |
| Objective:                    | In accordance with the state educational standard of<br>education are to form students' ideas about: the subject and social fu<br>their historical development; about the main historical types of r<br>about the main directions of modern religion; about religious vi<br>modern civilization and ways out of it.   | higher professional<br>inctions of religion in<br>eligious worldviews;<br>iews on the crisis of   |  |  |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. The student will learn to demonstrate knowledge of the<br>historical development of religion, its main directions and the trend<br>the modern world;<br>LO 2. Studying the history of the development of religious teaching<br>knowledge and the ability to distinguish the original content of re-<br>interpretations;<br>LO 3. The ability to determine the causes of extremism and ter<br>philosophical analysis of its consequences;<br>LO 4. Formation of logical and critical thinking skills in relation to<br>processes;<br>LO 5. Prevention of religious fanaticism and application of<br>knowledge in practical life;<br>LO 6. Student will have the ability to form ideological immunity aga | e main stages of the<br>s of its functioning in<br>ngs, the formation of<br>eligion from its false<br>rorism, and a socio-<br>religious and secular<br>acquired theoretical |  |  |  |  |
|                               | ideas, to express his free and fair attitude towards their evil intentio<br>LO 7. Formation of students' skills in using acquired knowledge in  | independent learning.   |  |  |  |  |

|                             | LO 8. The student will master the skills of perceiving and analyzing texts with philosophical and religious content, techniques for conducting discussion and polemics, skills of public speaking and written, reasoned presentation of one's own point of view, skills of analyzing the modern religious situation in the world.  |   |  |   |   |                               |
|-----------------------------|--|---|--|---|---|-------------------------------|
| Teaching<br>methods:        | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "INSERT", "Fishbone" method, "I know,<br>I found out, I want to know" hands-on activities, gamification and others are actively used<br>during practical classes. |   |  |   |   |                               |
| Assessment of the student's |  | Type of task  | Number of<br>(max)   | points  | Total   |                               |
| knowledge:                  | Current  | Practical works (1-10)  | 30   |   |   |                               |
|                             | control  | Independent work  | 10   | 40  |   |                               |
|                             | Final control  | Oral presentation   | 10   |   | 100   |                               |
|                             | Mid-term<br>control  | Written work  | 50   |   |   |                               |
| Topics of<br>lectures:      | <ul> <li>The importa</li> <li>National rel</li> <li>Zoroastriani</li> <li>Buddhism</li> <li>Christianity</li> <li>Islam</li> <li>Dogmatic d</li> <li>The role of f</li> <li>Religious on</li> <li>Modern reli</li> <li>Social dang</li> <li>in cyberspa</li> <li>Political and</li> <li>History and</li> <li>radicalism a</li> <li>The experie</li> <li>terrorism</li> <li>The meanin</li> </ul>   | ince of religion as a phenomenon of soci<br>igions<br>sm<br>irections and schools of Islamic religion<br>the Hanafi madhhab in the history of Ce<br>ganizations operating in Uzbekistan<br>gious movements and sects<br>er of spreading religious beliefs<br>ce.<br>I social danger of missionary and prosel<br>directions of religious fundamentalism,<br>and terrorism<br>nce of the world community in the fight<br>g of achieving the unity of secular know | al culture<br>ntral Asia<br>ytism<br>against extre<br>yledge and rel                     | mism a<br>igious f                                      | nd<br>faith                                       |                               |
| Literature:                 | 1. Muratov D., Alime<br>p. 2. Rakhimdzhanov<br>Society of Philosoph<br>OOO "Complex print<br>Methodological manu   | ova M., Karimov J. Religious studies, textbook Tash<br>D., Ernazarov O. Introduction to religious studies. S<br>ers of Uzbekistan", 2018 304 p. 3. Isoqjanov R. Cor<br>", 2020 198 p. 4. Kamilov D. Religious studies. Stud<br>al of "Religious Studies"./Sh. Alimova T. 2018 140   | kent, "Navroz" pu<br>tudy guide T.: I<br>nparative religious<br>y guide T.: Less<br>0 p. | blishing h<br>Publishing<br>s studies. S<br>on Press, 2 | ouse, 2019<br>House "Na<br>Study guide<br>2021128 | 264<br>ational<br>e T.:<br>p. |

| 1.3. Philosophy               |  |   |
|-------------------------------|--|---|
| Semestr:                      | 2  |   |
| Date of last<br>modification: | 31.08.2023   |   |
| Teachers:                     | Kasimova Zumradkhon Sabirzhanovna  |   |
| Component:                    | Compulsory   |   |
| Cycle:                        | Core   |   |
| ECTS:                         | 4  |   |
| Pre-requisities               | -  |   |
| Workload:                     | Types of classes   | Hours   |
|                               | Total  | 120   |
|                               | Lecture  | 30  |
|                               | Practical works  | 30  |
|                               | SAW (Student autonomous work)  | 60  |
|                               | Form of final control  | Exam  |
|                               | Final assessment method  | Testing   |
| Control forms:                | Current control, Mid-term control, Final control   |   |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,   |
| Final control                 | The final exam is taken in the form of a test, which contain   | s 25 questions, worth   |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total example  | n time 60 minutes   |
|                               | development of Eastern and Western philosophical thinking, "Philo<br>philosophical analysis, philosophical understanding of the w<br>"Philosophy of Knowledge", forms and levels of knowledge, basic l<br>philosophy content, science of logic, its object of research, laws an<br>their structure and the foundations of its understanding, society, w<br>problem, moral categories, ideas about sophistication, globalization<br>etc. took place.  | vorld, its problems,<br>aws and categories of<br>nd forms of thinking,<br>value, culture, human<br>and global problems,   |
| Goal:                         | It is to create a generalized system of students' worldview<br>place in it, to form a person's cognition, socio-political, ethical,<br>relations to the world, and to teach the skill of correct thinking in t<br>reasoning.   | and show a person's<br>, aesthetic and other<br>the process of logical  |
| Objective:                    | Is to equip young people with philosophical knowl achievements of modern science, and to develop self-awareness skills, skills and qualifications in them.   | edge based on the<br>and correct thinking   |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>students know the essence of philosophical knowledge, laws, and ca<br>development of nature, society, and human thinking; they can<br>importance of a person in life by forming a personal attitude toward.<br>They will have information about the characteristics and laws of ph<br>They study the leading ideas, scientific and spiritual heritage of 1<br>philosophy;<br>They should be able to understand the methodological important<br>professional activity, the role of analytical and synthetic, logical<br>processes;<br>They will have an idea about the essence of the reforms being carried<br>By studying philosophy, they should understand the essence of<br>processes in the life of society;<br>They should be able to evaluate socio-political processes from the<br>philosophical and systematic thinking and should be able to com- | tegories related to the<br>reveal the role and<br>ls them;<br>ilosophical thinking;<br>Eastern and Western<br>nee of philosophy in<br>al thinking in global<br>ed out in Uzbekistan;<br>social and political<br>the point of view of<br>ollect, store and use |

|                             | Logical analysis of information, observes information related to his professional activity<br>based on analytical and synthetic thinking and should make independent decisions based<br>on observational thinking;<br>They should be able to independently acquire new knowledge, improve it and<br>systematically organize their work on the basis of scientificity and creativity;<br>They should know how to express their thoughts and views in a constructive and logical<br>manner based on the rules of the literary language orally and in writing.  |  |  |   |   |   |
|-----------------------------|--|--|--|---|---|---|
| Teaching<br>methods:        | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "INSERT", "Fishbone" method, "I know,<br>I found out, I want to know" hands-on activities, gamification and others are actively used<br>during practical classes. |  |  |   |   |   |
| Assessment of the student's |  | Type of task   | Number of  | points  | Total   |   |
| knowledge:                  | Current  | Practical works (1-10)   | (max)<br>30  |   |   |   |
|                             | control  | Independent work   | 10   | 40  |   |   |
|                             | Final control  | Oral presentation  | 10   | 1   | 100   |   |
|                             | Mid-term<br>control  | Written work   | 50   |   |   |   |
| Topics of<br>lectures:      | <ul> <li>MODULE 1. P</li> <li>Philosophy</li> <li>Stages of de</li> <li>Stages of de</li> <li>Being (onto</li> <li>Philosophy</li> <li>Logic.</li> <li>Forms of th</li> <li>Philosophy</li> <li>Philosophy</li> <li>Philosophy</li> <li>MODULE 2. T</li> <li>IS A GLOBAL</li> <li>Moral philo</li> <li>Philosophy</li> <li>Philosophy</li> <li>Philosophy</li> <li>Anti-corrup</li> </ul>  | HILOSOPHY AND LOGIC<br>and its role in society<br>evelopment of philosophical thinking: Ea<br>evelopment of philosophical thinking: W<br>logy) and the philosophy of developmen<br>of knowledge (epistemology)<br>ought: understanding, judgment and con<br>of society<br>of Man (Philosophical Anthropology)<br>of values (axiology)<br>HE PHILOSOPHY OF MORALS AND<br>PROBLEM TODAY<br>sophy (Ethics)<br>of elegance (Aesthetics)<br>of globalization and sustainable develop<br>rience of fight against corruption<br>tion policy of Uzbekistan | astern philoso<br>Vestern philoso<br>nt<br>clusion.<br>D ELEGANCH  | phy<br>ophy<br>E. COR   | RUPTIO  | NC  |
| Literature:                 | 1. Davronov Z., She<br>TMU, 2019. 2. Mac<br>Muhammadjonova L<br>Saifnazarov I. Mukh<br>house - printing hous<br>Aesthetics). Textboo<br>Shermuhamedova N.  | muhamedova N, Kahharova M, Nurmatova M, Husar<br>daeva Sh. Shermuhamedova N. and others. Philosop<br>.A. Abdulla Sher, Shodimetova G. Moral philosophy<br>torov A., Sultanov T., Usmanov F. Philosophy. Textb-<br>e, 2021424 p. 4. Saifnazarov I.S., Abdullakhanova G.<br>k for higher educational institutions. LAMBERT Aca<br>Philosophy Tashkent: Idris Abdurauf Nashr, 2021. p   | nov B, Sultonova<br>ohy is a study gu<br>Tashkent: Vneshi<br>ook T.: Innovati<br>S., Ernazarov D.Z.<br>ademic Publishing<br>0.667_ | A. Philos<br>nide Ta<br>nvestpron<br>ve develo<br>. Philosop<br>RU. 201 | ophy Tas<br>ashkent: 20<br>n, 2023<br>opment pub<br>hy (Logic, 1<br>9134 pa | shkent:<br>)19. 3.<br>lishing<br>Ethics,<br>ges. 5. |

#### 2. Languages

| 2.1. Foreign lar              | 2.1. Foreign language I (English language)   |   |  |  |  |  |
|-------------------------------|--|---|--|--|--|--|
| Semestrs:                     | 1  |   |  |  |  |  |
| Date of last<br>modification: | 31.08.2023   |   |  |  |  |  |
| Teachers:                     | Saydaliyeva Gavkharkhon Avazovna, Barnoyeva Nilufar Yoqubovi   | na  |  |  |  |  |
| Component:                    | Compulsory   |   |  |  |  |  |
| Cycle:                        | Secondary  |   |  |  |  |  |
| ECTS:                         | 4  |   |  |  |  |  |
| Pre-requisities               | -  |   |  |  |  |  |
| Workload:                     | Types of classes Hours   |   |  |  |  |  |
|                               | Total  | 120   |  |  |  |  |
|                               | Practical lessons  | 48  |  |  |  |  |
|                               | SAW (Student autonomous work)  | 72  |  |  |  |  |
|                               | Form of final control  | Exam  |  |  |  |  |
|                               | Final assessment method  | Testing   |  |  |  |  |
| Control forms:                | Current control, Final control   |   |  |  |  |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total  | for 2 types of control.   |  |  |  |  |
| requirements                  | to obtain admission to the final control   | <b>JI</b>   |  |  |  |  |
| Final control                 | The final exam is taken in the form of a test, which contains 2 points each, tests are divided into 3 levels of difficulty. Total examples a second s | s 25 questions, worth<br>n time 60 minutes  |  |  |  |  |
|                               | to use English language according to their specialty. Moreover, the<br>a strong grammar syllabus with the specialist vocabulary students ne<br>area and the course includes tasks that covers 4 skills (listening, ra<br>writing) of learning language. The course includes topics such as J<br>IT acronyms, Computer hardware and computer software,<br>development, database basics, data storage and back up, E- con<br>Network, its types, network range and speed, software repair, hard<br>solutions.  | ey will learn IT terms<br>eed to succeed in their<br>eading, speaking and<br>Jobs and professions,<br>websites, website<br>nmerce, transactions,<br>ware repair, security |  |  |  |  |
| Goal:                         | The purpose of mastering the discipline is to give st<br>theoretical knowledge and practical skills in implementing English la   | udents systematized anguage in IT sphere.   |  |  |  |  |
| <i>Objective:</i>             | The course forms the knowledge and skills necessary to un<br>ICT-related knowledge in a foreign language.<br>This course prepares students to communicate in English in thei<br>activities.<br>Expands vocabulary related to ICT and IT, in particular<br>comprehension, speaking, reading and writing skills.   | derstand and express<br>r future professional<br>r, develops listening  |  |  |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. understand and use familiar everyday expressions and simple<br>LO 2. introduce himself and others, ask and answer questions about<br>such as address of residence, place of study and work, family, daily<br>LO 3. provide information about computer hardware and software;<br>LO 4. know the lexicon of computer hardware and software;<br>LO 5. distinguish between word groups and parts of speech;<br>LO 6. make simple and complex sentences using present, past and<br>LO 7. read a simple text and understand its content;   | e expressions;<br>personal information<br>routine;<br>future tenses;  |  |  |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;   | are conducted mainly<br>ods and technologies<br>gement of knowledge,<br>d be emphasized:  |  |  |  |  |

|                             | <ul> <li>technologi</li> <li>communic</li> <li>debates and</li> <li>case-study</li> <li>game tech</li> <li>games;</li> <li>information</li> <li>In order to</li> <li>open quest</li> <li>"INSERT",</li> <li>classes.</li> </ul>   | gies of e<br>cation of<br>d other<br>y metho<br>hnologi<br>on and<br>develo<br>stions",<br>, hands  | educational and research activities;<br>technologies (discussion, press-con<br>active forms and methods);<br>od (analysis of situations);<br>ies, in which students participate ir<br>communication (including distance<br>op critical thinking among students,<br>"Cluster", "Cross-discussion", "<br>-on activities, gamification and othe  | ference, brains<br>h business, role<br>learning) tech<br>, such methods<br>"Know-Want<br>ers are actively | e-playin<br>nologies<br>s as "Pro<br>to Kno<br>used du | g, educat<br>g, simul<br>s.<br>ediction<br>ow-Lear<br>ring prad | ational<br>ation<br>with<br>ned",<br>ctical |
|-----------------------------|---|---|---|---|--|---|---|
| Assessment of the student's |   |   | Type of task  | Number of<br>(max   | f <b>points</b><br>x)                                  | Total   |   |
| knowledge:                  | Current   | Prac  | ctical Assignments 1-2  | 20  | - 0  |   |   |
|                             | control   | Inde  | ependent work   | 30  | 50   | 100   |   |
|                             | Final contro  | ol Exa  | m (Testing)   | 50  |  |   |   |
|                             | <ul> <li>Schedules</li> <li>Spelling: 1</li> <li>Computer</li> <li>Computer</li> <li>Working v</li> <li>Computer</li> <li>Websites.</li> <li>Website a</li> <li>Website d</li> <li>The best v</li> <li>Data bases</li> <li>Data Proc</li> <li>Data stora</li> <li>E-comment</li> <li>E-comment</li> <li>E-comment</li> <li>Network s</li> <li>Network s</li> <li>Network r</li> <li>IT support</li> <li>Hardware</li> <li>Security s</li> </ul> | s: Desc<br>IT acro<br>r syster<br>r softw<br>with co<br>r usage<br>. Webs<br>analytic<br>develop<br>website<br>s. Data<br>cessing<br>age and<br>erce. E-<br>erce fea<br>on secu<br>system<br>range <i>a</i><br>rt. Faul<br>e repair | cribing your daily routine.<br>onyms<br>ms. Computer hardware:<br>are:<br>omputers.<br>e: Understand computer usage.<br>ite purpose<br>cs<br>pment<br>es<br>base basic: Understanding database<br>g: Describing data processing steps.<br>d back up<br>commerce Companies<br>ature<br>urity: Talking about security. Network<br>and speed<br>t diagnosis: Understanding faults.<br>:: Using toolkits and making repairs<br>ns: Describing security solutions. | product.<br>orks.   |  |   |   |
| Literature:                 | Maja Olejniczak   | k. "Englis  | sh for Information Technology" 1 Vocational En  | glish Course Book,  | Pearson  | l, 2011.  |   |

| 2.2. Foreign language II (English language) |   |   |  |  |
|---|---|---|--|--|
| Semestrs:                                   | 2   |   |  |  |
| Date of last<br>modification:               | 31.08.2023  |   |  |  |
| Teachers:                                   | Saydaliyeva Gavkharkhon Avazovna, Barnoyeva Nilufar Yoqubov   | na  |  |  |
| Component:                                  | Compulsory  |   |  |  |
| Cycle:                                      | Secondary   |   |  |  |
| ECTS:                                       | 4   |   |  |  |
| Pre-requisities                             | Foreign language I (English language)   |   |  |  |
| Workload:                                   | Types of classes  | Hours   |  |  |
|   | Total   | 120   |  |  |
|   | Practical lessons   | 48  |  |  |
|   | SAW (Student autonomous work)   | 72  |  |  |
|   | Form of final control   | Exam  |  |  |
|   | Final assessment method   | Testing   |  |  |
| Control forms:                              | Current control, Final control  |   |  |  |
| Assessment<br>requirements                  | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |  |  |
| Final control                               | The final exam is taken in the form of a test, which contains 2 points each, tests are divided into 3 levels of difficulty. Total example   | s 25 questions, worth<br>n time 60 minutes  |  |  |
| Short content:                              | English course will encourage students to improve their general English and learn<br>to use English language according to their specialty. Moreover, they will learn IT terms<br>a strong grammar syllabus with the specialist vocabulary students need to succeed in their<br>area and the course includes tasks that covers 4 skills (listening, reading, speaking and<br>writing) of learning language. The course includes topics such as working in the it<br>industry, it systems. data communication, databases, internet, web design, software<br>dayalonment IT solutions. |   |  |  |
| Goal:                                       | The purpose of mastering the discipline is to give st theoretical knowledge and practical skills in implementing English 1  | udents systematized anguage in IT sphere.   |  |  |
| Objective:                                  | The course forms the knowledge and skills necessary to understand and express<br>ICT-related knowledge in a foreign language. This course prepares students to<br>communicate in English in their future professional activities. Expands vocabulary related<br>to ICT and IT, in particular, develops listening comprehension, speaking, reading and<br>writing skills   |   |  |  |
| Learning                                    | After studying the discipline, students should be able to:  |   |  |  |
| outcome:                                    | LO 1. understand and use familiar everyday expressions and simple<br>LO 2. introduce himself and others, ask and answer questions about<br>such as address of residence, place of study and work, family, daily<br>LO 3. provide information about computer hardware and software;<br>LO 4. know the lexicon of computer hardware and software;<br>LO 5. distinguish between word groups and parts of speech;<br>LO 6. make simple and complex sentences using present, past and  | e expressions;<br>personal information<br>routine;<br>future tenses;  |  |  |
|   | LO 7. read a simple text and understand its content;  | ,   |  |  |
| Teaching<br>methods:                        | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brains  | are conducted mainly<br>ods and technologies<br>gement of knowledge,<br>d be emphasized:<br>storming, educational |  |  |
|   | debates and other active forms and methods);<br>- case-study method (analysis of situations);   |   |  |  |

|                             | - game techno<br>games;<br>- information a<br>In order to de<br>open question<br>"INSERT", ha<br>classes.   | logies, in which students participate in l<br>and communication (including distance levelop critical thinking among students, s<br>ns", "Cluster", "Cross-discussion", "K<br>nds-on activities, gamification and others  | earning) techr<br>such methods<br>Know-Want t<br>are actively u | -playing<br>nologies<br>as "Pre<br>to Kno<br>used dur | g, simul<br>s.<br>ediction<br>ow-Learn<br>ring prac | ation<br>with<br>ned",<br>ctical |
|-----------------------------|---|--|---|---|---|----------------------------------|
| Assessment of the student's |   | Type of task   |   | Number of points (max)                                |   |                                  |
| knowledge:                  | Current   | Practical Assignments 1-2  | 20  | 50  |   |                                  |
|                             | control   | Independent work   | 30  | 50  | 100   |                                  |
|                             | Final control   | Exam (Testing)   | 50  |   |   |                                  |
| practical<br>lessons:       | <ul> <li>IT organisati</li> <li>IT workplace</li> <li>IT systems. S</li> <li>GUI operating sy</li> <li>Data commution</li> <li>Networks</li> <li>Mobile complexity</li> <li>Administrati</li> <li>Data base and</li> <li>Peripherals</li> <li>Choice. Web</li> <li>IT costs</li> <li>Product reset</li> <li>Interactions.</li> <li>Video confert</li> <li>E-commercet</li> <li>Development</li> <li>Website desiti</li> <li>Software developments</li> <li>Diagnosis</li> <li>Solutions. Y</li> </ul> | ions.<br>e rules. Meetings<br>System specifications<br>ons. Multimedia hardware<br>stems<br>inication .Internet browsing<br>puting. Email<br>on.Spreadsheets and formulae<br>d system administration<br>hosting<br>arch. Making recommendations<br>Enterprise social media<br>rencing<br>. Training users<br>t. Requirements analysis<br>ign and architecture<br>velopment.Project management.<br>Investigations |   | 2012  |   |                                  |

| 2.3. Academic writing         |  |   |  |  |
|-------------------------------|--|---|--|--|
| Semestr:                      | 1  |   |  |  |
| Date of last<br>modification: | 31.08.2023   |   |  |  |
| Teachers:                     | Gayubova Komila Anvarovna, Medenseva Natalya Petrovna  |   |  |  |
| Component:                    | Compulsory   |   |  |  |
| Cycle:                        | Secondary  |   |  |  |
| ECTS:                         | 4  |   |  |  |
| Pre-requisities               | -  |   |  |  |
| Workload:                     | Types of classes   | Hours   |  |  |
|                               | Total  | 120   |  |  |
|                               | Practical works  | 48  |  |  |
|                               | SAW (Student autonomous work)  | 72  |  |  |
|                               | Form of final control  | Exam  |  |  |
|                               | Final assessment method  | Testing   |  |  |
| Control forms:                | Current control, Final control   |   |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,   |  |  |
| Final control                 | The final exam is taken in the form of a test, which contain 2 points each, tests are divided into 3 levels of difficulty. Total examples a second se | s 25 questions, worth<br>n time 60 minutes  |  |  |
| Short content:                | The course provides mastery of the main features of the scientific style of speech,<br>the study of the most common genres of oral and written academic discourse, both<br>educational and scientific, the formation of skills in creating written and oral educational<br>academic texts based on an idea of their goals, structure, stylistic features, genre<br>differences , mastery of the basic principles of communication in an academic<br>environment. During the course, the features of such genres will be discussed: abstract,<br>abstract, review, special attention will be paid to learning how to write a text, based on<br>the existing rules for creating a thematic text  |   |  |  |
| Goal:                         | The purpose of teaching the subject "Academic writing " is to apply specialist<br>language knowledge – vocabulary and terms in students, correct and logical composition<br>of sentences and texts, formation of speech etiquette and knowledge, skills and<br>qualifications in the skills of eloquence, to prepare an educated, ingenious, oral and<br>written literacy mature specialist in the specialty   |   |  |  |
| Objective:                    | - to introduce the features of academic genres (abstract, an<br>- increase the level of scientific communication (written and oral);<br>structuring texts for presentation purposes; - to learn the rule<br>organizers.  | alytical review, etc.);<br>- to teach the rules of<br>s for using graphic                 |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Possession of skills in writing, editing and processing vario<br>information.<br>LO 2. Conducting a literature review on the topic.<br>LO 3. Abstracting scientific and popular science texts.<br>LO 4. Structuring presentations.<br>LO 5.Writing analytical texts of various genres.<br>LO 6.Transformation of information from one type to another (grap<br>LO7. Able to distinguish the structure and content of an academic te  | bus types of texts and<br>bhic, text, etc.)<br>ext  |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes in active and creative forms. Among the effective pedagogical meth that promote active involvement of students in the search and manage the acquisition of experience in independent problem solving should - technology of problem- and project-based learning;<br>- technologies of educational and research activities;  | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized: |  |  |

|                             | <ul> <li>communica<br/>debates and o</li> <li>case-study i</li> <li>game techn<br/>games;</li> <li>information<br/>In order to de<br/>open question</li> <li>"INSERT", h<br/>classes.</li> </ul>  | tion technologies (discussion, press-con<br>other active forms and methods);<br>method (analysis of situations);<br>ologies, in which students participate in<br>and communication (including distance<br>evelop critical thinking among students<br>ons", "Cluster", "Cross-discussion",<br>ands-on activities, gamification and othe   | ference, brainst<br>n business, role<br>e learning) techn<br>, such methods<br>"Know-Want<br>ers are actively o                                | -playin<br>-playin<br>nologies<br>as "Pr<br>to Kno<br>used du                     | g, educat<br>g, simul<br>s.<br>ediction<br>ow-Lear<br>ring prac                      | ional<br>ation<br>with<br>ned",<br>ctical                     |  |
|-----------------------------|---|--|--|---|--|---|--|
| Assessment of the student's | Type of task Number of points (max) Total   |  |  |   |  |   |  |
| knowledge:                  | Current   | Practical Assignments 1-2  | 20   | 50  |  |   |  |
|                             | control   | Independent work   | 30   | 30  | 100  |   |  |
|                             | Final control   | Exam (Testing)   | 50   |   |  |   |  |
|                             | <ul> <li>Text and its types. Text-forming means of communication.</li> <li>Principles of text rubrication. Plan. Types of plan.</li> <li>Abstract. Types of notes.Note-taking methods.</li> <li>Functional speech styles.</li> <li>Annotation. Annotation Types. Lexico-grammatical cliches for annotation.</li> <li>Essay. Types of essays.</li> <li>Abstract as a genre of secondary text. Types of abstracts. Structure and language clichés for abstracts.</li> <li>Scientific review and course work.Coursework structure</li> <li>Report. Structure of the report.</li> <li>Project. Project characteristics.</li> <li>Theses. Types of reviews. Review structure.</li> <li>Presentation speech as a type of public speech. Presentation structure.</li> <li>Representation of facts, objects, processes and conclusions in scientific text.</li> </ul> |  |  |   |  |   |  |
| Literature:                 | Literature 1. Koro<br>2021 2. Kuvshinsk<br>Textbook and wor<br>of technical writi<br>student's. London<br>Logan, Utah: Utah<br>writingspaces1/irv   | tkina I. B. Academic writing: process, product and pra<br>caya Yu.M., Zevakhina N.A., Akhapkina Ya.E., Gordi-<br>kshop for universities. Moscow: Yurayt 2022 3. Jerald<br>ng. New York, Copyright 2003. 4. Stephen Bailey.<br>, 2015 5. Beaufort A. College writing and beyond: A to<br>State University Press, 2007. 6. Irvin L. What Is "Acad<br>inwhat-is-academic-writing. | ctice Textbook for un<br>enko E.I. Academic v<br>I Alred, Charles Brus<br>Akademic writing.<br>hew framework for un<br>lemic" Writing? // http | iversities.<br>vriting from<br>aw, Walte<br>Handbook<br>niversity w<br>p://wac.co | Moscow: Y<br>m research<br>r Oliu. Hah<br>for intern<br>riting instr<br>lostate.edu/ | Yurayt,<br>to text.<br>adbook<br>ational<br>uction.<br>books/ |  |

#### 3. Math and Sciences

| 3.1. Calculus                 |  |  |  |
|-------------------------------|--|--|--|
| Semestr:                      | 1  |  |  |
| Date of last<br>modification: | 31.08.2023   |  |  |
| Teachers:                     | Islamova Odila Abduraimovna, Chay Zoya Sergeevna   |  |  |
| Component:                    | Compulsory   |  |  |
| Cycle:                        | Core   |  |  |
| ECTS:                         | 6  |  |  |
| Pre-requisities               | -  |  |  |
| Workload:                     | Types of classes   | Hours  |  |
|                               | Total  | 180  |  |
|                               | Lecture  | 42   |  |
|                               | Practical works  | 30   |  |
|                               | SAW (Student autonomous work)  | 108  |  |
|                               | Form of final control  | Exam   |  |
|                               | Final assessment method  | Testing  |  |
| Control forms:                | Current control, Mid-term control, Final control   |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,  |  |
| Final control                 | The final exam is taken in the form of a test, which contain 2 points each, tests are divided into 3 levels of difficulty. Total examples a second se | s 25 questions, worth<br>m time 60 minutes   |  |
| Short content:                | Calculus is a branch of mathematics focused on the study of<br>It is divided into two main branches: differential calculus and integ<br>is fundamental to many fields, including physics, engineering, eco<br>as it provides tools for modeling and analyzing dynamic systems.   | of change and motion.<br>ral calculus. Calculus<br>promics, and biology,   |  |
| 000                           | quantities change and accumulate, providing essential tools for solving problems in<br>science, engineering, economics, and beyond. Calculus forms the foundation for<br>advanced study in mathematics and its applications in other disciplines, allowing students<br>to model and solve complex problems involving dynamic systems   |  |  |
| Objective:                    | To master the fundamental concepts of differential an including limits, derivatives, integrals, and their applications, understanding change and motion in various contexts.   | nd integral calculus,<br>, for analyzing and   |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Familiarization with the basic definitions and theorems of the subject "Calculus"<br>LO 2. The study of the basic concepts and methods of the subject "Calculus"<br>LO 3. Formation of problem-solving abilities based on theoretical knowledge.<br>LO 4. Ability to solve mathematical problems in the main sections of higher mathematics.<br>LO 5. The study of the basics of integral and differential calculus, complex numbers,<br>functions of several variables, the theory of numerical and functional series, checking the<br>convergence of a series, decomposition of functions into Taylor and Maclaurin series,<br>Fourier series.   |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manage<br>the acquisition of experience in independent problem solving shoult<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brains<br>debates and other active forms and methods);  | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized:<br>storming, educational |  |

|                             | - case-study m<br>- game techno<br>games;<br>- information a<br>In order to dev<br>open question<br>"INSERT", has<br>classes.  | ethod (analysis of situations);<br>logies, in which students participate in l<br>and communication (including distance levelop critical thinking among students, s<br>ns", "Cluster", "Cross-discussion", "K<br>nds-on activities, gamification and others   | business, role<br>earning) techn<br>such methods<br>Know-Want<br>s are actively u | -playing<br>nologies<br>as "Pro<br>to Kno<br>used dur | g, simula<br>s.<br>ediction<br>ow-Learn<br>ring prac | ation<br>with<br>ned",<br>ctical |  |
|-----------------------------|--|--|---|---|--|----------------------------------|--|
| Assessment of the student's |  | Type of task   | Number of point<br>(max)  |   | Total  |                                  |  |
| knowledge:                  | Current  | Practical works (1-3)  | 25  |   |  |                                  |  |
|                             | control  | Independent work   | 12  | - 37  |  |                                  |  |
|                             | Mid-term<br>control  | Written work   | 13  |   | 100  |                                  |  |
|                             | Final control  | Exam (Testing)   | 50  |   |  |                                  |  |
| lectures:                   | <ul> <li>Complete number, and</li> <li>The concept function. T</li> <li>The 1st and Compariso</li> <li>The continuit</li> <li>The concept Higher-ord</li> <li>The Lopital calculus (T</li> <li>The study of points, extr</li> <li>Primitive. TH</li> <li>Integration o</li> <li>Integration o</li> <li>The concept formula. A</li> <li>Improper interview.</li> <li>Fourier seriee</li> <li>A function o continuity of the complet differential</li> </ul> | Final control       Exam (Testing)       50         -Complex numbers: algebraic, trigonometric and exponential forms of a complex number, and actions on them.       The concept of a numerical sequence. The limit of the sequence. The concept of a function. The limit of the function. Calculating the limit of the function.         -The location of infinitesimal functions.       The continuity of the function. Calculation of function breakpoints.         -The concept of a derivative function.       Calculation of function breakpoints.         -The continuity of the function.       Calculation of the derivative of the function.         Higher-order derivatives.       The Lopital rule. The differential of the function. The main theorems of differential calculus (Theorems of Rolle, Lagrange and Cauchy).         -The study of functions using a derivative and the construction of its graph (critical points, extremum, concavity and convexity, asymptotes).         -Primitive. The indefinite integral. Integration methods.         -Integration of fractional rational and irrational functions.         -The concept of a definite integral. The mean value theorem. The Newton-Leibniz formula. Applications of a certain integral.         -The proper integrals of the I and II kind. Convergence of improper integrals.         -Numerical series.         -Functional series. Power series. The radius and area of convergence of the power series.         -Fourier series and its applications.         -A function of two variables. The domain of definition, the graph, the limit and the continuit |   |   |  |                                  |  |
| Literature:                 | Literature. 1. Rob<br>2. George Thomas<br>Calculus Early Tr<br>Concepts and Cor  | ert Adams., Christopher Essex., Calculus: A Com<br>s., Joel Hass., Christopher Heil., Przemysław Boga<br>anscendentals 15th edition. Pearson 2024. 3. Jam<br>ttexts 5th edition. Cengage Learning 2023.  | plete Course 9th<br>cki., Maurice We<br>es Stewart., Step                         | edition.<br>eir., José<br>ohen Kok                    | Pearson 2<br>Zuleta Est<br>oska., Cal                | 018.<br>rugo.,<br>culus:         |  |

| 3.2. Physics I                |   |   |  |  |
|-------------------------------|---|---|--|--|
| Semestr:                      | 1   |   |  |  |
| Date of last<br>modification: | 31.08.2023  |   |  |  |
| Teachers:                     | Abdurakhmanov Kakhkhar Pattakhovich, Bakhronov Khayot Nurov   | vich  |  |  |
| Component:                    | Compulsory  |   |  |  |
| Cycle:                        | Secondary   |   |  |  |
| ECTS:                         | 6   |   |  |  |
| Pre-requisities               | -   |   |  |  |
| Workload:                     | Types of classes  | Hours   |  |  |
|                               | Total   | 180   |  |  |
|                               | Lecture   | 40  |  |  |
|                               | Practical works   | 20  |  |  |
|                               | Laboratory  | 10  |  |  |
|                               | SAW (Student autonomous work)   | 110   |  |  |
|                               | Form of final control   | Exam  |  |  |
|                               | Final assessment method   | Testing   |  |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |  |  |
| Final control                 | The final exam is taken in the form of a test, which contains 25 questions, worth   |   |  |  |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total exam  | n time 60 minutes   |  |  |
| Short content:                | The content of basic physical phenomena and laws, the fundamental unity of the<br>laws of physics, the importance of physical science in the development of technology,<br>fundamental concepts, laws of physical science related to parts of mechanics, molecular<br>physics, thermodynamics, electromagnetism, vibrations, and waves are studied  |   |  |  |
| Goal:                         | Training and familiarization of students with physical processes a scientific foundations, physical concepts and competitors necessary for sol practical engineering problems.  | nd laws, their<br>ving theoretical and                              |  |  |
| Objective:                    | - formation of a scientific approach and understanding of the work<br>knowledge, practical skills and physical processes; - learning to draw cond<br>the essence of physical laws; - train students to apply the acquired knowle<br>professional activities.  | ld, theoretical<br>clusions by analyzing<br>dge and skills in their |  |  |
| Learning                      | As a result of mastering the subject, the student must:   |   |  |  |
| outcome:                      | <ul> <li>Have an idea and knowledge of the essence of basic physical phenomena and laws, the fundamental unity of the laws of physics, the possibility of their further development, the importance of physics in the development of technology;</li> <li>Be able to logically approach the solution of physical problems, make theoretical calculations and evaluate numerical values when studying physical processes and phenomena; keep abreast of new discoveries in the field of physics, acquire theoretical knowledge that provides the ability to use the principles of physics in their field of specialization and have the skills to apply them;</li> <li>Have the ability to analyze physical processes and make decisions based on theoretical and practical knowledge obtained from physics in future professional activities</li> </ul> |   |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);   |   |  |  |

|                             | - case-study m<br>- game techno<br>games;<br>- information a<br>In order to dev<br>open question<br>"INSERT", ha<br>classes.   | ethod (analysis of situations);<br>logies, in which students participate in l<br>and communication (including distance lovelop critical thinking among students, so<br>ns", "Cluster", "Cross-discussion", "K<br>nds-on activities, gamification and others  | ousiness, role<br>earning) techr<br>such methods<br>Know-Want t<br>are actively u                              | -playing<br>nologies<br>as "Pre<br>to Kno<br>ised dur               | g, simul<br>a.<br>ediction<br>ow-Lear<br>ring prace                         | ation<br>with<br>ned",<br>ctical             |
|-----------------------------|--|--|--|---|---|--|
| Assessment of the student's |  | Type of task   | Number of points<br>(max)  |   | Total   |  |
| knowledge:                  |  | Practical works  | 15   |   |   | -  |
|                             | Current  | Laboratory work  | 8  | 41  |   |  |
|                             | control  | Independent work   | 18   | -   |   |  |
|                             | Mid-term<br>control  | Written work   | 9  |   | 100   |  |
|                             | Final control  | Exam (Testing)   | 50   |   |   |  |
| Topics of<br>lectures:      | <ul> <li>Subject of phy</li> <li>Dynamics of a</li> <li>Rotational model</li> <li>Law of consender</li> <li>Relativistic mministry</li> <li>Molecular phy</li> <li>Thermodynamical</li> <li>Electrical inter</li> <li>Work of the e</li> <li>Dielectrics and</li> <li>Electricity.</li> <li>A magnetic fii</li> <li>Laws of Lorender</li> <li>Magnetic proposition</li> <li>The phenome</li> </ul> | <ul> <li>Subject of physics. Kinematics of translational and rotational motion of a material point.</li> <li>Dynamics of a material point.</li> <li>Rotational motion of a rigid body.</li> <li>Law of conservation of energy in mechanics</li> <li>Relativistic mechanics.</li> <li>Molecular physics</li> <li>Thermodynamics.</li> <li>Electrical interactions.</li> <li>Work of the electrostatic field during charge transfer</li> <li>Dielectrics and conductors in an electric field</li> <li>Electricity.</li> <li>A magnetic field. Biot-Savart-Laplace Law.</li> <li>Laws of Lorentz and Ampere. Hall effect.</li> <li>Magnetic properties of matter</li> </ul> |  |   |   |  |
| Literature:                 | Literature 1. Q.P.At<br>Principles with App<br>Roof 1,2,3. Moscow<br>Brooks Cole, 2010<br>"Mechanics" part 1.<br>in physics. "Electro  | odurakhmanov, V.S.Xamidov, N.A.Akhmedova. "PHYS<br>lications 6th Edition by Douglas C. Giancoli , 2014. 3. 1<br>, 2018. 4. Serway R.A., Jewett J.W. Physics for Scienti<br>5. Kh.M.Kholmedov, B.Ibragimov, Kh.N.Karimov. Metho<br>TUIT, 2020.6.A.S.Ganiyev, Kh.N.Bakhronov, I.O.Juman<br>magnetism " part 3. TUIT, 2020.   | SICS" Textbook. T<br>I.I.Savelev. The co<br>sts and Engineers v<br>dical guide for prace<br>iyazov. Methodical | ashkent. 2<br>urse is gen<br>with Mode<br>ctical train<br>guide for | 018. 2. Phy<br>neral physics,<br>rn Physics,<br>ing in phys<br>practical tr | /sics:<br>cs.<br>, 8ed.,<br>sics.<br>raining |

| 3.3. Physics II               |   |   |  |  |  |
|-------------------------------|---|---|--|--|--|
| Semestr:                      | 2   |   |  |  |  |
| Date of last<br>modification: | 31.08.2023  |   |  |  |  |
| Teachers:                     | Abduraxmanov Kakhkhar Pattakhovich, Bakhronov Khayot Nurov  | ich   |  |  |  |
| Component:                    | Compulsory  |   |  |  |  |
| Cycle:                        | Secondary   | Secondary   |  |  |  |
| ECTS:                         | 4   |   |  |  |  |
| Pre-requisities               | Physics I   |   |  |  |  |
| Workload:                     | Types of classes  | Hours   |  |  |  |
|                               | Total   | 120   |  |  |  |
|                               | Lecture   | 20  |  |  |  |
|                               | Practical works   | 20  |  |  |  |
|                               | Laboratory  | 10  |  |  |  |
|                               | SAW (Student autonomous work)   | 70  |  |  |  |
|                               | Form of final control   | Exam  |  |  |  |
|                               | Final assessment method   | Testing   |  |  |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |  |  |  |
| Final control                 | The final exam is taken in the form of a test, which contains<br>2 points each, tests are divided into 3 levels of difficulty. Total examples   | s 25 questions, worth<br>n time 60 minutes  |  |  |  |
| Short content:                | scientific approach and worldview in explaining theoretical know<br>and physical processes, physics of vibrations and waves, optics, func-<br>mechanics, solid state physics, contact phenomena, atomic and nuc   | leers, formation of a<br>ledge, practical skills<br>lamentals of quantum<br>lear physics. |  |  |  |
| Goal:                         | Training and familiarization of students with physical procession scientific foundations, physical concepts and competitors necessary theoretical and practical engineering problems.   | esses and laws, their for solving   |  |  |  |
| Objective:                    | - formation of a scientific approach and understanding of the<br>knowledge, practical skills and physical processes; - learning to dra<br>analyzing the essence of physical laws; - train students to apply the<br>and skills in their professional activities.   | e world, theoretical<br>w conclusions by<br>acquired knowledge                            |  |  |  |
| Learning<br>outcome:          | As a result of mastering the subject, the student must:<br>LO 1. Have an idea and knowledge of the essence of basic physical phenomena and laws,<br>the fundamental unity of the laws of physics, the possibility of their further development,<br>the importance of physics in the development of technology;<br>LO 2. Be able to logically approach the solution of physical problems, make theoretical<br>calculations and evaluate numerical values when studying physical processes and<br>phenomena; keep abreast of new discoveries in the field of physics, acquire theoretical<br>knowledge that provides the ability to use the principles of physics in their field of<br>specialization and have the skills to apply them;<br>LO 3. Have the ability to analyze physical processes and make decisions based on<br>theoretical and practical knowledge obtained from physics in future professional<br>activities. |   |  |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;  | are conducted mainly<br>ods and technologies<br>gement of knowledge,<br>d be emphasized:  |  |  |  |

|                             | <ul> <li>communication technologies (discussion, press-conference, brainstorming, educational debates and other active forms and methods);</li> <li>case-study method (analysis of situations);</li> <li>game technologies, in which students participate in business, role-playing, simulation games;</li> <li>information and communication (including distance learning) technologies.</li> <li>In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned", "INSERT", hands-on activities, gamification and others are actively used during practical classes</li> </ul>   |                  |                 |        |       |  |
|-----------------------------|---|------------------|-----------------|--------|-------|--|
| Assessment of the student's |   | Type of task     | Number of (max) | points | Total |  |
| knowledge:                  |   | Practical works  | 15              |        |       |  |
|                             | Current   | Laboratory work  | 8               | 41     |       |  |
|                             | control   | Independent work | 18              |        | 100   |  |
|                             | Mid-term<br>control   | Written work     | 9               |        | 100   |  |
|                             | Final control   | Exam (Testing)   | 50              |        |       |  |
| Topics of<br>lectures:      | <ul> <li>Oscillatory movements.</li> <li>Damped and forced mechanical vibrations. Electromagnetic vibrations.</li> <li>Wave processes.</li> <li>Superposition of waves.</li> <li>Electromagnetic waves.</li> <li>Light emission</li> <li>Light diffraction</li> <li>Dispersion and polarization of light</li> <li>Quantum optics</li> <li>Linear spectra of atoms</li> <li>Solid state physics</li> <li>Proprietary semiconductors</li> <li>Impurity semiconductors</li> <li>Contact phenomena</li> </ul>   |                  |                 |        |       |  |
| Literature:                 | - Physics of the atomic nucleus<br>Literature 1. Q.P.Abdurakhmanov, V.S.Xamidov, N.A.Akhmedova. "PHYSICS" Textbook. Tashkent. 2018. 2. Physics:<br>Principles with Applications 6th Edition by Douglas C. Giancoli , 2014. 3. I.I.Savelev. The course is general physics. Roof<br>1,2,3. Moscow, 2018. 4. Serway R.A., Jewett J.W. Physics for Scientists and Engineers with Modern Physics, 8ed., Brooks<br>Cole, 2010.5. Abdurakhmanov K.P., Ochilova O., Tohirov U.H., Khaidarov K.B A methodological guide to practical<br>classes in physics. Part 4. Harmonic vibrations, mechanical and electromagnetic vibrations, mechanical and<br>electromagnetic waves. Tashkent, 2021.6. Imamov E., Rakhmatullayeva M., Mukhamedaminova L. and others, A<br>methodological guide to practical classes in physics. Part 6. Solid state Physics. Atomic and nuclear physics. Tashkent,<br>2021 |                  |                 |        |       |  |

| 3.4. Differential Equations   |  |  |  |  |
|-------------------------------|--|--|--|--|
| Semestr:                      | 2  |  |  |  |
| Date of last<br>modification: | 31.08.2023   |  |  |  |
| Teachers:                     | Mamatov Abdugani Ermamatovich  |  |  |  |
| Component:                    | Compulsory   |  |  |  |
| Cycle:                        | Core   |  |  |  |
| ECTS:                         | 4  |  |  |  |
| Pre-requisities               | Calculus   |  |  |  |
| Workload:                     | Types of classes   | Hours  |  |  |
|                               | Total  | 120  |  |  |
|                               | Lecture  | 30   |  |  |
|                               | Practical works  | 18   |  |  |
|                               | SAW (Student autonomous work)  | 72   |  |  |
|                               | Form of final control  | Exam   |  |  |
|                               | Final assessment method  | Testing  |  |  |
| Control forms:                | Current control, Mid-term control, Final control   |  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,  |  |  |
| Final control                 | The final exam is taken in the form of a test, which contain   | s 25 questions, worth  |  |  |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total example  | n time 60 minutes  |  |  |
| Snori content:                | Differential equations course involves solving mathematical equations that<br>describe the relationship between a function and its derivatives. They are essential in<br>modeling various physical systems and phenomena, including physics, engineering,<br>biology, and economics. There are two main types of differential equations: ordinary<br>differential equations (ODEs), which involve functions of a single variable and their<br>derivatives, and partial differential equations (PDEs), which involve functions of multiple<br>worighted and their partial derivatives |  |  |  |
| Goal:                         | The purpose of studying differential equations is to equimathematical tools necessary to model, predict, and analyze the besystems that change over time. This knowledge is essential for uphenomena, designing engineering systems, and conducting scientific   | ip students with the<br>ehavior of real-world<br>inderstanding natural<br>fic research.  |  |  |
| Objective:                    | To understand and solve equations that describe the rel<br>function and its derivatives, enabling the modeling and analysis of<br>various fields such as physics, engineering, biology, and economics  | ationship between a<br>f dynamic systems in<br>s.  |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Familiarization with the basic definitions and theorems of the<br>equations"   | subject "Differential  |  |  |
|                               | LO 2. Study of the basic concepts and methods of the subject "Diffe<br>LO 3. Obtaining skills in the application of mathematical concepts<br>of analysis.  | erential equations"<br>and studied methods   |  |  |
|                               | LO 4. Ability to solve mathematical problems in the main sectio equation.  | ns of the differential   |  |  |
|                               | LO 5. Obtaining skills for solving an ordinary first-order differential<br>order differential equations of various types.<br>LO 6. Obtaining skills for solving differential equations and system<br>equations by the Laplace transform method.  | l equation and higher-<br>s of linear differential                                       |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;   | are conducted mainly<br>ods and technologies<br>gement of knowledge,<br>d be emphasized: |  |  |

|                             | <ul> <li>technologies</li> <li>communicatidebates and ot</li> <li>case-study m</li> <li>game technogames;</li> <li>information a</li> <li>In order to devolve open question</li> <li>"INSERT", ha</li> <li>classes.</li> </ul>  | of educational and research activities;<br>on technologies (discussion, press-confe<br>her active forms and methods);<br>ethod (analysis of situations);<br>logies, in which students participate in<br>and communication (including distance l<br>velop critical thinking among students,<br>ns", "Cluster", "Cross-discussion", "H<br>nds-on activities, gamification and others  | erence, brainst<br>business, role-<br>earning) techn<br>such methods<br>Know-Want t<br>s are actively t | orming<br>-playing<br>aologies<br>as "Pro<br>so Kno<br>ised dui | , educat<br>g, simul<br>s.<br>ediction<br>ow-Lear<br>ring prac | ional<br>ation<br>with<br>ned",<br>ctical |
|-----------------------------|---|---|---|---|--|---|
| Assessment of the student's |   | Type of task  | Number of<br>(max)  | points  | Total  |   |
| knowledge:                  | Current   | Practical works (1-3)   | 25  |   |  |   |
|                             | control   | Independent work (1-2)  | 12  | 37  |  |   |
|                             | Mid-term<br>control   | Written work  | 13  |   | 100  |   |
|                             | Final control   | Exam (Testing)  | 50  |   |  |   |
|                             | <ul> <li>Linear diffe<br/>Bernoulli n</li> <li>Bernoulli's</li> <li>The differe<br/>and Clerau</li> <li>Higher-ord</li> <li>Linear diff<br/>Basic theor</li> <li>Linear ho<br/>characterist</li> <li>Linear inho<br/>right-hand</li> <li>Differentia<br/>variation of</li> <li>Approxima<br/>packages).</li> <li>A system o</li> <li>Original an</li> <li>Basic prope</li> <li>Solving dif</li> </ul> | <ul> <li>Homogeneous and reducible to homogeneous differential equations. Application to applied tasks.</li> <li>Linear differential equations. Solution of linear differential equations by Lagrange and Bernoulli methods. Application to applied tasks.</li> <li>Bernoulli's equations.Equations in full differentials. Integrating multipliers.</li> <li>The differential equation is unresolved with respect to the derivative. The Lagrange and Clerault equations.</li> <li>Higher-order differential equations admitting a decrease in order.</li> <li>Linear differential equations of higher orders. Vronskian. Fundamental solutions. Basic theorems.</li> <li>Linear homogeneous differential equations with constant coefficients. The characteristic equation.</li> <li>Linear inhomogeneous differential equations with constant coefficients with a special right-hand side.</li> <li>Differential equations of the second order and their solution using the method of variation of arbitrary constants. The Ostrogradsky-Liouville formula.</li> <li>Approximate methods for solving differential equations (using mathematical packages).</li> <li>A system of differential equations. Methods of solutions.</li> <li>Original and image. Laplace transform.</li> <li>Solving differential equations and systems of differential equations by the method of</li> </ul> |   |   |  |   |
| Literature:                 | Literature 1. Khasar<br>2.Yuzhov A.Q., Mir<br>A First Course in Or<br>Kotlin, O'reilly Mec  | tov Compiled A.B., An introduction to the theory of ord<br>zakarimov E.M., Ordinary differential equations in the I<br>rdinary Differential Equations.bookboon.com G. Black<br>lia, 2021.   | linary differential ea<br>Maple system, Tash<br>Mike, Mike Dunn, T                                      | quations, 7<br>kent 2013<br>Programm                            | Furan-Press<br>. 3. Norbert<br>ning Androi                     | s 2019.<br>Euler.<br>id with              |

| 3.5. Probability              | and Statistics  |  |  |  |  |
|-------------------------------|---|--|--|--|--|
| Semestr:                      | 3   |  |  |  |  |
| Date of last<br>modification: | 31.08.2023  |  |  |  |  |
| Teachers:                     | Kalandarov Utkir Namozovich   |  |  |  |  |
| Component:                    | Compulsory  |  |  |  |  |
| Cycle:                        | Core  |  |  |  |  |
| ECTS:                         | 6   |  |  |  |  |
| Pre-requisities               | Differential Equations  |  |  |  |  |
| Workload:                     | Types of classes  | Hours  |  |  |  |
|                               | Total   | 180  |  |  |  |
|                               | Lecture   | 42   |  |  |  |
|                               | Practical works   | 30   |  |  |  |
|                               | SAW (Student autonomous work)   | 108  |  |  |  |
|                               | Form of final control   | Exam   |  |  |  |
|                               | Final assessment method   | Testing  |  |  |  |
| Control forms:                | Current control, Mid-term control, Final control  |  |  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in control, to obtain admission to the final control   | total for 2 types of   |  |  |  |
| Final control                 | The final exam is taken in the form of a test, which contain  | ns 25 questions.   |  |  |  |
|                               | worth 2 points each, tests are divided into 3 levels of difficulty. Total exam time 60 minutes  |  |  |  |  |
| Short content:                | Probability and statistics course is branch of mathematics dealing with data,<br>uncertainty, and the analysis of random phenomena. Probability theory provides a<br>mathematical framework for quantifying the likelihood of events and understanding<br>random processes. Statistics involves collecting, analyzing, interpreting, and presenting<br>data. The course is essential fundamentally for students |  |  |  |  |
| Goal:                         | The purpose of studying probability and statistics is to prepare students to handle<br>data and uncertainty in scientific research, engineering, business, and everyday life. This<br>subject provides the skills necessary to collect, analyze, and draw meaningful<br>conclusions from data, enabling informed decision-making and effective problem-<br>solving in a wide range of fields.                   |  |  |  |  |
| Objective:                    | To learn the principles of probability theory and sta<br>analyzing, interpreting, and making decisions based on data, v<br>understanding randomness and variability in various contexts.  | tistical methods for<br>vith an emphasis on                        |  |  |  |
| Learning                      | After studying the discipline, students should be able to:  |  |  |  |  |
| outcome:                      | LO 1. Familiarization with the basic definitions and theorems of the and statistics "   | e subject "Probability   |  |  |  |
|                               | statistics"<br>LO 3. Obtaining skills in the application of mathematical concepts   | and studied methods  |  |  |  |
|                               | of analysis.<br>LO 4. Mastering the skills of representation and allocation of commodels  | ntinuous and discrete  |  |  |  |
|                               | LO 5. Information-related process analysis skills.<br>LO 6. Increases the giftedness of students, manifests the skills of lo<br>thinking in students.   | gical and algorithmic  |  |  |  |
| Teaching                      | In the conditions of the credit system of education, classes  | are conducted mainly   |  |  |  |
| methods:                      | in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manage<br>the acquisition of experience in independent problem solving shoul<br>- technology of problem- and project-based learning;  | nods and technologies<br>gement of knowledge,<br>ld be emphasized: |  |  |  |

|                             | <ul> <li>technologies</li> <li>communicatidebates and ot</li> <li>case-study m</li> <li>game technologiames;</li> <li>information a</li> <li>In order to depen question</li> <li>"INSERT", ha</li> </ul>   | of educational and research activities;<br>on technologies (discussion, press-confe<br>her active forms and methods);<br>hethod (analysis of situations);<br>logies, in which students participate in t<br>and communication (including distance I<br>velop critical thinking among students,<br>ns", "Cluster", "Cross-discussion", "H<br>nds-on activities, gamification and others  | erence, brainste<br>business, role-<br>earning) techr<br>such methods<br>Know-Want t<br>s are actively u  | orming<br>playing<br>nologie<br>as "Pre<br>o Kno<br>used dui   | , educat<br>g, simul<br>s.<br>ediction<br>pw-Learn<br>ring prac  | ional<br>ation<br>with<br>ned",<br>ctical  |
|-----------------------------|--|--|---|--|--|--|
| Assessment of the student's |  | Type of task   | Number of   | points   | Total  |  |
| knowledge:                  |  | $\mathbf{D}$ montional superly $(1, 2)$  | (IIIax)   |  |  |  |
|                             | Current  | Independent work (1-2)   | 12  | 37   |  |  |
|                             | Milter   |  | 12  |  | 100  |  |
|                             | control  | Written work   | 13  |  | 100  |  |
|                             | Final control  | Exam (Testing)   | 50  |  |  |  |
|                             | <ul> <li>Probability<br/>Determinat<br/>Kolmogoro</li> <li>Theorems<br/>Theorems<br/>group of ev<br/>Dependent<br/>dependent</li> <li>Conditiona<br/>(assumptio)</li> <li>A sequence<br/>Poisson's to<br/>probable m<br/>multiple ev</li> <li>Random va</li> <li>The main to<br/>variance, m<br/>median.</li> <li>The most<br/>Binomial,<br/>hypergeom</li> <li>The most co<br/>normal dis<br/>distribution</li> <li>A system of<br/>a discrete<br/>properties,<br/>and its prop</li> <li>Numerical<br/>correlation<br/>distribution</li> <li>The law of<br/>of large m<br/>theorem. E<br/>random van</li> </ul> | revents. Operations on events. Elements<br>definitions. Statistical, classical, geo<br>tion of probability when the space of<br>ov's axioms.<br>of addition and multiplication of proba<br>of addition of probabilities of joint and<br>vents. Opposite events. The probability of<br>and independent events. Theorems of<br>and independent events. Theorems of<br>and independent events.<br>I probability. The formula of total proba<br>ns). The Bayes formula.<br>theorem. Local and integral theorems<br>umber of occurrences of an event in the Events<br>in the Bernoulli scheme.<br>ariables. Types of random variables. Way<br>numerical characteristics of random variables. The<br>active distributions are of the discri-<br>geometric and Poisson distributions,<br>netric distribution.<br>ommon distributions are of the continuous<br>tributions. The law of three sigma. As<br>n.<br>of two random variables. The law (matrix<br>two-dimensional random variable. The<br>distribution density of a continuous<br>perties<br>characteristics of a random vector. The<br>coefficient and its properties. Two-d<br>ns.<br>large numbers. The central limit theorem<br>umbers for a sequence of independent<br>Bernoulli's theorem. The central limit theorem<br>and the proves theorem, Laplace's theorem and the proves theorem. The central limit theorem<br>and the proves theorem, Laplace's theorem and theorem and the proves theorem. The central limit theorem and the proves theorem and theorem and the proves theorem. The central limit theorem and theor | of combinato<br>metric definit<br>elementary e<br>abilities. Cond<br>incompatible<br>f occurrence of<br>multiplication<br>bility. Probab<br>cheme. The<br>of Moivre–I<br>Bernoulli scher<br>ys to set them.<br>iables. Mather<br>moments of t<br>rete type. Ber<br>negative bir<br>us type. Unifor<br>ymmetry and<br>) of the probal<br>he distributio<br>two-dimensio<br>a coefficient<br>imensional ne<br>a Chebyshev's<br>random vari- | rics.<br>ion of<br>vents i<br>ditional<br>events.<br>of at lea<br>of pro-<br>ilities o<br>Bernou<br>Laplace<br>ne. Exp<br>natical<br>he kth<br>rnoulli<br>omial<br>rm, exp<br>excess<br>bility d<br>n func<br>nal ran-<br>of cov<br>ormal<br>inequa<br>iables.<br>enticall | probab<br>is count<br>probab<br>A com<br>ist one e<br>obabilitie<br>of hypoth<br>illi forr<br>e. The<br>perience<br>expecta<br>order, n<br>distribut<br>distribut<br>onential<br>. Chi sc<br>istribution<br>tion and<br>dom var<br>ariance.<br>and uni<br>lity. The<br>Chebysl<br>y distribu | ility.<br>able.<br>ility.<br>plete<br>vent.<br>es of<br>neses<br>nula.<br>most<br>with<br>ttion,<br>node,<br>ttion.<br>ttion,<br>, and<br>quare<br>on of<br>d its<br>iable<br>The<br>form<br>e law<br>hev's<br>puted |

|             | <ul> <li>The main tasks of mathematical statistics. The subject of mathematical statistics. Primary sampling analysis. The variation series. Graphs of the variation series. The empirical distribution function. Polygon, histogram. Numerical characteristics of the sample</li> <li>Statistical estimates of unknown distribution parameters. The concept of statistics and statistical evaluation. Evaluation properties: non-bias, consistency, efficiency. Disadvantages of point estimates. Methods of finding estimates: the method of moments, the method of maximum likelihood.</li> <li>Interval estimates. Confidence interval, confidence probability (reliability). Confidence intervals. The concept of confidence probability. The confidence interval and the accuracy of the estimate. The confidence interval for the mean value of the normal distribution for unknown and known cases of standard deviation σ. The confidence interval for the or^2 variance of the normal distribution.Determination of the sample size n.</li> <li>Statistical hypotheses. Types of statistical hypotheses. Errors of the I and II kind. The power of the criterion. The critical area. The stages of testing statistical hypotheses. Testing hypotheses about the average value of the normal distribution with a known and unknown standard deviation σ, testing hypotheses about the variance of the normal distribution.</li> <li>The criteria for Pearson and Kolmogorov's agreement. Verification of the statistical hypothesis about the type of unknown distribution using Pearson's χ^2 agreement criterion analysis. The linear correlation coefficient and its properties.</li> <li>Regression analysis. The equations. OLS for estimating the parameters of multidimensional regression. Regression equations. Publication analysis of variance. Models of univariate and multifactorial analysis of variance. Schemes of variance analysis.</li> </ul> |
|-------------|--|
| Literature: | 1. Robert Hogg., Elliot Tanis., Dale Zimmerman., Probability and Statistical Inference, 10th edition. Pearson 2019. 2.<br>Pappu Kousalya., Probability, Statistics and Random Processes Pearson 2013. 3. Richard A., Johnson., Probability and<br>Statistics for Engineers 9th edition (Global Edition). Pearson 2017. 4. Morris DeGroot ., Mark Schervish ., Instructor's<br>Solutions, Manual for Probability and Statistics 4th edition. Pearson 2012. 5. Michael Akritas., Probability & Statistics<br>with R for Engineers and Scientists Pearson 2016.   |

| 3.6. Discrete Structures      |   |   |  |  |  |  |
|-------------------------------|---|---|--|--|--|--|
| Semestr:                      | 2   |   |  |  |  |  |
| Date of last<br>modification: | 31.08.2023  |   |  |  |  |  |
| Teachers:                     | Begimov Oybek Mamarasulovich, Rakhmonova Nilufar Normurodovna   |   |  |  |  |  |
| Component:                    | Compulsory  |   |  |  |  |  |
| Cycle:                        | Core  |   |  |  |  |  |
| ECTS:                         | 4   |   |  |  |  |  |
| Pre-requisities               | -   |   |  |  |  |  |
| Workload:                     | Types of classes  | Hours   |  |  |  |  |
|                               | Total   | 120   |  |  |  |  |
|                               | Lecture   | 30  |  |  |  |  |
|                               | Practical works   | 18  |  |  |  |  |
|                               | SAW (Student autonomous work)   | 72  |  |  |  |  |
|                               | Form of final control   | Exam  |  |  |  |  |
|                               | Final assessment method   | Testing   |  |  |  |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |  |  |  |  |
| Final control                 | The final exam is taken in the form of a test, which contain 2 points each, tests are divided into 3 levels of difficulty. Total exam   | s 25 questions, worth<br>m time 60 minutes  |  |  |  |  |
|                               | discrete structures, sets, subsets, basic operations on sets, ordered sets, Cartesian product<br>of sets, binary relations and relation matrices, types of relations, basic rules of<br>combinatory, permutations without repetition, permutations and placements, Boolean<br>algebra, the concept of reasoning, Boolean functions, generality and accessibility<br>quantifiers, the laws of logic, construction of the truth table of logical functions, methods<br>for minimizing logical networks, Carnot cards, basic concepts of graph theory, Euler and<br>Hamilton graphs, forest, trees, tree properties, oriented graph, adjacency matrix of a<br>directed graph, route, chain, cycle in directed graphs, algorithms for finding the shortest  |   |  |  |  |  |
| Goal:                         | The purpose of mastering the discipline is to give students theoretical knowledge<br>and practical skills in learning Discrete structures   |   |  |  |  |  |
| Objective:                    | -understanding the fundamentals of Discrete structures:<br>-understanding the fundamentals of Discrete structures; -studying sets, subsets,<br>basic operations on sets, ordered sets, Cartesian product of sets, binary relations and<br>relation matrices, types of relations; -developing practical skills in basic rules of<br>combinatory, permutations without repetition, permutations and placements; -analyzing<br>Boolean functions, generality and accessibility quantifiers, the laws of logic, construction<br>of the truth table of logical functions, methods for minimizing logical networks, Carnot<br>cards; -studying basic concepts of graph theory, Euler and Hamilton graphs, forest, trees,<br>tree properties, oriented graph; -exploring modern trends adjacency matrix of a directed<br>graph, route, chain, cycle in directed graphs, algorithms for finding the shortest path |   |  |  |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Understand fundamentals of Discrete structures.<br>LO 2. Understand the sets, subsets, basic operations on sets, or<br>product of sets, binary relations and relation matrices, types of relat<br>LO 3. Possess skills in basic rules of combinatory, permutation<br>permutations and placements.<br>LO 4. Use boolean functions, generality and accessibility quantifie<br>construction of the truth table of logical functions, methods for<br>networks, Carnot cards.  | dered sets, Cartesian<br>tions<br>as without repetition,<br>ers, the laws of logic,<br>r minimizing logical |  |  |  |  |

|                             | LO 5. Use basic concepts of graph theory, Euler and Hamilton graphs, forest, trees, tree properties, oriented graph.<br>LO 6. Perform configuration of matrix of a directed graph, route, chain, cycle in directed graphs, algorithms for finding the shortest path.  |  |                    |        |       |  |  |
|-----------------------------|---|--|--------------------|--------|-------|--|--|
| Teaching<br>methods:        | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned",<br>"INSERT", hands-on activities, gamification and others are actively used during practical<br>classes.  |  |                    |        |       |  |  |
| Assessment of the student's |   | Type of task   | Number of<br>(max) | points | Total |  |  |
| knowledge:                  | Current   | Practical assignment (PA1, PA2, PA3)<br>Independent work | 20<br>10           | 40     |       |  |  |
|                             | Mid-term<br>control   | Personal assignment<br>Written work                      | 10                 | 10     | 100   |  |  |
|                             | Final control   | Exam (Testing)   |                    |        |       |  |  |
| Topics of<br>lectures:      | <ul> <li>Introductions Discrete structures and examples</li> <li>Sets. Operation on sets. Subsets.</li> <li>Sorted sets. Cartesian products. Properties of Cartesian products.</li> <li>Relations. Binary relations and their matrix. Types of relations. Equivalent relations.</li> <li>Mappings and functions. Originality, images and mapping in a limited set.</li> <li>Combinatory. Basic rules of combinatory. Permutations, placement, combinations.</li> <li>Boole's algebra. The concept of an utterance. Binary identities of propositional logic.</li> <li>Boole's functions. Equivalence of formulas. Community and existence quantifiers.</li> <li>The laws of logic. Building Truth Tables for Logic Functions. Normal forms.<br/>Maximum normal forms. Binary logic gates. Application of binary logic gates.</li> <li>Analysis and synthesis problems in logical circuits. Logical networks.</li> <li>Minimizing logical networks. Karnaugh map. Application of predicates as a mathematical model of feedback.</li> <li>Basic concepts of graph theory. Methods for defining graphs. Adjacency and Incident Matrices. Graph isomorphism.</li> <li>Routes, chains, cycles. Euler and Hamiltonian graphs. Planar graphs.</li> <li>Euler's formulas for plane graphs. Homeomorphism.</li> <li>Trees. Forest. Properties of trees. Spanning tree. Minimum spanning tree. Root tree.</li> <li>Directed graph. Digraph. Adjacency matrix for the digraph.</li> </ul> |  |                    |        |       |  |  |
| Literature:                 | - Koutes, chains, and loops for digraphs. Shortest Path Algorithms<br>Literature 1. Mathematical logic and discrete mathematics. T.: "Teacher", Toraev Kh, 2003. 2. Discrete mathematics for<br>programmers, Tekhnosphere, M., Haggarty R., 2003. 3. Discrete mathematics - M.: "Lan", Shevelev Yu.P., 2008. 4.<br>Discrete Math. "Phoenix", Aseev G.G., Abramov O.M., Sitnikov D.E., 2003 5. Discrete mathematics - Taganrog Radio<br>Engineering University, Taganrog, Kulabukhov S.Yu., 2001. 6. Problems and exercises in discrete mathematics. M.:<br>Nauka., Gavrilov G.P., Sapozhchenko A.A., 2005. 7. Discrete mathematics theory, problems, applications M.<br>Erussalimsky Ya.M., 2002.   |  |                    |        |       |  |  |

#### 4. General

| 4.1. Ecology                  |  |   |  |  |  |
|-------------------------------|--|---|--|--|--|
| Semestr:                      | 5  |   |  |  |  |
| Date of last<br>modification: | 31.08.2023   |   |  |  |  |
| Teachers:                     | Borisova Elena Anatolyevna   |   |  |  |  |
| Component:                    | Elective   |   |  |  |  |
| Cycle:                        | Secondary  |   |  |  |  |
| ECTS:                         | 4  |   |  |  |  |
| Pre-requisities               | -  |   |  |  |  |
| Workload:                     | Types of classes   | Hours   |  |  |  |
|                               | Lecture  | 30  |  |  |  |
|                               | Practical works  | 18  |  |  |  |
|                               | SAW (Student autonomous work)  | 72  |  |  |  |
|                               | Form of final control  | Exam  |  |  |  |
|                               | Final assessment method  | Testing   |  |  |  |
| Control forms:                | Current control, Mid-term control, Final control   | C   |  |  |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total  | for 2 types of control,   |  |  |  |
| requirements                  | to obtain admission to the final control   |   |  |  |  |
| Final control                 | The final exam is taken in the form of a test, which contains 2 points each, tests are divided into 3 levels of difficulty. Total example  | s 25 questions, worth<br>n time 60 minutes                                      |  |  |  |
| Short content:                | The main goal of environmental education is the formation of a conscious<br>attitude to environmental problems among all segments of the population,<br>including students of higher educational institutions.<br>The course "Ecology", taught in universities, should serve to form the scientific  |   |  |  |  |
| Goal:                         | Requirements for knowledge skills and abilities of students in teaching this   |   |  |  |  |
|                               | <ul> <li>subject:</li> <li>It is necessary to know the science of ecology and its tasks, the causes of environmental problems, environmental factors and their impact on organisms, ecosystems and the conditions for their sustainability, the current state of the natural environment and emerging environmental problems, the impact of scientific and technological progress on the environment:</li> <li>based on our national beliefs and values, to have the skills of reasonable, economical use of land, water, air and natural resources, any damage to nature can have extremely dangerous consequences for human life.</li> </ul> |   |  |  |  |
| Objective:                    | Technical competence: understanding and applying the principles of<br>rational environmental management, working with environmental legislation,<br>modeling environmental situations; - Analytical competence: critical analysis and<br>assessment of environmental systems, selection of the optimal resource saving<br>strategy; - Communicative and collaborative competence: teamwork, effective<br>communication and shared decision making in environmental projects.   |   |  |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Anow the basic patterns of functioning of living organisms, e<br>levels of organization, the biosphere as a whole and their.<br>LO 2. Be able to analyze problems associated with anthropogenic<br>on the environment.<br>LO 3. Have knowledge and skills in the field of environmental proto<br>LO 4. Know the concepts, strategies and practical tasks of sustain<br>various countries and the Republic of Uzbekistan.   | ecosystems at various<br>(technogenic) impact<br>ection.<br>able development in |  |  |  |

|                             | LO 5. To form in students a comprehensive, objective and creative approach to discussing the most pressing and complex problems of ecology, environmental protection and sustainable development.  |   |  |   |  |  |
|-----------------------------|--|---|--|---|--|--|
| Teaching<br>methods:        | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned",<br>"INSERT", hands-on activities, gamification and others are actively used during practical<br>classes. |   |  |   |  |  |
| Assessment of the student's |  | Type of task  | Number of j<br>(max)   | points  | Total  |  |
| knowledge:                  |  | Practical works (1-10)  | 20   |   |  |  |
|                             | Current control  | Independent work  | 12   | 40  |  |  |
|                             |  | Oral presentation   | 8  |   | 100  |  |
|                             | Mid-term<br>control  | Written work  | 10   | 100   |  |  |
|                             | Final control  | Exam (Testing)  | 50   |   |  |  |
| Topics of<br>lectures:      | <ul> <li>Ecology course</li> <li>The doctrine o</li> <li>Ecology of eco</li> <li>Environmental</li> <li>Atmosphere an</li> <li>Protection of v</li> <li>Preservation of</li> <li>Natural resource</li> <li>Pollution of the</li> <li>Problems of er</li> <li>Pollution of in</li> <li>Negative impa</li> <li>Universal envir</li> <li>The main direce</li> <li>The sphere of monitoring.</li> </ul>  | e, goal, task, structure and history<br>f the biosphere<br>systems<br>factors and their classification<br>ad its protection<br>water resources<br>f the lithosphere<br>ces and their rational use<br>e environment with various wastes<br>wironmental protection in the Republic<br>dustrial cities and their impact on the e<br>ct of the Aral Sea tragedy on the environ<br>ronmental problems. Regional environ<br>tions of environmental safety. Environ<br>f communication and its impact on | c of Uzbekistar<br>nvironment<br>onment.<br>mental probler<br>imental assess<br>the environme  | n.<br>ns.<br>nent.<br>ent. Env  | vironm   | ental  |
| Literature:                 | 1. Karimov I.A. Uzbek<br>of development. Uzbel<br>3. Rafikov A.A., Abir<br>TextbookT.2001. 5.<br>Abirkulov K.N., Abdu<br>the Republic of Uzbek   | Istan on the threshold of the 21st century: a threat to so<br>cistan 1997. 2. Abirkulov K.N., Kurbonniezov R. Fu<br>kulov K.N., Khodzhimatov A.N. Ecology, textbook<br>Tokhtaev A.S. Ecology. TextbookT.1998. 6. Yorn<br>lkosimov A., Khamdamov Sh. Social ecology, textbo<br>istan. Textbook-T.2004. 9. Environmental protection.  | ecurity. Conditions f<br>ndamentals of ecolo<br>-T. 2004. 4. Holliev<br>natova D.Yu. Indust<br>ok-T.2004. 8. Nign<br>Laws and rules. Jus | or stability<br>ogy. Urgen<br>v I., Ikrom<br>trial Ecolo<br>natov A. Ec<br>stice 2002 | and guar<br>ch. UDU,<br>ov A. Ec<br>gy - T.20<br>cological | antees<br>1999.<br>ology.<br>)07. 7.<br>law of |

| 4.2. Pedagogy. Psychology     |   |                         |  |  |  |
|-------------------------------|---|-------------------------|--|--|--|
| Semestr:                      | 5   |                         |  |  |  |
| Date of last<br>modification: | 31.08.2023  |                         |  |  |  |
| Teachers:                     | Yusupova Zamira Zaripovna, Zakirova Madina Rinatovna  |                         |  |  |  |
| Component:                    | Elective  |                         |  |  |  |
| Cycle:                        | Secondary   |                         |  |  |  |
| ECTS:                         | 4   |                         |  |  |  |
| Pre-requisities               | -   |                         |  |  |  |
| Workload:                     | Types of classes  | Hours                   |  |  |  |
|                               | Total   | 120                     |  |  |  |
|                               | Lecture   | 30                      |  |  |  |
|                               | Practical works   | 18                      |  |  |  |
|                               | SAW (Student autonomous work)   | 72                      |  |  |  |
|                               | Form of final control   | Exam                    |  |  |  |
|                               | Final assessment method   | Testing                 |  |  |  |
| Control forms:                | Current control, Mid-term control, Final control  |                         |  |  |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total   | for 2 types of control, |  |  |  |
| requirements                  | to obtain admission to the final control  |                         |  |  |  |
| Final control                 | The final exam is taken in the form of a test, which contains 25 questions, worth 2 points each, tests are divided into 3 levels of difficulty. Total exam time 60 minutes  |                         |  |  |  |
|                               | decision of the President of the Republic of Uzbekistan $N_{\odot}$ - 4851 of October 6, 2020<br>and the analysis and training of reforms being introduced to bring the education system<br>of the Republic of Uzbekistan to the level of world standards. focused on the study of<br>advanced strategic practices  |                         |  |  |  |
| Goal:                         | To be able to apply educational methods in the teaching of technical sciences<br>and in-depth training of individual and psychological characteristics of a person.   |                         |  |  |  |
| Objective:                    | <ul> <li>The maskur course consists of 2 parts; 1. In the pedagogy section, the development of pedagogy as a science, the methods used in the educational process, and the scientific foundations of advanced pedagogical technologies are covered. 2. The development of the science and its developed areas as a science are covered in the section of</li> </ul>   |                         |  |  |  |
|                               | characteristics of a person are scientifically explained. Purpose and   | strategy of             |  |  |  |
|                               | engineering psychology. The tasks of engineering psychology are c   | overed.                 |  |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Students will get an idea of the scientific research works of the<br>and Europe.  | inkers in Central Asia  |  |  |  |
|                               | <ul><li>LO 2. They will have knowledge about the "Strategy of actions for further development of the Republic of Uzbekistan" and reforms in the education system.</li><li>LO 3. Students will be able to show their abilities in innovative activity during the educational process, in the correct qualitative assessment of the pedagogue.</li><li>LO 4. They study the character, abilities and temperament of an IT specialist.</li><li>LO 5. They can acquire the qualities of management and leadership in education and production</li></ul> |                         |  |  |  |
|                               | LO 6. Students learn the operator's activities in the "Man-mac<br>educational process.<br>LO 7. Information-psychological security studies the manifestat<br>threats.   | chine" system in the    |  |  |  |

| Teaching          | In the cond   | itions of the credit system of educat         | ion. classes are     | e condu                                 | cted ma               | ainly   |  |
|-------------------|---|---|----------------------|---|-----------------------|---------|--|
| methods:          | in active and creative forms. Among the effective pedagogical methods and   |   |                      |   |                       |         |  |
|                   | technologies that promote active involvement of students in the search and manage   |   |                      |   |                       | nent    |  |
|                   | of knowledge, the acquisition of experience in independent problem solving sho  |   |                      |   |                       |         |  |
|                   | emphasized:   |   | I                    | U                                       |                       |         |  |
|                   | - application of peo  | lagogical technologies in the proces          | s of education;      |   |                       |         |  |
|                   | - pedagogical scien   | tific research methods;                       |                      |   |                       |         |  |
|                   | - study of personal   | ty and psychological methods (que             | stionnaire, inter    | view, c                                 | bserva                | tion,   |  |
|                   | experiment, laborat   | tory, test and sociometric methods)           | •                    |   |                       |         |  |
|                   | - case-study metho  | d (analysis of situations);                   |                      |   |                       |         |  |
|                   | - through the metho   | ods of psychotraining, students try the       | hemselves as h       | olders c                                | of vario              | us      |  |
|                   | professions;  |   |                      |   |                       |         |  |
|                   | - information and c   | ommunication (including distance l            | earning) techno      | ologies.                                |                       |         |  |
|                   | In order to develop   | logical thinking among students, m            | ethods such as       | "Brains                                 | stormin               | ıg",    |  |
|                   | "Cluster", "Problem   | natic education", "Know-I-want-to-            | learn", "INSER       | T", pra                                 | ctical                |         |  |
|                   | exercises, gamifica   | tion and others are actively used du          | ring practical ti    | aining.                                 |                       |         |  |
| Assessment of     |   | Type of tesk                                  | Number of p          | points                                  | Total                 |         |  |
| the student's     |   | Type of task                                  | (max)                |   | 10141                 |         |  |
| knowledge:        |   | Practical works (1-10)                        | 20                   |   |                       |         |  |
|                   | Current control   | Independent work                              | 10                   | 40                                      |                       |         |  |
|                   |   | Oral presentation                             | 10                   |   | 100                   |         |  |
|                   | Mid-term control  | Written work                                  | 10                   |   |                       |         |  |
|                   | Final control   | Exam (Testing)                                | 50                   |   | -                     |         |  |
|                   |   | C 1   | 50                   |   |                       |         |  |
| Topics of         | - History and theor   | y of pedagogy.                                |                      |   |                       |         |  |
| lectures:         | - Person as an obje   | ct and subject of education.                  | tachnologiag         |   |                       |         |  |
|                   | - Educational meth  | acional Tasks and research method             | technologies.        | v Inton                                 | rolation              | ahin    |  |
|                   | - r sychology as a  | webology with other sciences                  | is of psycholog      | y. mei                                  | relation              | isinp   |  |
|                   | Cognitive proces  | ses Activity and its types. The rol           | e of psycholog       | rical kr                                | owledg                | re in   |  |
|                   | human activity M  | otive and motivation Motivation of            | of social behav      | ior Co                                  | nscious               | and     |  |
|                   | unconscious motiv   | es.   |                      |   | liserous              | una     |  |
|                   | - Individual psych  | ological characteristics of a person          | (character, abi      | litv. ten                               | nperam                | ent).   |  |
|                   | Communication a   | and its types. Psychology of interper         | sonal relations      |   | <b>T</b>              | ,.      |  |
|                   | - Engineering psyc  | hology as a branch of labor psychol           | ogy.                 |   |                       |         |  |
|                   | - Labor regime and its psychological essence. Ouality of labor and psychotechnological  |   |                      |   |                       |         |  |
|                   | issues of its provision.  |   |                      |   |                       |         |  |
|                   | - Subject of engine   | eering psychology. Purpose and str            | ategy of engine      | eering j                                | osychol               | logy.   |  |
|                   | Tasks of engineering psychology.  |   |                      |   |                       |         |  |
|                   | - Research methods and general features in engineering psychology. Psychological  |   |                      |   |                       |         |  |
|                   | methods. Physiol  | ogical methods. Mathematical meth             | ods. Imitation       | method                                  | s.                    |         |  |
|                   | - Features of class   | ification of "man-machine" system             | . Operator in t      | he "ma                                  | n-mach                | nne"    |  |
|                   | system.   |   | . • •                |   |                       |         |  |
|                   | - Human-Machine   | Collaboration. Sensorimotor require           | ements in work       |   |                       |         |  |
|                   | - Psychological inf   | ormation security and social develo           | pment.               |   |                       |         |  |
|                   | - Manifestations at   | a sources of threats to the informat          | ion and psychol      | ologica                                 | l securi              | ty of   |  |
|                   | the individual, society and the state.  |   |                      |   |                       |         |  |
|                   | - I sychological se   | n-protection of a person in the con           | unions of oper       | 1 1111111111111111111111111111111111111 |                       | ation   |  |
| I it on a torrest | 1 BM Umarov Psychol   | agy Texthook - T 2012 2 F Mominov Sh I        | Sarotov and others   | Informatio                              | n nevehol             | logical |  |
| Literature:       | security in open informati  | on systems. Textbook T.: "Science and techno  | logy", 2013. 3. S.K. | Ganiyev,                                | M.M. Ka               | rimov,  |  |
|                   | K.A. Tashev. Information  | n security. Textbook, Tashkent-2017.4. T.A. F | ugelova. Engineerin  | g psychol                               | logy. Tex<br>Methodol | tbook,  |  |
|                   | Moscow-2019. 5. S.V. Andrievskaya. Engineering psychology, pedagogy and team management. Methodological recommendations for seminar classes, Novopolotsk, Belarus – 2022. 6. Oktam Shamsiyev. Labor and engineering |   |                      |   |                       |         |  |
|                   | psychology. Textbook, Ta  | shkent-2024.                                  | 2                    |   | -                     | 2       |  |

| 4.3. Life safety              |   |   |  |  |  |
|-------------------------------|---|---|--|--|--|
| Semestr:                      | 6   |   |  |  |  |
| Date of last<br>modification: | 31.08.2023  |   |  |  |  |
| Teachers:                     | Saidova Gulchekhra Erkinovna  |   |  |  |  |
| Component:                    | Elective  |   |  |  |  |
| Cycle:                        | Secondary   |   |  |  |  |
| ECTS:                         | 4   |   |  |  |  |
| Pre-requisities               | -   |   |  |  |  |
| Workload:                     | Types of lessons  | Hour  |  |  |  |
|                               | Total   | 120   |  |  |  |
|                               | Lecture   | 30  |  |  |  |
|                               | Practical work  | 18  |  |  |  |
|                               | SAW (Student Autonomous Work)   | 72  |  |  |  |
|                               | Final control form  | Exam  |  |  |  |
|                               | Final evaluation method   | Test  |  |  |  |
| Control forms:                | Current control, Mid-term control, Final control  | <u> </u>  |  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |  |  |  |
| Final control                 | The final exam is taken in the form of a test, which contain  | s 25 questions, worth   |  |  |  |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total exam time 60 minutes  |   |  |  |  |
| Goal:                         | students aimed at in-depth study of theoretical knowledge with the help of practical skills.<br>Life safety is the creation of normal human life conditions, protection of him and the<br>environment (production, environment, everyday life) from dangerous and harmful<br>factors of a natural and man-made nature.<br>The course "Life Safety" provides basic concepts and definitions in the<br>production and performance of work in private life. Defines visual concepts in the field |   |  |  |  |
|                               | basis for the application of various types of lighting and noise effect<br>and the environment.   | ts on the human body  |  |  |  |
| Objective:                    | Distinguish ergonomic features of workplaces (ligh microclimate).   | t, noise, vibration,  |  |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be ab LO 1. Have an idea of the harmful effects of radiation on the l environment $I O 2$ . Distinguish types, means of fire safety systems, as well as classified of the safety systems.  | le to:<br>human body and the  |  |  |  |
|                               | LO 2. Distinguish types, means of fire safety systems, as wen as erach<br>hazard<br>LO 3. Distinguish between methods and means of human prot<br>situations   | ection in emergency   |  |  |  |
|                               | LO 4. He will get an idea of the main directions of the labor legisl<br>of Uzbekistan, protection of employees, current benefits<br>LO 5. Learns about modern electrical safety systems and the mecha   | ation of the Republic<br>nisms of the effect of                                   |  |  |  |
|                               | electricity on the human body   |   |  |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, lessons<br>in active and creative forms. Among the effective pedagogical meth<br>that help students actively participate in the search and managemen<br>worth noting the acquisition of independent problem-solving experi-<br>problem-based and project-based educational technology;<br>- educational and scientific activity technologies;  | are mainly conducted<br>nods and technologies<br>nt of knowledge, it is<br>ience: |  |  |  |
|                               | - communication technologies (discussion, press conference, brains<br>debates and other active forms and methods);  | storming, educational   |  |  |  |

|                             | <ul> <li>- case-study method (situation analysis);</li> <li>- game technologies in which students participate in business, role-playing, simulation games;</li> <li>- information and communication (including distance education) technologies.</li> <li>In order to develop critical thinking among students, methods such as "Prediction with open questions", "Cluster", "Mutual discussion", "Know-I-want-to-learn", "INSERT",</li> </ul>                                  |  |                      |          |           |       |  |  |  |
|-----------------------------|---|--|----------------------|----------|-----------|-------|--|--|--|
|                             | practical exercises,  | etc. gamification and others are activ   | vely used durin      | g practi | cal train | ning. |  |  |  |
| Assessment of the student's |   | Type of task   | Number of j<br>(max) | points   | Total     |       |  |  |  |
| knowledge:                  |   | Practical works (1-10)   | 20                   |          |           |       |  |  |  |
|                             | Current control   | Independent work   | 10                   | 40       |           |       |  |  |  |
|                             |   | Oral presentation  | 10                   |          | 100       |       |  |  |  |
|                             | Mid-term control  | Written work   | 10                   |          |           |       |  |  |  |
|                             | Final control   | Exam (Testing)   | 50                   |          | -         |       |  |  |  |
| lectures:                   | <ul> <li>The main content,</li> <li>Ergonomics of pr</li> <li>Types, systems a</li> <li>The effect of nois</li> <li>The effect of election</li> <li>Ionizing radiation</li> <li>Electrical safety:</li> <li>human body to ele</li> <li>The main factors against exposure to</li> <li>Electrical device</li> <li>First aid in case of</li> <li>First aid for injur</li> <li>Legal and organi</li> <li>Fire safety.</li> <li>Emergencies, the</li> <li>Negative impact</li> </ul> | Final controlExam (Testing)50-The main content, purpose and objectives of the science of safety of life activities Ergonomics of production buildings Types, systems and features of lighting The effect of noise and vibrations on the human body The effect of electromagnetic fields on the human body Ionizing radiation in telecommunication enterprises Electrical safety: the effect of electric current on the human body, the resistance of the human body to electric current The main factors of damage to a person from electric current, methods of protection against exposure to electric current Electrical device protection tools First aid in case of emergency First aid for injuries and wounds Legal and organizational foundations of the safety of life activities Fire safety Emergencies, their types and characteristics. |                      |          |           |       |  |  |  |
| Literature:                 | 1. Ecology and life safety: A textbook for university students / ed. L. A. Muravey, 2016. 2. Safety and ecology of life activities. Sapaev M.S., Kadyrov F.M. Tutorial, Tashkent - "contact person" -2019, 276p. 3. O.D.Rakhimov, I.X.Siddikov, M.O.Murodov, Safety of life activities. Ecology. Textbook for Bachelor's degree courses in higher education. T.: "The liaison", 2017-332 p.   |  |                      |          |           |       |  |  |  |
| 4.4. Power sup                | ply for infocommunication systems  |  |  |
|-------------------------------|--|--|--|
| Semestr:                      | 6  |  |  |
| Date of last<br>modification: | 31.08.2023   |  |  |
| Teachers:                     | Amurova Natalya Yurievna   |  |  |
| Component:                    | Elective   |  |  |
| Cycle:                        | Secondary  |  |  |
| ECTS:                         | 4  |  |  |
| Pre-requisities               | -  |  |  |
| Workload:                     | Types of classes   | Hours  |  |
|                               | Total  | 120  |  |
|                               | Lecture  | 30   |  |
|                               | Practical works  | 18   |  |
|                               | SAW (Student autonomous work)  | 72   |  |
|                               | Form of final control  | Exam   |  |
|                               | Final assessment method  | Testing  |  |
| Control forms:                | Current control, Mid-term control, Final control   |  |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total  | for 2 types of control   |  |
| requirements                  | to obtain admission to the final control   | for 2 types of control,  |  |
| Final control                 | The final exam is taken in the form of a test, which contains 25 questions, worth 2 points each, tests are divided into 3 levels of difficulty. Total exam time 60 minutes   |  |  |
|                               | supply of infocommunication systems is ensured through the analysis systems and the study of power equipment, which allows students knowledge to analyze and optimize complex systems, identifying a problems in practice.<br>Creative design of innovative energy solutions aimed at deverse reliable energy systems and devices requires students to be able to a design knowledge to create technically sound and innovative solutions. | is of electrical power<br>s to apply theoretical<br>and solving technical<br>eloping efficient and<br>pply engineering and<br>ons. |  |
| Goal:                         | The acquisition of creative, design and engineering exper<br>achieved through practical work with power equipment, as well as<br>documentation, which contributes to the deepening of their technic<br>the development of professional skills necessary for effective work<br>supply of infocommunication systems.   | rience by students is<br>analysis of technical<br>cal competencies and<br>in the field of power                                    |  |
| Objective:                    | - Technical competence: understanding and application of elect<br>principles, working with technical documentation and modeling pr<br>Competence: critical analysis and assessment of electrical power<br>optimal technical solutions; - Communicative and collaborative con<br>effective communication and shared decision making in electrical p   | rical power systems<br>rograms; - Analytical<br>systems, selection of<br>mpetence: teamwork,<br>rojects.                           |  |
| Learning                      | After studying the discipline, students should be able to:   |  |  |
| outcome:                      | LO 1. Analyze and evaluate the parameters of power supply of facilities.   | f infocommunication  |  |
|                               | and energy efficiency.   | rements of reliability   |  |
|                               | LO 5. Use and interpret technical documentation and electrical stan<br>LO 4. Apply methods and technologies to reduce electricity losses in  | uards.<br>n infocommunication  |  |
|                               | systems.<br>LO 5. Develop and implement solutions for integrating renewable<br>power supply systems.<br>LO 6. Manage relay protection and automation systems for electrica   | e energy sources into<br>al power systems  |  |

| Teaching<br>methods:        | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned",<br>"INSERT", hands-on activities, gamification and others are actively used during practical   |   |  |  |  |  |
|-----------------------------|--|---|--|--|--|--|
| Assessment of the student's |  | Type of task  | Number of j  | points   | Total  |  |
| knowledge:                  |  | Practical works (1-10)  | 20   |  |  |  |
|                             | Current control  | Independent work  | 10   | 40 100   |  |  |
|                             | Current control  | Oral presentation   | 10   |  | 100  |  |
|                             | Mid torm control   | Written work  | 10   |  |  |  |
|                             | Final control  | From (Testing)  | 50   |  | _  |  |
|                             | Final control  | Exam (Testing)  |  |  |  |  |
| lectures:                   | <ul> <li>Organization of power supply in information and communication systems.</li> <li>Quantities and parameters characterizing electrical energy. Units. Basic laws. DC and AC power supply systems.</li> <li>Primary and secondary sources of power supply. Renewable and non-renewable energy sources.</li> <li>Solar energy. Information about solar energy. Types of solar devices. Solar collectors</li> <li>Analysis of the development of wind energy devices. Environmental aspect.</li> <li>Mechanisms and forms of organization and management of processes in electrical stations and substations of power supply systems of infocommunication facilities.</li> <li>The role of devices for transmitting and distributing electrical energy of infocommunication objects.</li> <li>Transformation and distribution of electrical energy. Essential elements. Single and three-phase transformers, structure and principle of their operation.</li> <li>Rectifiers and converters for power supply of infocommunication facilities.</li> <li>Uninterrupted power supply.</li> <li>Devices for controlling energy efficiency and resource efficiency in information and communication devices.</li> <li>Relay protection and automation of electrical energy losses at facilities and infocommunication devices.</li> <li>Accounting and control of production and consumption of electrical energy in infocommunication systems. ASKUE system.</li> <li>Climate control devices for infocommunication systems. Security of service and remember.</li> </ul> |   |  |  |  |  |
| Literature:                 | 1. The Essential Guide to<br>Language: English. Paper<br>Monk. Practical Electroni<br>ISBN: 978-0-07-177134<br>© 2015 by David Cook. I<br>Portable World - A Hand<br>4th edition (2016). ISBN-   | Power Supplies. Edited by Gary Bocock. Publish<br>rback: 156 pages. ISBN-10: 1634433432. ISBN<br>ics for Inventors. Third Edition. p 1120. Copyrig<br>4. MHID: 0-07-177134-4. 3. David Cook. Robot B<br>SBN-13 (pbk): 978-1-4842-1360-5. ISBN-13 (el-<br>book on Rechargeable Batteries for Non-Enginer<br>10: 0968211844, ISBN-13: 978-0968211847. | er: XP Power; First<br>-13: 978-163443343<br>ght © 2013 by The<br>uilding for Beginners<br>ectronic): 978-1-484<br>ers" Isidor Buchman | Edition (Ja<br>33. 2. Paul<br>McGraw-I<br>s, Third Ed<br>2-1359-9.<br>n. Cadex I | nuary 1,<br>Scherz,<br>Hill Comj<br>ition. Cop<br>4. Batteri<br>Electronic | 2014).<br>Simon<br>panies.<br>pyright<br>es in a<br>cs Inc.; |

## 5. Fundamental

| 5.1. Programming              | I  |  |  |
|-------------------------------|--|--|--|
| Semestr:                      | 1  |  |  |
| Date of last<br>modification: | 31.08.2023   |  |  |
| Teachers:                     | Ishniyazov Odil Olimovich, Shobdarov Elbek Bekkadir uli  |  |  |
| Component:                    | Compulsory   |  |  |
| Cycle:                        | Secondary  |  |  |
| ECTS:                         | 6  |  |  |
| Pre-requisities               | Calculus   |  |  |
| Workload:                     | Types of classes   | Hours  |  |
|                               | Total  | 180  |  |
|                               | Lecture  | 30   |  |
|                               | Practical works  | 42   |  |
|                               | SAW (Student autonomous work)  | 108  |  |
|                               | Form of final control  | Testing  |  |
|                               | Final assessment method  | Fyam   |  |
| Controlformer                 | Current control Mid town control Einel control   | LAdin  |  |
| Control forms:                | Current control, Mid-term control, Final control   | for 2 true of operation  |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total  | for 2 types of control,  |  |
| Final control                 | The final evan is taken in the form of a test, which contain   | e 25 questions worth   |  |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total example  | m time 60 minutes  |  |
| Short content:<br>Goal:       | The purpose of teaching science is to teach students the fundamental concepts of programming languages and algorithmic methods, to solve practical problems related to various fields, to teach logical thinking, to create applications in various programming environments and to develop their skills in practice.<br>The aim of training is to teach students fundamental concepts and methods of algorithmic programming languages, solving practical problems related to various fields, logical thinking, formation of skills to create applications in various programming   |  |  |
| Objective:                    | <ul> <li>- formation of optimization thinking; - development of mathematical and algorithmic intuition in solving problems encountered in practice; - formation of basic knowledge in the field of algorithmization and programming; - mastering analytical and numerical methods of solving applied problems.</li> </ul>  |  |  |
| Learning outcome:             | After studying the discipline, students should be able to:<br>LO 1. Understand and use basic programming concepts, linear, branching and iterative<br>structures, functions and properties of arrays, files and strings.<br>LO 2. Will have the ability to critically analyze and evaluate the achievements of modern<br>science, solve research and practical problems, including creating new ideas in<br>interdisciplinary fields.<br>LO 3. Must have the skills to develop a software product with a user-friendly interface<br>based on a functional and object-oriented approach to programming using modern syntax<br>of programming languages to solve specific problems |  |  |
| Teaching methods:             | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brains<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);  | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized:<br>storming, educational |  |

|                   | <ul> <li>game technologies, in which students participate in business, role-playing, simulation games;</li> <li>information and communication (including distance learning) technologies.</li> <li>In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned", "INSERT", hands-on activities, gamification and others are actively used during practical</li> </ul>   |   |   |   |  |
|-------------------|---|---|---|---|--|
| Assessment of the | classes.  |   | Number of   | nointa  |  |
| student's         |   | Type of task  | (max)   | )<br>)  | Total  |
| knowledge:        | Current control   | Practical works (1-10)  | 30  | 40  |  |
|                   | Current control   | Independent work  | 10  | 40  | 100  |
|                   | Mid-term control  | Written work  | 10  |   | 100  |
|                   | Final control   | Exam (Testing)  | 50  |   |  |
| Literature:       | Final control         Exam (Testing)         50           Basic concepts of algorithms and programming. Algorithm properties and expression methods. Introduction to Programming. Compiler types. Identifier and their types.           Structure of programming languages. Organization of linear algorithms and calculation of algebraic expressions using mathematical library functions.           Branching and selection operators. Networking operators and their operation procedure. Ternary operator. Unconditional transition operator.           -Repetition operators. Parameterized repetition operator (for). Preconditional and postconditional repeating operators (while and do while)           -Functions. Function description. Recursive functions. Reload functions. Organization of user library.           -One-dimensional arrays. Static arrays. Methods for sorting and searching array elements. Methods of performing various operations on arrays.           -Multidimensional arrays. Static arrays. Methods for sorting and searching array elements. Methods of performing various operations on arrays.           -Working with pointers and dynamic memory. Dynamic arrays and their use as function parameters. Memory allocation functions.           -Strings and extended characters (in the Char category).           -Strings and extended characters (in the String category). String standard functions and manipulation of strings using them.           -Working with files.           -Fundamentals of object-oriented programming. Class and object concepts. Constructors.           -An array of objects. Relationships between classes.           -Enc |   |   |   |  |
| Luerauure:        | Textbook. – T.: "Nihol pri<br>C and C++. – T.: "Success<br>I and Programming II tu<br>Methodological manual fe<br>2017. 145 p.  | nt", 2021. – 604 b. 3. Nazirov Sh.A., Qobulov R.V<br>or- publishing house" LLC, 2013. – 488 p. 4. Abd<br>torial, 2022,141 p. 5. Xaydarova M.Y., Mallay<br>or performing laboratory work on the subject "F | V., Bobojanov M.R.,<br>ullayeva Z. Sh., Ishr<br>ev O.U., Abdullaye<br>Programming in C+ | , Raxmanov<br>niyazov O.C<br>eva Z.SH.,<br>+ (1 part) | 2 Q.S. Langua<br>D. Programmi<br>Sattarov A.<br>FUIT, Tashko |

| 5.2. Programming II           |  |   |  |  |
|-------------------------------|--|---|--|--|
| Semestr:                      | 2  |   |  |  |
| Date of last<br>modification: | 31.08.2023   |   |  |  |
| Teachers:                     | Ishniyazov Odil Olimovich, Shobdarov Elbek Bekkadir uli  |   |  |  |
| Component:                    | Compulsory   |   |  |  |
| Cycle:                        | Secondary  |   |  |  |
| ECTS:                         | 6  |   |  |  |
| Pre-requisities               | Programming I  |   |  |  |
| Workload:                     | Types of classes   | Hours   |  |  |
|                               | Total  | 180   |  |  |
|                               | Lecture  | 30  |  |  |
|                               | Practical works  | 42  |  |  |
|                               | SAW (Student autonomous work)  | 108   |  |  |
|                               | Form of final control  | Testing   |  |  |
|                               | Final assessment method  | Exam  |  |  |
| Control forms:                | Current control, Mid-term control, Final control   |   |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,   |  |  |
| Final control                 | The final exam is taken in the form of a test, which contains  | s 25 questions, worth   |  |  |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total example  | n time 60 minutes   |  |  |
| Snort content:                | The purpose of teaching science is to teach students the fundamental concepts of programming languages and algorithmic methods, to solve practical problems related to various fields, to teach logical thinking, to create applications in various programming environments and to develop their skills in practice.  |   |  |  |
| Goal:                         | The purpose of teaching the subject is to teach students the<br>oriented programming principles of programming languages<br>capabilities of programming languages, user interface capability<br>programming environment, and the ability to solve practical problec<br>fields.   | he concept of object-<br>and the advanced<br>ilities in a modern<br>ems related to various  |  |  |
| Objective:                    | The task of science is to accept technological innovations for s<br>acquire theoretical knowledge, practical skills, a methodological ap<br>processes related to various fields, as well as form a scientific world<br>technical knowledge using modern programming. languages and ap<br>their professional activities.  | tudent programmers,<br>pproach to events and<br>lview, solve issues of<br>pply their methods in   |  |  |
| Learning                      | After studying the discipline, students should be able to:   |   |  |  |
| outcome:                      | LO 1. Knowledge of concepts of classes and objects, contain inheritance, polymorphism, abstract concepts, features of progenvironment and can use them.<br>LO 2. will have the ability to critically analyze and evaluate the ach science, solve research and practical problems, including creating interdisciplinary fields.<br>LO 3. Must have the skills to analyze small projects used in indust friendly software products based on simple and optimal solutions to the statement of the statement | iners, encapsulation,<br>gramming in a GUI<br>dievements of modern<br>eating new ideas in<br>try and develop user-<br>o complex problems. |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brains<br>debates and other active forms and methods);   | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized:<br>storming, educational                        |  |  |

|                             | <ul> <li>case-study metho</li> <li>game technologie</li> <li>games;</li> <li>information and o</li> <li>In order to develogiopen questions",</li> <li>"INSERT", hands-<br/>classes.</li> </ul>  | d (analysis of situations);<br>es, in which students participate in<br>communication (including distance l<br>p critical thinking among students,<br>"Cluster", "Cross-discussion", "H<br>on activities, gamification and others  | business, role-playing<br>earning) technologies<br>such methods as "Pre<br>Know-Want to Kno<br>s are actively used dur  | g, simulation<br>ediction with<br>w-Learned",<br>ring practical  |  |  |
|-----------------------------|---|---|---|--|--|--|
| Assessment of the student's |   | Type of task  | Number of points<br>(max)   | Total  |  |  |
| knowledge:                  | Current control   | Practical works (1-10)  | <u>30</u><br>10<br>40   |  |  |  |
|                             | Mid-term control  | Written work  | 10  | 100  |  |  |
|                             | Final control   | Exam (Testing)  | 50  |  |  |  |
| lectures:                   | Final control       Exam (Testing)       50         •Working with templates in object-oriented programming. Template concept and their use. Methods of creating function templates, class templates and their use.         •Containers (Collections). STL libraries. Container classes. Linear containers (array, vector, deque, list, forward_list).         •Associative containers. Associative containers (set, map, multiset, multimap).         •Container adapters. Stack, queue, priority_queue. Algorithms for working with containers.         •Working with numeric classes. Numerical classes and working with them (complex, vallaray, slice, gslice, etc.).         •Programming in the Visual Studio environment. Menus and toolbars in the Visual Studio environment.         •Programming in a GUI environment. Programming in a GUI environment. Menus and toolbars in a GUI environment.         •Working with components. Component concept and properties. Working with forms.         •Working with components. Component concept and properties. Data input and output components.         •Working with components. Components for branching and selection. Components for working with arrays.         •Graphical capabilities in a GUI environment. Graphical state, build images and function graphs (Chart) in GUI environment.         •Working with dialog boxes. Dialog windows and their configuration, control elements in the GUI environment.         •Working with dialog boxes. Connecting dialog boxes and creating message boxes in a GUI environment. |   |   |  |  |  |
|                             | <ul> <li>T.: "Nihol print", 2021.</li> <li>T.: "Successor- publishin,<br/>simultaneously in Canada<br/>in Visual C++ // "Comm<br/>Practice Using C++ (2n<br/>R.Xoldorboev Methodica</li> </ul>  | – 604 b. 3. Nazirov Sh.A., Qobulov R.V., Bobojano<br>g house" LLC, 2013. – 488 p. 4. Horton IBegi<br>–2016. –P. 988. 5. Mallayev O.U., Qurbonov N.<br>unicator". UzRO and OMTV, 2019, 224 p. 6. Bj<br>d Edition). Person Education, Inc. 2014. secon<br>l guide to learning C++ programming language (2 | w M.R., Raxmanov Q.S. Langu<br>nning Visual C++ 2012/ I.F.<br>M., Xaydarova M.Yu. Creati<br>arne Stroustrup. Programmir<br>nd printing, January 2015.<br>2015). | Jage C and C++. –<br>Iorton. Published<br>ing small projects<br>ig: Principles and<br>7. J.Axmadaliev, |  |  |

| 5.3. Engineerin               | g graphics   |   |
|-------------------------------|--|---|
| Semestr:                      | 3  |   |
| Date of last<br>modification: | 31.08.2023   |   |
| Teachers:                     | Modullayev Jahongir Sobir ugli   |   |
| Component:                    | Compulsory   |   |
| Cycle:                        | Core   |   |
| ECTS:                         | 6  |   |
| Pre-requisities               | Differential Equations   |   |
| Workload:                     | Types of classes   | Hours   |
|                               | Total  | 180   |
|                               | Lecture  | 42  |
|                               | Practical works  | 30  |
|                               | SAW (Student autonomous work)  | 108   |
|                               | Form of final control  | Exam  |
|                               | Final assessment method  | Testing   |
| Control forms:                | Current control, Mid-term control, Final control   |   |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in tota control, to obtain admission to the final control   | ll for 2 types of   |
| Final control                 | The final exam is taken in the form of a test, which contains  | s 25 questions, worth   |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total exar   | n time 60 minutes   |
|                               | transition laws is considered Representing a spatial body on a plan<br>planimetric image of it laws of the geometric modeling process stu<br>of spatial body elements from its planimetric image back to its spa<br>and study of transplant laws. Learning the laws of space shooting fr   | ne, that is, to create a<br>ady Interrelationships<br>atial position research<br>rom a model.                             |
| Goal:                         | The purpose of teaching the subject - "Engineering graphics" is to c<br>dimensional objects in space and their relationships, based on graph<br>the form of two-dimensional drawings on a plane, with the help of<br>programs and tools. It is to provide the level of knowledge require<br>standard, corresponding to the profile of the course on increasing and<br>and designing skills.  | connect various three-<br>nic models of space in<br>of computer graphics<br>ed by the educational<br>d developing drawing |
| Objective:                    | The purpose of the subject is to teach students the fundamentals design, drawing editing techniques, working with complex objects, drawing management tools, utilities, and 3D printing.   | of 3D modeling for drawing annotations,   |
| Learning                      | After studying the discipline, students should be able to:   |   |
| outcome:                      | <ul> <li>LO 1. To acquaint the student with the origin of drawing geomethistory and practical importance.</li> <li>LO 2. To develop constructive-geometric thinking in students and ability.</li> <li>LO 3. Development of spatial imagination, that is, memory imagination and the student of thinking, creativity and talent.</li> <li>LO 5. Research and study methods of solving geometric problem body on its flat image.</li> </ul>  | etry, its development<br>to form their design<br>ation in students.<br>as related to a spatial                            |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brains<br>debates and other active forms and methods); | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized:<br>storming, educational        |

|                             | <ul> <li>case-study metho</li> <li>game technologie</li> <li>games;</li> <li>information and c</li> <li>In order to develop</li> <li>open questions",</li> <li>"INSERT", hands-classes.</li> </ul>   | d (analysis of situations);<br>es, in which students participate in<br>communication (including distance l<br>o critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and other   | business, role<br>learning) techr<br>such methods<br>Know-Want t<br>s are actively t   | -playing<br>nologies.<br>as "Pree<br>to Know<br>used duri   | diction<br>w-Learn  | tion<br>with<br>ed",<br>tical                                    |
|-----------------------------|--|---|--|---|---|--|
| Assessment of the student's |  | Type of task  | Number of points (max)   |   | Total   |  |
| knowledge:                  |  | Practical works (1-10)  | 20   | <u>,</u>  |   |  |
|                             | Current control  | Independent work  | 5  | 30  |   |  |
|                             |  | Oral presentation   | 5  | _   | 100   |  |
|                             | Mid-term control   | Written work  | 20   |   |   |  |
|                             | Final control  | Exam (Testing)  | 50   |   |   |  |
| lectures:                   | <ul> <li>Geometric design</li> <li>Orthogonal proje</li> <li>Geometric object</li> <li>Projection metho</li> <li>Application softw</li> <li>Basic commands</li> <li>Drawing tools an</li> <li>Manage object pr</li> <li>Drawing and edit</li> <li>Sizing of mechar</li> <li>Isometric drawin</li> <li>Blocks and mech</li> <li>Fundamentals of</li> <li>3D modeling methods</li> </ul> | <ul> <li>Enter. Rules for preparing drawings.</li> <li>Geometric designs.</li> <li>Orthogonal projection of geometric shapes.</li> <li>Geometric objects.</li> <li>Projection methods.</li> <li>Application software packages widely used in engineering graphics.</li> <li>Basic commands for drawing.</li> <li>Drawing tools and drawing. Settings.</li> <li>Manage object properties. Basic editing tools.</li> <li>Drawing and editing complex objects.</li> <li>Sizing of mechanical drawings.</li> <li>Blocks and mechanical assembly.</li> <li>Fundamentals of 3D modeling in engineering graphics.</li> </ul> |  |   |   |  |
| Literature:                 | <ol> <li>D.U.Sabirova, Chizma         <ul> <li>T. : Fan va Texnologiya,<br/>uchun uslubiy qullanma, I<br/>Multidisciplinary Guide tr<br/>2020. SDC Publications.</li> <li>Paperback – Large Print, J<br/>4th Edition, John Wiley au<br/>press, 2012. 7.David Sala<br/>Josef Albers, "Interaction</li> </ul> </li> </ol>  | geometriya va muhandislik grafikasi, uquv qullar<br>2019.2. Sh.Sh.Allamova, Muhandislik<br>Muxarrirlik nashr - 2019.3. Douglas Smith,<br>o Drafting Theory and Practice with Video Instru<br>4.Shameer S.A., AutoCAD Exercises For Be<br>January 24, 2021. 5.Dym, C. L. and Little, P. Eng<br>ad Sons, 2015. 6. Clive L. Dym, David C. Brov<br>omon The Computer Graphics Manual Springer<br>on of Color" by 2020.  | nma; Uz R Oliy va u<br>grafikasi fanidan la<br>Antonio Ramire<br>action, Technical D<br>eginners: Designers<br>gineering Design: A<br>vn. Engineering De<br>v-Verlag London Li | urta maxsus<br>boratoriya i<br>z, Ashlei<br>rawing 101<br>s WorkBoo<br>Project-Ba<br>sign. Camb<br>imited New | s ta'lim vaz<br>ishlarini ba<br>gh Fuller<br>with Auto<br>ok For Pra<br>ased Introdu<br>oridge univ<br>v York, 20 | irligi.<br>jarish<br>CAD<br>ctice,<br>iction<br>ersity<br>11. 8. |

| 5.4. Fundamen                 | tals of Cyber Security   |   |
|-------------------------------|--|---|
| Semestr:                      | 3  |   |
| Date of last<br>modification: | 31.08.2023   |   |
| Teachers:                     | Salimov Sirojiddin Akhmadzhonovich, Yuldasheva Nafisa Salimovi   | na  |
| Component:                    | Compulsory   |   |
| Cycle:                        | Core   |   |
| ECTS:                         | 6  |   |
| Pre-requisities               | -  |   |
| Workload:                     | Types of classes   | Hours   |
|                               | Total  | 180   |
|                               | Lecture  | 42  |
|                               | Practical works  | 30  |
|                               | SAW (Student autonomous work)  | 108   |
|                               | Form of final control  | Exam  |
|                               | Final assessment method  | Testing   |
| Control forms:                | Current control, Mid-term control, Final control   |   |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,   |
| Final control                 | The final exam is taken in the form of a test, which contains 2 points each, tests are divided into 3 levels of difficulty. Total exam   | s 25 questions, worth<br>n time 60 minutes  |
|                               | of cyber security, fundamentals of cryptography, access control, ne<br>security, information security threats and effective methods and to<br>The course helps students understand the importance of the process<br>administration in the context of information security, social issu<br>confidentiality, social engineering problems, cyber ethics, human se   | etwork and computer<br>pols to combat them.<br>s of management and<br>les such as personal<br>ecurity, etc. |
| Goal:                         | The purpose of mastering the discipline is to provide knowledge, skills and competence in solving issues related to information systems and information resources in professional activ  | students with with<br>o cyber security of<br>vities   |
| Objective:                    | Have an idea about the legal, organizational and technical as<br>security, the principles of information security; Perform simple<br>rejection tree analysis methods; Possess skills in using threat ana<br>tools;   | spects of information<br>e "tie-butterfly" and<br>lysis and prevention                                      |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO.1 Describe the basic concepts of cyber security;<br>LO.2 Explain the international, national and departmental regulato<br>field of cyber security;  | ory framework in the  |
|                               | <ul> <li>LO.3 Demonstrate an understanding of confidentiality, integrity, and LO.4 Explain the main types of threats to cyber security and the methods in the methods of violation of confidentiality, integrinformation;</li> <li>LO.6 To have the skills to use information protection methods and the LO.7 Implementation of cryptography, access control, network and the statemethods.</li> </ul> | d usability;<br>thods and methods of<br>rity and usability of<br>cools;<br>computer security.               |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;   | are conducted mainly<br>ods and technologies<br>ement of knowledge,<br>d be emphasized:                     |

| -             |  |  |   |  |  |   |
|---------------|--|--|---|--|--|---|
|               | - communication technologies (discussion, press-conference, brainstorming, educational   |  |   |  |  |   |
|               | debates and other active forms and methods);   |  |   |  |  |   |
|               | - case-study method (analysis of situations);  |  |   |  |  |   |
|               | - game technologi  | es, in which students participate in   | i business, role-j  | playing  | , simula   | ation   |
|               | games;   | on and the first of the state o | learning) tealer.   | 1  |  |   |
|               | - information and o  | communication (including distance  | learning) technologi  | blogies.   | distion  |   |
|               | In order to develo   | "Chuster" "Cross discussion"   | , such methods a  | as Pred  |  | with  |
|               | "INSERT" hands   | on activities gamification and othe  | KIIOW-Walle u   | od duri  | ng prac  | neu ,   |
|               | classes.   | on activities, gammeation and othe   | is are actively us  |  | ing prac   | lical   |
| Assessment of |  | — • • •  | Number of   | points   |  |   |
| the student's |  | Type of task   | (max)   |  | Total  |   |
| knowledge:    |  | Practical works (1-10)   | 20  |  |  |   |
|               | Current control  | Independent work   | 10  | 40   |  |   |
|               |  | Oral presentation  | 10  |  | 100  |   |
|               | Mid-term control   | Written work   | 10  |  |  |   |
|               | Final control  | Exam (Testing)   | 50  |  |  |   |
|               | <ul> <li>-Introduction, cybercrime, cyber law and cybersecurity.</li> <li>-Human security, architecture, strategy and policy of cybersecurity.</li> <li>-Basic concepts of cryptography and it's history.</li> <li>-Symmetric cryptosystems, Asymmetric cryptosystems.</li> <li>-Data Integrity Methods, Disk and file encryption. Methods of secure deletion of data.</li> <li>-Identification and authentication tools, Logical access control to the data.</li> <li>-Physical data protection, computer networks and network security issues.</li> <li>-Network security tools, Wireless network security.</li> <li>-Risk management, the concept of accessibility. Backup, restore and event logging.</li> <li>-Software security issues, computer viruses and problems of protection from viruses.</li> <li>- Account protection, protection against social engineering.</li> <li>- Learn how to assess risks in cyber security.</li> <li>- Learn how to install and configure a password-based authentication mechanism in an operating system (Windows OS), conduct a reconnaissance attack.</li> <li>- Building network security using the Network Screen tool, a secure Wi-Fi wireless network.</li> <li>- Learning to restore data using special software tools, Installing virus protection on personal computers.</li> </ul> |  |   |  |  |   |
| <b>.</b>      | - Learn how to ma  | inage password usage, how to colle   | ct data from soc  | al netw  | Orks.  | <u>І. Т.</u>                                      |
| Literature:   | "Nihol print" OK, 2021<br>methodical handbook, -T<br>Information securityT<br>Practice. Second Edition.<br>systems". Tutorial. M.: F   | <ol> <li>A.A. Gamyev, Z.I. Audoyquilov. Cybersec<br/>- 224 p. (Uz.) 2. S.K. Ganiyev, Z.T. Xudoyqulov,<br/>.: «Mahalla va oila nashriyoti», 2021240 p. (Ru<br/>.: "FAN va texnologiya", 2016, 372 p. (Uz.) 4.<br/>ISBN 978-0-470-62639-9. 2011. 5. Shangin V.F<br/>ORUM - INFRA-M. 2019. 591 p. (Ru.)</li> </ol>  | <ul> <li>M.B. Nasrullayev. Cy</li> <li>J. S.K. Ganiyev, M.</li> <li>M.Stamp. Informatic</li> <li>F. "Integrated informat</li> </ul> | bersecurit<br>M. Karimo<br>on security<br>ion protec | y Fundam<br>ov, K.A. T<br>v. Principl<br>tion in cor | k, -1.:<br>entals:<br>ashev.<br>es and<br>rporate |

| 5.5. Data struct              | tures and algorithms   |   |
|-------------------------------|--|---|
| Semester:                     | 3  |   |
| Date of last<br>modification: | 31.08.2023   |   |
| Teachers:                     | Tashpulatova Nadira Batirovna, Mukhsinov Shamil Shavkatovich   |   |
| Component:                    | Compulsory   |   |
| Cycle:                        | Core   |   |
| ECTS:                         | 6  |   |
| Pre-requisities               | Programming II   |   |
| Workload:                     | Types of classes   | Hours   |
|                               | Total  | 180   |
|                               | Lecture  | 42  |
|                               | Practical works  | 30  |
|                               | SAW (Student autonomous work)  | 108   |
|                               | Form of final control  | Exam  |
|                               | Final assessment method  | Testing   |
| Control forms:                | Current control, Mid-term control, Final control   |   |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,   |
| Final control                 | The final exam is taken in the form of a test, which contains 2 points each, tests are divided into 3 levels of difficulty. Total exam   | s 25 questions, worth<br>n time 60 minutes  |
| Short content:                | Data Structures and Algorithms course is a fundamental science that focuses on the study of organizing and manipulating of structures are the way data is organized and stored in a computal algorithms are the step-by-step instructions for solving a specific pro-  | subject in computer<br>data efficiently. Data<br>iter's memory, while<br>oblem.   |
| Goal:                         | The purpose of "Data Structures and Algorithms" course<br>foundation in organizing, storing, and manipulating data efficiency<br>programs.   | is to provide a solid ciently in computer   |
| Objective:                    | -Understanding the fundamental data structures and their pro-<br>store and organize data;-learning various algorithms for sear<br>manipulating data to solve real-world problems;-analyzing the perfor<br>and data structures to make informed choices for optimizing code ef<br>problem-solving skills by applying data structures and algorithm<br>computational problems;-enhancing software development capa<br>efficient and scalable code that can handle large datasets and perform | operties to effectively<br>rching, sorting, and<br>rmance of algorithms<br>fficiency;-developing<br>ns to solve complex<br>abilities by writing<br>m tasks quickly. |
| Learning                      | After studying the discipline, students should be able to:   |   |
| outcome:                      | LO 1. To be able to use data types correctly, to acquire the skills of   | using the technology  |
|                               | of their creation.<br>$I \cap 2$ Understand and apply properties of linear data structures   |   |
|                               | LO 3. Understand and apply properties of inical data structures.   |   |
|                               | LO 4. Get an idea of List" type data structures. Ability to impleme  | ent lists statically and  |
|                               | dynamically.   |   |
|                               | LO 5. To have an idea about the characteristics of dynamic data str  | ructures, to be able to   |
|                               | LO 6. Be able to explain and apply the properties of non-linear data   | structure.  |
| Teaching                      | In the conditions of the credit system of education, classes a   | are conducted mainly  |
| methods:                      | in active and creative forms. Among the effective pedagogical meth   | ods and technologies  |
|                               | the acquisition of experience in independent problem solving should  | d be emphasized:  |
|                               | - technology of problem- and project-based learning:   | a oo ompilasizou.   |
|                               | - technologies of educational and research activities;   |   |

|                             | - communication technologies (discussion, press-conference, brainstorming, educational debates and other active forms and methods);                             |  |  |                                       |                                  |                        |
|-----------------------------|---|--|--|---------------------------------------|----------------------------------|------------------------|
|                             | <ul> <li>case-study method (analysis of situations);</li> <li>game technologies, in which students participate in business, role-playing, simulation</li> </ul> |  |  |                                       |                                  |                        |
|                             | games;  | communication (including distance)   | oorning) toohnol   | orios                                 |                                  |                        |
|                             | In order to develor   | critical thinking among students   | such methods as  | "Pred                                 | iction                           | with                   |
|                             | open questions",  | "Cluster", "Cross-discussion", "I  | Know-Want to   | Know                                  | -Learn                           | ned",                  |
|                             | "INSERT", hands-  | on activities, gamification and others   | s are actively use   | d durin                               | ig prac                          | ctical                 |
|                             | classes.  | -  | -  |                                       |                                  |                        |
| Assessment of the student's |   | Type of task   | Number of po<br>(max)  | oints                                 | Total                            |                        |
| knowledge:                  |   | Practical works (1-10)   | 24   | 24                                    |                                  |                        |
|                             | Current control   | Independent work   | 10   | 34                                    | 100                              |                        |
|                             | Mid-term control  | Written work   | 16   |                                       | 100                              |                        |
|                             | Final control   | Exam (Testing)   | 50   |                                       |                                  |                        |
| Topics of                   | - Data types and  | algorithms. Abstract structures of   | f information. I   | Develo                                | oment                            | and                    |
| lectures:                   | analysis of al  | gorithms. Data and stages of t   | heir expression.   | . Data                                | struc                            | cture                  |
|                             | classification.   |  | •  |                                       |                                  |                        |
|                             | - Overview of o   | data structures. Configured data   | types: arrays,   | vectors                               | s, reco                          | ords,                  |
|                             | collections, and  | pointer types.   |  |                                       |                                  |                        |
|                             | - Recursion and   | its application in programming. Re-  | cursive algorithm  | ns, the                               | r anal                           | ysis.                  |
|                             | Data search alg   | orithms. The concept of search and   | its function. Line   | ar seat                               | ch Ri                            | nary                   |
|                             | search. Efficien  | cv and optimization of search metho  | ods.   | ai scai                               | CII. DI                          | iiai y                 |
|                             | - Data sorting a  | lgorithms. The concept of sorting  | and its function   | on. Str                               | ict so                           | rting                  |
|                             | methods.  |  |  |                                       |                                  | C                      |
|                             | - Linear data stru  | ctures. Linear containers. Iterators a   | and their types  |                                       |                                  |                        |
|                             | - Linearly linked   | lists. Understanding Linked Lists.   | Logical represen   | ntation                               | of line                          | early                  |
|                             | linked lists  | d Dag Barragant stack guous and  | dealeration using  | a o lino                              | orly li                          | nkad                   |
|                             | - Stack, Queue al   | id Dec. Represent stack, queue, and  | declaration using  | g a nne                               | arry m                           | likeu                  |
|                             | - Priority queues.  | Dictionaries and their implementat   | ion  |                                       |                                  |                        |
|                             | - Tree data struct  | ures. Definitions and properties of  | tree data structur   | res. Cla                              | assifica                         | ation                  |
|                             | of trees. Tree vi   | ew.  |  |                                       |                                  |                        |
|                             | - Binary search t   | ree. Algorithms for adding elements  | , deleting eleme   | nts and                               | l searc                          | hing                   |
|                             | in a binary sear  | ch tree.   | company and an   | : <b>f</b> :                          | halam                            |                        |
|                             | - Balanced Bina   | ry Trees. Balancing algorithms:  | general and sp   | pecific                               | Dalan                            | icing                  |
|                             | - Binary trees in l   | heap tree form Description of heap   | tree structure. He   | ean tree                              | exect                            | ition                  |
|                             | algorithms. Hea   | p training methods and efficiency  |  |                                       |                                  |                        |
|                             | - Algorithms for  | working with graphs. Graph represe   | entation methods   | : joint                               | matrix                           | and                    |
|                             | relationship ma   | trix. Adjacency list and arc list  |  |                                       |                                  |                        |
|                             | - Graph visualiza<br>search (DFS) al  | ation algorithms. Breadth first sea gorithm  | rch (BFS) algor  | rithm.                                | Depth                            | -first                 |
| Literature:                 | Literature 1. Shukla, Raje:<br>[45 ex.] 2. Kruse, Robert I<br>(India) Pvt. Ltd., 2012 6<br>DMK Press, 2012 272 p  | sh K. Data Structures Using C and C++ : monogr<br>Data Structures and Program Design in C : mo<br>07 p. [25 ex.]3. Wirth, Niklaus. Algorithm and st<br>[1 ex.] | aph - New Delhi : Wile<br>nograph New Delhi:<br>ructure dannyx. Textbo | ey India, 2<br>Dorling I<br>ook - 2nd | 2012 5<br>Kindersle<br>ed., ispr | 02 p.<br>ey<br>: - M.: |

| 5.6. Electronics              | and circuits I   |   |
|-------------------------------|--|---|
| Semestr:                      | 3  |   |
| Date of last<br>modification: | 31.08.2023   |   |
| Teachers:                     | Saidov Kamoladdin Nuraddinovich, Sattarov Khurshid Abdishukur  | ovich   |
| Component:                    | Compulsory   |   |
| Cycle:                        | Core   |   |
| ECTS:                         | 6  |   |
| Pre-requisities               | Physics II   |   |
| Workload:                     | Types of classes   | Hours   |
|                               | Total  | 180   |
|                               | Lecture  | 42  |
|                               | Practical works  | 30  |
|                               | SAW (Student autonomous work)  | 108   |
|                               | Form of final control  | Exam  |
|                               | Final assessment method  | Testing   |
| Control forms:                | Current control, Mid-term control, Final control   |   |
| Assessment                    | Attendance at classes and 60% of academic progress in total  | for 2 types of control,   |
| requirements                  | to obtain admission to the final control   |   |
| Final control                 | The final exam is taken in the form of a test, which contains<br>2 points each tests are divided into 3 levels of difficulty. Total example  | s 25 questions, worth   |
| Short content:                | The theoretical concepts of the course are mainly learned the  | hrough exercises and  |
| Short content.                | labs of increasing complexity to achieve all the concepts covered. Cin<br>Science consists of Circuit Theory and Basic Topics of Electronics<br>concepts that an ICT major should be familiar with.  | rcuits and Electronics<br>s, which are the basic                      |
| Goal:                         | Gaining a thorough understanding of the subject will enable<br>circuits and electronics with systematic academic knowledge an<br>fundamental electronic topics make up practical abilities.  | e students to construct<br>d circuit theory and                       |
| Objective:                    | Learning the principles of electronics and semiconductional subjects of electronics; gaining hands-on experient electronics theory; assessing and maximizing ICT performance; and integrated circuit trends and technologies.  | actors; studying the<br>ace with circuit and<br>investigating current |
| Learning                      | After studying the discipline, students should be able to:   |   |
| outcome:                      | LO1. The relationship between an electric current and voltage in   | passive elements to   |
|                               | LO2. Measuring instruments to learning and use various generators  |   |
|                               | LO3. Learns to calculate currents and voltages in passive and a electric circuit.  | ctive elements in an  |
|                               | LO4. The number of equations needed to analyze and learns to deter<br>an electrical circuit and determine the minimum.   | rmine the topology of   |
|                               | LO5. Learn to find ways to analyze an electrical circuit.  |   |
|                               | LO6. An explores the relationship between mathematical terms an  | nd understanding the  |
|                               | first- and second-order circuit s.   | nlace transform   |
|                               | LO8. Learns to simulate system state in transient and steady state.  | place transform.  |
|                               | LO9. We know how to connect semiconductor devices in electric ci   | rcuits and how to use   |
|                               | them depending on their function.  |   |
| Teaching                      | In the conditions of the credit system of education, classes a   | are conducted mainly  |
| methods:                      | in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning; | ods and technologies<br>gement of knowledge,<br>d be emphasized:      |

|                             | <ul> <li>technologies of e</li> <li>communication to<br/>debates and other a</li> <li>case-study method</li> <li>game technologies</li> <li>games;</li> <li>information and of<br/>In order to develop<br/>open questions",</li> <li>"INSERT", hands-</li> </ul>   | ducational and research activities;<br>echnologies (discussion, press-con<br>active forms and methods);<br>d (analysis of situations);<br>es, in which students participate in<br>communication (including distance<br>o critical thinking among students<br>"Cluster", "Cross-discussion",<br>on activities, gamification and othe   | ference, brainston<br>h business, role-<br>e learning) techn<br>, such methods<br>"Know-Want to<br>ers are actively u                        | orming,<br>playing<br>ologies.<br>as "Prec<br>o Knov<br>sed duri                     | educati<br>, simula<br>diction<br>v-Learr<br>ng prac                           | ional<br>ation<br>with<br>ned",<br>ctical                 |
|-----------------------------|--|---|--|--|--|---|
| Assessment of the student's | classes.   | Type of task  | Number of<br>(max)   | points   | Total  |   |
| knowledge:                  |  | Practical works (1-10)  | 25   |  |  |   |
|                             | Current control  | Independent work  | 7  | 40   |  |   |
|                             |  | Oral presentation   | 8  | -  | 100  |   |
|                             | Mid-term control   | Written work  | 10   |  | 100  |   |
|                             | Final control  | Exam (Testing)  | 50   |  | -  |   |
| Topics of<br>lectures:      | <ul> <li>Introduction to E</li> <li>Electronic circuit</li> <li>An analysis of di</li> <li>Calculating elect</li> <li>The main quantit</li> <li>Characteristics of</li> <li>Mutual induction</li> <li>Quadrupoles and</li> <li>Transient process</li> <li>The device operation</li> <li>Contact phenome</li> <li>Semiconductor d</li> <li>Bipolar transistor</li> <li>Multilayer semic</li> <li>Field transistors</li> </ul> | lectronics and Circuits 1. The purp<br>simulators.<br>rect current and electric circuits;<br>ric circuits and direct current;<br>ies of sinusoidal current and chara<br>f electrical circuits under the influe<br>a circuits;<br>filters;<br>ses in the electric circuit;<br>tion of semiconductor and physica<br>ena in semiconductors;<br>iodes;<br>rs;<br>onductor devices;<br>(FT); | oose and tasks of<br>cterizing it;<br>ence of a sinusoi<br>Il foundations;   | dal sign   | »;<br>al;  |   |
| Literatures:                | 1. A.A. Tulyaganov, S.<br>Communicator, 2018, 14<br>(textbook) Tashkent.: «<br>(textbook), Tashkent. «<br>Instruments. 5. X.K. At<br>technology», 2011, 428 p<br>Devices and Circuit Appl  | S. Parsiev, V.A. Tulyaganova, U.M. Abdull<br>44 p. 2. X.K.Aripov, A.M. Abdullayev, N.B.<br>Communicator», 2017, 376 p. 3. Aripov X.K.<br>The boston of thought», 2013, 447 p. 4. Ro<br>ripov, A.M. Abdullayev, N.B. Alimova, Elo<br>6. Thomas F. Schubert, Jr., Ernest M. Kim.<br>acations, 2014,   | layev. Theory of ele<br>. Alimova, Electronic<br>., Abdullaev A.M., A<br>on Mancini, Amps Fo<br>ectronics (textbook)<br>Fundamentals of Elec | ectrical circ<br>es and circ<br>limova N.J<br>or Everyon<br>Tashkent,<br>tronics Boo | cuits. (tut<br>cuit engin<br>B., "Schen<br>le, 2002,<br>« Scienc<br>ok 1: Elec | corial),<br>eering<br>matic"<br>Texas<br>e and<br>ctronic |

| 5.7. Electronics              | and circuits II   |  |
|-------------------------------|---|--|
| Semestr:                      | 4   |  |
| Date of last<br>modification: | 31.08.2023  |  |
| Teachers:                     | Saidov Kamoladdin Nuraddinovich, Sattarov Khurshid Abdishukur   | ovich  |
| Component:                    | Compulsory  |  |
| Cycle:                        | Core  |  |
| ECTS:                         | 6   |  |
| Pre-requisities               | Electronics and circuits I  |  |
| Workload:                     | Types of classes  | Hours  |
|                               | Total   | 180  |
|                               | Lecture   | 42   |
|                               | Practical works   | 30   |
|                               | SAW (Student autonomous work)   | 108  |
|                               | Form of final control   | Exam   |
|                               | Final assessment method   | Testing  |
| Control forms:                | Current control, Mid-term control, Final control  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,  |
| Final control                 | The final exam is taken in the form of a test, which contain  | s 25 questions, worth  |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total example   | m time 60 minutes  |
| Snort content:                | network construction principles, technologies and devices, local, n<br>in computer programs, network management methods, basic net<br>routing processes, network software and hardware security.  | erstand an computer<br>network design issues<br>work protocols, data                         |
| Goal:                         | The goal of teaching subject - modern information and communication technologies belong to a complex class of systems, which are made up of electrical circuits of different complexity.  |  |
| Objective:                    | The system is one of the important issues in the study of t<br>devices. This is the science of telecommunication technologies, c<br>electronic devices used in the types, characteristics, their struct<br>complex issues of technological devices, which they create using<br>study consists of removing sxemotexnik to include. | he form of electronic<br>computer engineering<br>cture, properties and<br>mexanizim work and |
| Learning                      | After studying the discipline, students should be able to:  |  |
| outcome:                      | LO1. Necessary to have knowledge about the current role of in applications of integrated circuits in nanoelectronics, fur bioelectronics.   | tegrated circuits, the<br>actional electronics,  |
|                               | elements of the preparation of integrated circuits performing variou<br>LO3. Necessary to have knowledge of amplifier circuits based on tra<br>characteristics and parameters.  | is tasks.  |
|                               | radiotechnical devices, the determination of the technical parameter amplifiers.  | s of integrated circuit  |
|                               | LO5. Able to determine the parameters and characteristics of the a in radio equipment.<br>LO6. Able to find the results of the transmission characteristic of   | integrated circuits by   |
|                               | connecting measuring instruments.<br>LO7. Able to electronically analyze the state of logical elements  | circuits; he is able to  |
|                               | assemble circuits.<br>LO8. Able to connect amplifiers, stable current generators, operati<br>in electrical circuits, as well as apply them depending on the task.   | on amplifier, optrons  |

| Teaching<br>methods:<br>Assessment of | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologie<br>that promote active involvement of students in the search and management of knowledge<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educationa<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned"<br>"INSERT", hands-on activities, gamification and others are actively used during practica<br>classes. |  |   |  |                              | ainly<br>ogies<br>odge,<br>onal<br>ation<br>with<br>ned",<br>ctical |
|---------------------------------------|---|--|---|--|------------------------------|---|
| the student's                         |   | Type of task   | Number of po  | oints [  | Fotal                        |   |
| knowledge:                            |   | Practical works (1-10)   | (IIIax)<br>25   |  |                              |   |
|                                       | Current control   | Independent work   | 7   | 40   |                              |   |
|                                       | Current control   | Oral presentation  | 8   | 40   | 100                          |   |
|                                       | Mid term control  | Written work   | 10  |  | 100                          |   |
|                                       | Final control   | Exam (Tosting)   | 50  |  |                              |   |
|                                       | Final control   |  |   |  |                              |   |
| lectures:                             | <ul> <li>Electrical signal a</li> <li>The effect on the</li> <li>Schemes for con-<br/>amplifier stages</li> <li>Schemes for con-<br/>amplifier stages</li> <li>Multi-cascade an</li> <li>Integrated circuit<br/>circuit;</li> <li>Darlington pair.</li> <li>Analog integrates</li> <li>Constant voltage</li> <li>Fixed current am</li> <li>Operation amplifi</li> <li>Logical elements</li> <li>Simple inverter<br/>inverters and SI</li> <li>Integral injective</li> <li>Logical elements</li> <li>Complementary</li> </ul>  | amplifiers;<br>characteristics of feedback and its s<br>inecting bipolar transistors and mo<br>s;<br>innecting field transistors and mod<br>s;<br>mplifiers. Power amplifiers;<br>preparation technology. Active and<br>Wilson current view scheme;<br>d circuits. Stable current generator (<br>level shift device;<br>plifiers (FCA);<br>ier;<br>. Transfer characteristics of logical of<br>Transistor-transistor logic. Transist<br>hottky barriers;<br>logic. Connected emitters logic;<br>made in a metal dielectric semicono<br>inverters. Optrons; | trengthening dev<br>des of operation<br>es of operation<br>passive element<br>SCG) scheme;<br>elements;<br>tor-transistor log<br>ductor transistor; | vices;<br>of tran<br>of tran<br>s of the<br>gic with | nsistor<br>isistor<br>integr | rs in<br>s in<br>ated   |
| Literature:                           | -Complementary inverters. Optrons;<br>1. H.K.Aripov, M.A.Abdullaev, N.B.Alimova, Electronics and schematics (Textbook) Tashkent.: "Communicator ", 2017<br>y, 376 p. 2. H.K.Aripov, A.Abdullaev, N.B.Alimova, Toshmatov Sh.T. "Schematics" (textbook), Tashkent, "The boston<br>of thought", 2013, 447 p. 3. K.Aripov, M.A.Abdullaev, N.B.Alimova, H.H.Bustanov, Sh.T. Toshmatov. Digital logic<br>devices design. Textbooks. –T.: "Communicator", 2017, 396 p. 4. H.K.Aripov, A.M.Abdullaev, N.B.Alimova,<br>H.H.Bustanov, It Doubles.V.Obyedkov, Sh.T. Toshmatov. Electronics (textbook) Tashkent.: "Science and technology",<br>2011, 428 p. 5. Multisim User Guide. National Instruments, 2007. 6. Robert L. Boyleastad. Introductory Circuit analysis.<br>2014.Pearson Education Limited, 1091p. 7. Behzad Razavi. Fundamentals of Microelectronics.2nd edition.2014 John<br>Wilev-Sons 932 p.   |  |   |  |                              |   |

| 5.8. Electromag               | gnetic fields and waves  |  |
|-------------------------------|--|--|
| Semestr:                      | 4  |  |
| Date of last<br>modification: | 31.08.2023   |  |
| Teachers:                     | Kan Vitaliy Sergeyevich, Shakhobiddinov Alisher Shopatkhiddinov  | vich   |
| Component:                    | Compulsory   |  |
| Cycle:                        | Core   |  |
| ECTS:                         | 6  |  |
| Pre-requisities               | Physics II   |  |
| Workload:                     | Types of classes   | Hours  |
|                               | Total  | 180  |
|                               | Lecture  | 42   |
|                               | Laboratory works   | 30   |
|                               | SAW (Student autonomous work)  | 108  |
|                               | Form of final control  | Exam   |
|                               | Final assessment method  | Testing  |
| Control forms:                | Current control, Mid-term control, Final control   |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total  | for 2 types of control,  |
| requirements                  | to obtain admission to the final control   |  |
| Short content:                | The course "Electromagnetic fields and waves" studies<br>electrodynamics, the design and construction of transmission lines,<br>units, and fiber-optic communication links, which are widely used in<br>systems today. | the fundamentals of<br>microwave paths and<br>telecommunications     |
| Goal:                         | The purpose of the course is to give students the necessary le<br>the devices of transmission lines, microwave paths and nodes, as wel<br>in the field of fiber-optic communication lines used in modern<br>systems.   | evel of knowledge on<br>l as initial knowledge<br>telecommunications |
| Objective:                    | The course consists of the following main sections: fundar<br>of the electromagnetic field, electrodynamics, radiation a<br>electromagnetic waves, directional electromagnetic waves and gu<br>microwave devices.      | mentals of the theory<br>nd propagation of<br>iding systems, linear  |
| Learning                      | After studying the discipline, students should be able to:   |  |
| outcome:                      | LO 1. Formation of general concepts of electrodynamics.  |  |
|                               | LO 2. Understanding the theory of Maxwell's equations.   | austions   |
|                               | LO 3. Faining concepts about the purpose of transmission lines   | equations.   |
|                               | LO 5. Studying the principles of operation of measuring lines, n   | odes and microwave   |
|                               | paths.<br>LO 6. Study of the design features of cavity resonators, bridges a   | and other microwave  |
|                               | devices.   |  |
|                               | LO 7. Familiarization with measurements of parameters an   | d characteristics of   |
|                               | LO 8 Gaining knowledge in the field of solving problems when   | calculating the main   |
|                               | parameters of transmission lines and microwave devices using the<br>electrodynamics.   | ne basic equations of  |
| Teaching                      | In the conditions of the credit system of education, classes a   | are conducted mainly   |
| methods:                      | in active and creative forms. Among the effective pedagogical meth   | ods and technologies   |
|                               | that promote active involvement of students in the search and manage   | gement of knowledge,   |
|                               | the acquisition of experience in independent problem solving should<br>technology of problem- and project-based learning:  | u de empnasized:   |
|                               | - technologies of educational and research activities;   |  |

|                                | - communication t<br>debates and other a  | echnologies (discussion, press-confe<br>active forms and methods);                     | erence, brainsto                       | orming,                | educati                  | ional              |  |
|--------------------------------|---|--|--|------------------------|--------------------------|--------------------|--|
|                                | - case-study method (analysis of situations);   |  |  |                        |                          |                    |  |
|                                | - game technologi   | es, in which students participate in   | business, role-j                       | playing                | , simula                 | ation              |  |
|                                | games;  |  |  |                        |                          |                    |  |
|                                | - information and o   | communication (including distance l  | learning) techno                       | ologies.               |                          |                    |  |
|                                | In order to develop   | p critical thinking among students,  | such methods a                         | as "Preo               | diction                  | with               |  |
|                                | open questions",  | "Cluster", "Cross-discussion", "I  | Know-Want to                           | $\rightarrow$ Knov     | <i>w</i> -Learr          | ned",              |  |
|                                | "INSERT", hands-  | on activities, gamification and other  | s are actively us                      | sed duri               | ng prac                  | stical             |  |
| A                              |   |  |  | • .                    | 1                        |                    |  |
| Assessment of<br>the student's |   | Type of task   | Number of j<br>(max)                   | points                 | Total                    |                    |  |
| knowledge:                     |   | Practical works (1-10)   | 25                                     |                        |                          |                    |  |
|                                | Current control   | Independent work   | 7                                      | 40                     |                          |                    |  |
|                                |   | Oral presentation  | 8                                      |                        | 100                      |                    |  |
|                                | Mid-term control  | Written work   | 10                                     |                        |                          |                    |  |
|                                | Final control   | Exam (Testing)   | 50                                     |                        |                          |                    |  |
| Topics of                      | Introduction EM   | E concepts EME vectors media pa  | rameters mater                         | rial equi              | ations                   | <u> </u>           |  |
| lectures                       | - Boundary condit   | ions at the interface between media  | Boundary cond                          | ditions of             | on the                   |                    |  |
| icerures.                      | surface of an ideal   | conductor.   | Doundary con                           |                        | shi the                  |                    |  |
|                                | - EMF operators, Maxwell's first, second, third and fourth equations.                   |  |  |                        |                          |                    |  |
|                                | - Maxwell's equation system for a monochromatic field. Dielectric loss tangent.         |  |  |                        |                          |                    |  |
|                                | - Homogeneous ar  | nd inhomogeneous wave equations.   |  | U                      |                          |                    |  |
|                                | - Energy and powe   | - Energy and power of EMF. Flow and flux density. EMF energy balance. Umov–            |  |                        |                          |                    |  |
|                                | Poynting theorem.   |  |  |                        |                          |                    |  |
|                                | - Plane wave. Para  | meters (characteristics) of a plane w  | vave.                                  |                        |                          |                    |  |
|                                | - Elementary elect  | ric emitter. Structure of the EI field.  |  |                        |                          |                    |  |
|                                | - Characteristics of  | f El directionality. Power and radiat  | ion resistance.                        |                        |                          |                    |  |
|                                | - Types of polariza   | ation (linear, circular, elliptical, norr  | nal and parallel                       | l polariz              | zation)                  |                    |  |
|                                | - Brillouin's concept. Field structure under normal and parallel polarization. Biplanar |  |  |                        |                          |                    |  |
|                                | - Guided wave analysis Characteristics (parameters) of directed waves                   |  |  |                        |                          |                    |  |
|                                | - Guided wave analysis. Characteristics (parameters) of directed waves.                 |  |  |                        |                          |                    |  |
|                                | - Round waveguide and its main characteristics (parameters.)                            |  |  |                        |                          |                    |  |
|                                | - Coaxial waveguide and its main characteristics (parameters.)                          |  |  |                        |                          |                    |  |
|                                | - Symmetrical, unbalanced and strip transmission lines. Measuring transmission lines.   |  |  |                        |                          |                    |  |
|                                | - Transmission lin  | e communication elements: pin, loop  | p, hole.                               |                        |                          |                    |  |
|                                | - Directional coup  | ler, its parameters  |  |                        |                          |                    |  |
|                                | - Transmission lin  | e coordination. Matched loads.   |  |                        |                          |                    |  |
|                                | - Elements of the 1   | nicrowave path: Kinks, bends, twist  | s. Microwave b                         | oridges.               | Kinds.                   |                    |  |
|                                | - Volumetric resor  | nator. Types of cavity resonators  | 1                                      |                        |                          |                    |  |
|                                | - Dielectric waveg  | uide and light guide. Methods for in   | nplementing fit                        | per-opti               | с                        |                    |  |
|                                | communication ele   | ements   |  |                        | EDV                      |                    |  |
| Literature:                    | 1. Ю.В.Пименов, В.И.В<br>Основы Technical elec  | ольман, Technical electrodynamics – M.Radio trodynamics, St. Petersburg, Lan, 2022. 3. | and Communication<br>Pimenov Yu.V., V  | s,2022. 2.<br>Volman V | Е.Р.Мил<br>I., Тес       | ютин,<br>chnical   |  |
|                                | electrodynamics, - M: Rad   | lio and Communication, 2002. 4. O.I. Falkovsky,  | Fechnical electrodyna                  | amics, St.             | Petersburg               | g, Lan,            |  |
|                                | 6. Sazonov D.M., Gridin   | A.N., Mishustin B.A. Microwave devices. / Ed. 1  | ∠ voiumes, vol. 1 I<br>D.M. Sazonova M | vi.: Gosen             | ergoizdat,<br>School, 19 | , 1970.<br>981. 7. |  |
|                                | Volman V.I., Pimenov Yu   | I.V., Technical electrodynamics, - M: Svyaz, 197                                       | 1.                                     | 0                      | .,-,                     |                    |  |

| 5.9. Fundamen                 | tals of artificial intelligence   |  |
|-------------------------------|---|--|
| Semestr:                      | 4   |  |
| Date of last<br>modification: | 31.08.2023  |  |
| Teachers:                     | Nurmurodov Javohir Nurmurod ugli  |  |
| Component:                    | Compulsory  |  |
| Cycle:                        | Core  |  |
| ECTS:                         | 6   |  |
| Pre-requisities               | Programming II, Probability and Statistics  |  |
| Workload:                     | Types of classes  | Hours  |
|                               | Total   | 180  |
|                               | Lecture   | 42   |
|                               | Practical works   | 30   |
|                               | SAW (Student autonomous work)   | 108  |
|                               | Form of final control   | Exam   |
|                               | Final assessment method   | Testing  |
| Control forms:                | Current control, Mid-term control, Final control  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,  |
| Final control                 | The final exam is taken in the form of a test, which contain 2 points each, tests are divided into 3 levels of difficulty. Total example  | s 25 questions, worth<br>m time 60 minutes   |
|                               | develop a set of algorithms that force computers and technical<br>act like humans. In this, students will study the basic co<br>intelligence, their application in any field, game theory, se<br>recognition and machine learning algorithms, and the appl<br>neural networks. acquires knowledge.  | devices to think and<br>oncepts of artificial<br>arch agents, object<br>ication of artificial        |
| Goal:                         | The purpose of teaching science is to develop the sk<br>develop artificial intelligence technologies and methods,<br>practical foundations of the computational processes of<br>algorithms, which are widely used today, and the development<br>force machines to think like humans and make decisions like   | tills and abilities to<br>the theoretical and<br>machine learning<br>at of algorithms that<br>humans |
| Objective:                    | -to have concepts of artificial intelligence; -mathematical ar<br>automated and computer systems; -in higher education, retrain<br>education institutions; -in offices and organizations whose acti<br>information protection.  | nd software support of<br>ing and professional<br>vities are related to                              |
| Learning                      | After studying the discipline, students should be able to:  |  |
| outcome:                      | <ul><li>LO 1. In the process of analyzing the subject area, in which a intelligence and to improve it in those areas.</li><li>LO 2. Building software tools and artificial neural network algor machine learning algorithms.</li><li>LO 3. Gain skills in machine learning model development skills.</li><li>LO 4. Must be proficient in applying common machine learning algorithms.</li></ul>   | reas to use artificial<br>ithms for developing<br>ning techniques and                                |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving shoul<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities; | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized:            |

|                             | <ul> <li>communication to<br/>debates and other a</li> <li>case-study metho</li> <li>game technologio<br/>games;</li> <li>Information and other</li> </ul>  | echnologies (discussion, press-confe<br>active forms and methods);<br>d (analysis of situations);<br>es, in which students participate in<br>communication (including distance l   | erence, brainsto<br>business, role-j<br>earning) techno  | playing,<br>playing,<br>plogies.  | educat   | ional<br>ation   |
|-----------------------------|---|--|--|---|--|--|
|                             | In order to develop<br>open questions",<br>"INSERT", hands-   | "Cluster", "Cross-discussion", "I<br>on activities, gamification and other   | such methods a<br>Know-Want to<br>s are actively us  | as "Prec<br>5 Knov<br>sed duri  | v-Leari<br>ng prac   | with<br>ned",<br>ctical                                    |
|                             | classes.  |  |  |   | 1  | 1  |
| Assessment of the student's |   | Type of task   | Number of j<br>(max)   | points  | Total  |  |
| knowledge:                  |   | Practical works (1-10)   | 20   |   |  |  |
|                             | Current control   | Independent work   | 10   | 40  |  |  |
|                             |   | Oral presentation  | 10   |   | 100  |  |
|                             | Mid-term control  | Written work   | 10   | <u> </u>  |  |  |
|                             | Final control   | Exam (Testing)   | 50   |   | -  |  |
| Topics of<br>lectures:      | <ul> <li>Introduction to see</li> <li>History of artific:</li> <li>Intelligent agents</li> <li>Solving problems</li> <li>Find solutions us</li> <li>Theory of games</li> <li>Logical agents</li> <li>Knowledge presses</li> <li>Definition of vag</li> <li>Probabilistic dect</li> <li>Development and</li> <li>Representation of</li> <li>General recursion</li> <li>Types of machine</li> <li>Artificial neural to</li> </ul> | cience: artificial intelligence basics a<br>ial intelligence<br>is in artificial intelligence<br>ing classic search<br>entation issues<br>ue knowledge<br>ision-making<br>I use of expert systems<br>f knowledge in expert systems<br>n rule<br>e learning<br>networks   | and application  | S   |  |  |
| Literature:                 | 1. Bekmuratov Q.A. Sun'i           300 b 48 (adadi 100           2. O. Campesato. Artifici:           c. 3. Sirojiddin Komolov,           C. Нейронные сети: пол           Xia Jiang. Artificial Intell           AI and Machine Learning   | y intellekt [Text] : uqu v qullanma Q. A. Bekmura<br>)) экз ISBN 978-9943-5804-8-0 : 65150<br>al Intelligence, Machine Learning and Deep Lear<br>Sherzod Raxmatov: Sun'iy intellekt asoslari. Ма<br>ный курс. 22е изд. пер. с англ М. Изд. дом «l<br>igence: Chapman va Hall/CRC 2018 - 480 c. ISB<br>for Coders: UReilly Media 2020-390c. ISBN 13 | tovT. : Aloqachi, 20<br>sum ГРНТИ У<br>ning. ISBN: 978-1-6<br>Ishinaviy uqitish. To<br>Зильямс» 2006-452<br>3N 13: 9781138502:<br>9781492078197. | 019 312  <br>ДК 28.<br>58392-467-<br>9shkent – 2<br>с. 5.Richar<br>383. 6.Lau | b Adabi<br>23004.8(0<br>-8. 2020.<br>2019. 4.X<br>rd E. Neaj<br>rence Mo | yotlar:<br>075.8).<br>– 339<br>айкин<br>politan<br>proney. |

## 6. Core

| 6.1. Microproce               | essors  |  |
|-------------------------------|---|--|
| Semestr:                      | 4   |  |
| Date of last<br>modification: | 31.08.2023  |  |
| Teachers:                     | Abaskhanova Khalima Yunusovna, Akhmedova Khusniya Khusano   | ovna   |
| Component:                    | Compulsory  |  |
| Cycle:                        | Core  |  |
| ECTS:                         | 6   |  |
| Pre-requisities               | Discrete structures   |  |
| Workload:                     | Types of classes  | Hours  |
|                               | Total   | 180  |
|                               | Lecture   | 42   |
|                               | Practical works   | 30   |
|                               | Independent work  | 108  |
|                               | Form of final control   | Exam   |
|                               | Final assessment method   | Testing  |
| Control forms:                | Current control, Mid-term control, Final control  | <u>.                                    </u>   |
| Assessment                    | Attendance at classes and 60% of academic progress in total   | for 2 types of control,  |
| requirements                  | to obtain admission to the final control  |  |
| Final control                 | The final exam is taken in the form of a test, which contain  | s 25 questions, worth  |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total example   | m time 60 minutes  |
|                               | and their structure, principles of operation, processor command sy<br>data exchange, creating programs in a high-performance program<br>configuring them in hardware, building communication<br>microprocessors and microcontrollers, in which information teachers<br>of knowledge on the implementation and organization of exchange  | rstem and methods of<br>mming language and<br>systems based on<br>s the theoretical basis<br>principles.   |
| Goal:                         | The purpose of the discipline is to teach students about micr<br>structure, principle of operation, processor command system and da<br>to create programs in a high-performance programming language a<br>hardware support, to build communication systems based on<br>microcontrollers, to exchange information in them. It consists of t<br>skills of theoretical foundations of knowledge on implementation<br>principles.   | coprocessors and their<br>ta exchange methods,<br>and configure them in<br>microprocessors and<br>teaching and creating<br>and organization of   |
| Objective:                    | The objective of the discipline to create knowledge a systems, to create practical skills for creating microprocessor syst programming languages and testing them on the basis of hardware.   | bout microprocessor<br>ems using high-level  |
| Learning                      | After studying the discipline, students should be able to:  |  |
| outcome:                      | LO 1. Microprocessor and microprocessor system concepts and te<br>structure and operation of microprocessor systems. The role of mic<br>in the field of communication, stages of development and prosp<br>system types and stages of development. General structure of a micr<br>of a microprocessor system. Principle of microprocessor system op<br>LO 2. Bus types of microprocessor systems. Their functions. T<br>exchange based on buses. Basic devices of microprocessor system<br>Microprocessor registers and memory segments. Types of of<br>microprocessor systems. Data exchange methods of micro<br>Architecture of microprocessor systems and their analysis.;<br>LO 3. Programming languages and their command system. Progra<br>and microprocessor systems software. Simple programming | rms. Basics of types,<br>croprocessor systems<br>bects. Microprocessor<br>coprocessor. Structure<br>eration.;<br>Types of information<br>s and their functions.<br>operating modes of<br>oprocessor systems.<br>mming environments<br>processes. Complex |

| Teaching<br>methods:        | LO 4. Microcont<br>Controller concep<br>microcontrollers, p<br>command system.<br>system of microcor<br>LO 5. Organization<br>external memories<br>quality of microcor<br>Basic stages of desi<br>hardware and softy<br>Additional modules<br>LO 6. To be able to<br>input and output of<br>quality of the syste<br>microcontrollers; d<br>and microcontrollers<br>LO 7. Creating sof<br>configuration tools<br>programming of de<br>of memory and tim<br>LO 8. To be able to<br>of digital devices;<br>LO 9. To know th<br>processes and their<br>In the cond<br>in active and creative<br>the acquisition of e<br>- technologies of ec<br>- communication to<br>debates and other a<br>- case-study methoo-<br>game technologies<br>in order to develop<br>open questions",<br>"INSERT", hands-o | roller concept. Concept of micr<br>of the structure of the centro<br>rocessor core and memory. Microco<br>The structure of the processor cen-<br>natrollers<br>of memory in microcontrollers and<br>in microcontrollers. Special function<br>troller-based systems.<br>Igning and developing devices and s<br>ware configuration methods. Micro-<br>s of clock generators, watchdog time<br>to write a program in a modern pro-<br>f data; to be able to research the sp<br>m and expanding its capabilities on<br>esign and development of digital or<br>rs; should know how to configure ha<br>tware for microprocessor systems,<br>for creating programs for microp<br>evices based on microprocessors and<br>e management processes, development<br>o select methods of creating and co<br>e tools for creating software for a<br>configuration and organization;<br>itions of the credit system of educative<br>forms. Among the effective peda<br>involvement of students in the search<br>xperience in independent problem s<br>blem- and project-based learning;<br>fucational and research activities;<br>echnologies (discussion, press-confective<br>forms and methods);<br>d (analysis of situations);<br>es, in which students participate in<br>communication (including distance 1<br>o critical thinking among students,<br>"Cluster", "Cross-discussion", "Ho<br>on activities, gamification and others | oprocessor an<br>ral processor an<br>ral processor.<br>ontroller softwa<br>ter and feature<br>I working with<br>ns to increase f<br>ystems based of<br>pecial function<br>the basis of m<br>levices based of<br>ardware and so<br>being able to to<br>processor system<br>d microcontrol<br>ent of algorithm<br>onfiguring software<br>tion, classes are<br>gogical methods<br>the and manager<br>olving should levices<br>business, role-period<br>such methods a<br>Know-Want to<br>sare actively us | d micr<br>Archi<br>re. Micr<br>es of the<br>it, use of<br>the capa<br>on micro<br>wer sav<br>ontrollen<br>guage,<br>s of imp<br>nicropro-<br>on micro<br>ftware t<br>use basi<br>ems; ass<br>llers; pr<br>ms;<br>ware for<br>ol of tec<br>e conduc<br>ds and tec<br>ment of<br>be emph<br>orming,<br>playing,<br>ologies.<br>as "Preco<br>o Know | ocontro<br>tecture<br>ocontro<br>tecture<br>ocontro<br>tecture<br>ocontro<br>f stack<br>bilities<br>control<br>ing mo<br>s.<br>to orga<br>proving<br>cessors<br>ogether<br>c tools<br>cembly<br>ogrami<br>workf.<br>chnolog<br>cted ma<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolog<br>chnolo | oller.<br>of<br>oller<br>nand<br>and<br>and<br>llers,<br>odes.<br>unize<br>g the<br>and<br>ssors<br>r;<br>and<br>and<br>ning<br>lows<br>gical<br>ainly<br>ogies<br>edge,<br>:<br>ional<br>ation<br>with<br>ned",<br>ctical |
|-----------------------------|--|--|--|--|--|--|
|                             | classes.   | on activities, gammeation and others   | s are actively us  |  | ng prac  | lical  |
| Assessment of the student's |  | Type of task   | Number of j<br>(max)   | points   | Total  |  |
| knowledge:                  | Current control  | Practical works (1-10)<br>Independent work   | 30<br>10   | 40   | 100  |  |
|                             | Mid-term control   | Written work   | 10   |  | 100  |  |
|                             | Final control  | Exam (Testing)   | 50   |  |  |  |
| Topics of<br>lectures:      | <ul> <li>Microprocessor at<br/>principles of operate</li> <li>The structure and<br/>modes and architece</li> <li>Structure of the pre-<br/>Addressing method</li> <li>Microprocessor system</li> <li>Creating a programing</li> <li>Microcontrollers.</li> </ul>   | nd microprocessor system concepts<br>ion, buses and information exchang<br>functions of the main devices of mi<br>ture of microprocessor systems.<br>cocessor.<br>ods.<br>ystems software.<br>m in a microprocessor-based progra<br>Microcontroller concept, memory a  | and terms, type<br>e cycles.<br>croprocessor s<br>mming envirou  | es, struc<br>ystems.<br>nment.<br>ore.   | ture,<br>Operat  | ing  |

|             | - Organization of microcontrollers, organization of their communication with the  |
|-------------|---|
|             |   |
|             | - Organization and structure of data input and output ports of microcontrollers.  |
|             | - Organizing the connection of the microcontroller with time and external environment.  |
|             | - Auxiliary hardware of microcontrollers. Design features of digital devices based on   |
|             | microcontroller.  |
|             | - Software design for microcontrollers. Designing devices on microcontrollers.  |
|             | - Getting to know the interfaces of instrumental environments. Creating simple  |
|             | programs for microprocessor systems in the interfaces of instrumental environments.   |
|             | Creating complex programs for microprocessor systems in the interfaces of instrumental  |
|             | environments.   |
|             | - Learning to design digital logic devices.   |
|             | - Learning to design systems based on microprocessors. Design of microcontroller  |
|             | systems.  |
|             | - Creation of software for microcontroller systems. Integration of hardware and software  |
|             | of microcontroller systems.   |
| Literature: | 1. Abaskhanova H.Yu., Amirsaidov U.B. Microprocessors. Study guide for higher educational institutions. "Fan va texnologiyalar". Tashkent-2017 272 p. 2. Abaskhanova H.Yu., Mirzaeva M.B., Parsiev S.S Microprocessor. Study guide for higher educational institutions. "Hihol print". Tashkent-2021200 p. 3. Abaskhanova H.Yu., Baltayev J.B., Yaronova N.V. Microprocessor devices of radio communication, a textbook for higher educational institutions. "IMPRESS MEDIA". |
|             | 1 asiikeint-2025547 p.  |

| 6.2. Informatio               | n coding theory  |  |
|-------------------------------|--|--|
| Semestr:                      | 5  |  |
| Date of last<br>modification: | 31.08.2023   |  |
| Teachers:                     | Qodirov Azamat Almat ugli  |  |
| Component:                    | Compulsory   |  |
| Cycle:                        | Core   |  |
| ECTS:                         | 6  |  |
| Pre-requisities               | Data structure and algorithms  |  |
| Workload:                     | Types of classes   | Hours  |
|                               | Total  | 180  |
|                               | Lecture  | 42   |
|                               | Practical works  | 30   |
|                               | SAW (Student autonomous work)  | 108  |
|                               | Form of final control  | Exam   |
|                               | Final assessment method  | Writing  |
| Control forms:                | Current control, Mid-term control, Final control   |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,  |
| Final control                 | The final exam is taken in the form of a test, which contain 2 points each, tests are divided into 3 levels of difficulty. Total exam  | s 25 questions, worth<br>m time 60 minutes   |
|                               | respective fitness for specific applications. Codes are used for<br>cryptography, error detection and correction, data transmission and<br>are studied by various scientific disciplines—such as informati<br>engineering, mathematics, linguistics, and computer science—<br>designing efficient and reliable data transmission methods. This t<br>removal of redundancy and the correction or detection of errors in t | or data compression,<br>d data storage. Codes<br>ion theory, electrical<br>for the purpose of<br>ypically involves the<br>he transmitted data. |
| Goal:                         | The course is designed for undergraduate students and tead<br>encoding and decoding information with noisy codes, dictionary cor<br>modulation, reliability and adaptation in data transmission systems.   | ches the principles of npression algorithms,   |
| Objective:                    | This course examines theoretical questions in information at<br>as information size, entropy, redundancy, performance, informa<br>discrete sources, coding in discrete and noisy channels, error mode<br>parameters of noisy coding. This science creates a necessary be<br>characteristics of the development of noisy coding bases in<br>information transmission.   | nd coding theory such<br>ation descriptions of<br>els, classification and<br>asis for studying the<br>modern methods of                        |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Acquire knowledge about information and coding theory in<br>infrastructure   | n modern information   |
|                               | LO 2. Have knowledge about the quality indicators of data transmisystems and their requirements;<br>LO 3. Have knowledge about the importance of information desinformation sources;<br>LO 4. Know the general principles of building an access network;   | scriptions of discrete   |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manage<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;                      | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized:  |

| Assessment of | <ul> <li>communication te<br/>debates and other au</li> <li>case-study method</li> <li>game technologie<br/>games;</li> <li>information and co<br/>In order to develop<br/>open questions",</li> <li>"INSERT", hands-oc<br/>classes.</li> </ul>   | chnologies (discussion, press-con<br>ctive forms and methods);<br>d (analysis of situations);<br>s, in which students participate in<br>ommunication (including distance<br>oritical thinking among students<br>"Cluster", "Cross-discussion",<br>on activities, gamification and othe  | ference, brainstorm<br>n business, role-play<br>e learning) technolog<br>, such methods as "<br>"Know-Want to H<br>ers are actively used  | ing, educ<br>ying, sin<br>gies.<br>Predictio<br>Know-Le<br>during p                      | cational<br>nulation<br>on with<br>carned",<br>practical                       |
|---------------|---|---|---|--|--|
| the student's |   | Practical works (1-10)  | 20  | 5 (max)  | Total  |
| knowledge:    | Current control   | Independent works (1-10)  | 10  | 40   |  |
|               | Current control   |   | 10  | 40   | 100  |
|               |   |   | 10  |  | 100  |
|               | Mid-term control  | Written work  | 10  |  | -  |
|               | Final control   | Exam (Written)  | 50  |  |  |
| lectures:     | <ul> <li>Introduction. The role and importance of information and coding theory in modern information infrastructure. Basic concepts of science ( information, message, signal) Quality indicators of data transmission networks and systems and their requirements.Standards of computer networks.</li> <li>Informational descriptions of discrete message sources. Volume of information. Entropy. Redundancy. Productivity.</li> <li>Shannon's theorem in discrete message sources. Shannon-Fano, Huffman compression algorithms. Dictionary encoding methods (LZ77, LZ78)</li> <li>Data compression (text, audio, video). Lossy and lossless compression methods. Compression algorithms in modern modems.</li> <li>Measures, methods, classification and requirements for increasing reliability in telecommunication systems</li> <li>Shannon's theorem in noisy discrete channels. Error models. Classification and parameters of noise-immunity coding</li> <li>Linear and block codes. Hamming, cyclic codes.</li> <li>Goley and Fire codes.</li> <li>BChX and Reed-Solomon codes.</li> <li>Use of noise-immunity codes in telecommunications.</li> <li>General principles of construction of subscriber access network. Classification, structure and capabilities of modems.</li> <li>Protocols and interfaces used in modems. Modulation and demodulation methods.</li> <li>Wired and wireless data transmission technologies</li> <li>Principles of adaptation in data transmission systems</li> </ul> |   |   |  |  |
| Literature:   | 1. Abbas El Gamal, Youn<br>Network Coding: Introduct<br>J.B. Baltayev. Information<br>B.M. Umirzakov. Network<br>assessing the reliability of c<br>and coding. Text of lecture<br>Tashkent TITU. 2006   | g-Han Kim Network Information Theory. C<br>tion. Cambridge University Press, 2008. 3. Dju<br>and Coding Theories.T.: "Communicator".2<br>r protocols. Study guide.T.: "Communicator"<br>digital elements of radio systems. – T.: TITY, 2<br>s. TITU, 2014. 7. N.B. Usmanova Information | ambridge University Press,<br>aravev P.X., Djabbarov Sh. 7<br>2018, 296 р. 4. R.X. Djurae<br>.2018, 144 р. 5. Давронбен<br>017.–168 р. 6. S.K. Ganiye<br>transmission systems and n | , 2011. 2. 7<br>Yu., S.O. M<br>ev, Sh.Yu. I<br>coв Д.A. M<br>ev. Informat<br>etworks. St | racey Ho<br>laxmudov,<br>Djabbarov,<br>ethods for<br>tion theory<br>udy guide. |

| 6.3. Signals and              | l systems   |   |  |
|-------------------------------|---|---|--|
| Semestr:                      | 5   |   |  |
| Date of last<br>modification: | 31.08.2023  |   |  |
| Teachers:                     | Khasanov Umidjon Komiljon ugli  |   |  |
| Component:                    | Compulsory  |   |  |
| Cycle:                        | Core  |   |  |
| ECTS:                         | 6   |   |  |
| Pre-requisities               | Electromagnetic fields and waves  |   |  |
| Workload:                     | Types of classes  | Hours   |  |
|                               | Total   | 180   |  |
|                               | Lecture   | 42  |  |
|                               | Practical works   | 30  |  |
|                               | SAW (Student autonomous work)   | 108   |  |
|                               | Form of final control   | Exam  |  |
|                               | Final assessment method   | Testing   |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |  |
| Final control                 | The final exam is taken in the form of a test, which contains<br>2 points each, tests are divided into 3 levels of difficulty. Total exam   | s 25 questions, worth<br>n time 60 minutes  |  |
| Short content:                | The science provides information and understanding about signals, their types, analog and digital signal processing methods and algorithms, signal processing systems, systems development processes.   |   |  |
| Goal:                         | Providing students with knowledge and understanding of signals and signal processing methods and algorithms, their development systems, hardware and software tools of signals, and the ability to use them in real-time systems.   |   |  |
| Objective:                    | - to have information about signals and their types and characteristic<br>of analog and digital processing of signals; - development of real-ti<br>systems; - to have information about systems and their life stages;  | cs; - to form concepts<br>me signal processing  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Students will have basic information about signals and types of signals.<br>LO 2. Analyzes processes of digital signal processing.<br>LO 3. Performs analog and digital processing.<br>LO 4. Can use modern processing systems.   |   |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;   |   |  |
|                               | <ul> <li>communication technologies (discussion, press-conference, brains debates and other active forms and methods);</li> <li>case-study method (analysis of situations);</li> <li>game technologies, in which students participate in business, rol-games;</li> <li>Information and communication (including distance learning) tech In order to develop critical thinking among students, such method open questions", "Cluster", "Cross-discussion", "Know-Want "INSERT", hands-on activities, gamification and others are actively</li> </ul> | e-playing, simulation<br>nologies.<br>s as "Prediction with<br>to Know-Learned",<br>used during practical |  |
|                               | classes.  |   |  |

| Assessment of the student's | Type of task Number of points (max)  |   |   |  |   |
|-----------------------------|--|---|---|--|---|
| knowledge:                  |  | Practical works (1-10)  | 30  |  |   |
|                             | Current control  | Independent work  | 5   | 40   |   |
|                             |  | Oral presentation   | 5   |  | 100   |
|                             | Mid-term control   | Written work  | 10  |  |   |
|                             | Final control  | Exam (Testing)  | 50  |  |   |
| Topics of                   | - Basic characteris  | tics of signals and systems   |   |  |   |
| lectures:                   | - Areas of signal e  | xpression.  |   |  |   |
|                             | - Discretization, quantization and coding of signals   |   |   |  |   |
|                             | - Segmentation and framing in signal processing.   |   |   |  |   |
|                             | - Basic operations   | of time domain signals  |   |  |   |
|                             | - Basics of functional spaces and units  |   |   |  |   |
|                             | - Methods of spectral analysis of vibrations in nonlinear circuits.  |   |   |  |   |
|                             | - Signal interpolation and approximation methods   |   |   |  |   |
|                             | - Spectral signal pr   | ocessing.   |   |  |   |
|                             | - Signal spectral pr   | cocessing systems.  |   |  |   |
|                             | - Organization of a  | rchitecture and memory of signal pr   | ocessors.   |  |   |
|                             | - Addressing meth  | ods in signal processors.   |   |  |   |
|                             | - A family of signa  | ll processors.  |   |  |   |
|                             | - Test tools for sig   | nal processors.   |   |  |   |
|                             | - Modern signal pr   | ocessing systems.   |   |  |   |
| Literature:                 | Literature 1Ayficher E., D<br>992 s. 2. Proakis, John G.,<br>"Digital Signal Processing<br>Ingle and John G. Proakis | yervis B. Sifrovaya obrabotka signalov. Praktiche<br>and Dimitris G. Manolakis. "Digital signal proce<br>Fundamentals and Applications." Academic Pre<br>. "Digital signal processing using Matlab, Third e | skiy podxod. 2-e izc<br>ssing." PHI publicat<br>ss is an imprint of E<br>dition". Global Engi | laniye. Vil<br>tion. 2004.<br>lsevier. 20<br>ineering. 2 | yams, 2004. —<br>3. Li Tian.<br>08. 4. Vinay K.<br>012. |

| 6.4. Wireless N               | etworks   |   |  |
|-------------------------------|---|---|--|
| Semestr:                      | 6   |   |  |
| Date of last<br>modification: | 31.08.2023  |   |  |
| Teachers:                     | Alimdjanov Khayot Farkhadovich  |   |  |
| Component:                    | Compulsory  |   |  |
| Cycle:                        | Core  |   |  |
| ECTS:                         | 6   |   |  |
| Pre-requisities               | Electromagnetic fields and waves, Signals and systems   |   |  |
| Workload:                     | Types of classes  | Hours   |  |
|                               | Total   | 120   |  |
|                               | Lecture   | 30  |  |
|                               | Practical works   | 18  |  |
|                               | SAW (Student autonomous work)   | 72  |  |
|                               | Form of final control   | Exam  |  |
|                               | Final assessment method   | Testing   |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |  |
| Final control                 | The final exam is taken in the form of a test, which contain 2 points each, tests are divided into 3 levels of difficulty. Total exam   | s 25 questions, worth<br>m time 60 minutes  |  |
|                               | technologies for organizing wireless Networks", it must include technologies for organizing wireless communications, methods for their difference from TC channels, technical concepts for communications. communication networks, spectrum extension signal separation using optical and radio communications, as we constructing wireless local networks.   | r allocating channels,<br>constructing wireless<br>systems, methods of<br>well as principles of |  |
| Goal:                         | The purpose of mastering the discipline is to give su<br>theoretical knowledge and practical skills in building wireless network  | tudents systematized orks.  |  |
| Objective:                    | Successful completion of this course allows students to prepare for independent work in the field of design, operation, setup and repair of wireless networks used in the fields of communications and broadcasting, as well as in the research departments of organizations that produce and supply wireless networks, communication equipment on the market of Uzbekistan.  |   |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. knows the features and types of narrowband and broadband wireless<br>communication systems<br>LO 2. knows how to organize and plan wireless networks<br>LO 3. knows the architecture of wireless communication networks and their areas of<br>application.<br>LO 4. acquires skills in solving communication problems and solving them in wireless<br>networks<br>LO 5. have skills in calculating parameters of wireless communication networks<br>LO 6. has skills in wireless network design |   |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manage<br>the acquisition of experience in independent problem solving shoul<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;  | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized:       |  |

|               | - communication technologies (discussion, press-conference, brainstorming, education debates and other active forms and methods); |   |  |  | cational                               |
|---------------|---|---|--|--|--|
|               | <ul><li> case-study method</li><li> game technologies</li></ul>   | l (analysis of situations);<br>s, in which students participate in  | n business, role-play  | ying, sin  | ulation                                |
|               | games;  |   |  | _  |  |
|               | - information and co  | ommunication (including distance  | e learning) technolog  | gies.  |  |
|               | In order to develop   | "Cluster" "Cross discussion"  | , such methods as "<br>"Know Want to I   | Prediction   | on with                                |
|               | "INSERT", hands-o   | n activities, gamification and othe   | ers are actively used  | during p   | ractical                               |
|               | classes.  |   | , i i i i i i i i i i i i i i i i i i i  | 8 F  |  |
| Assessment of |   | Type of task  | Number of points   | s (max)  | Total                                  |
| the student's |   | Practical works (1-10)  | 20   |  |  |
| knowledge:    | Current control   | Independent work  | 10   | 40   |  |
|               |   | Oral presentation   | 10   | -  | 100                                    |
|               | Mid-term control  | Written work  | 10   |  | 1                                      |
|               | Final control   | Exam (Written)  | 50   |  | -                                      |
| Topics of     | - Connection to   | wireless networks. Methods  | of wireless signa  | l transn   | nission.                               |
| lectures:     | Classification of   | wireless data transmission technology   | ologies.   |  |  |
|               | - Features of ra  | dio wave propagation. Featur  | res of radio way   | e propa  | igation.                               |
|               | Classification of   | radio frequencies.  | nd definitions. One  | oting pr   | incinlas                               |
|               | and design of   | antennas Unique features of   | microwave antenna  | ating pr   | mercial                                |
|               | antennas.   | antennas. Enique reactives of   |  | .s. com  | iner erar                              |
|               | - Methods of con  | necting to the transmission medi  | ium in wireless net  | works. N   | <i>Aultiple</i>                        |
|               | access by frequ   | ency, time and code. Organization   | ation of duplex mo   | ode in v   | vireless                               |
|               | networks.   | modulation in wireless networ   | ka Manipulationa   | in digita  | 1 radio                                |
|               | communication (BPSK)  | systems. Amplitude (ASK), frequ   | iency (FSK) and ph   | ase shift  | keying                                 |
|               | - Types of multi  | -order modulations. Ouadrature  | phase shift keyin  | g (OPS   | K) and                                 |
|               | quadrature ampl   | itude modulation (QAM).   | 1 5  |  | ,                                      |
|               | - Radio relay and   | satellite communications. Satellit  | e navigation. Gener  | al princi  | ples for                               |
|               | constructing rad  | io relay lines. Block diagrams of   | digital radio relay st   | ations.  |  |
|               | - The evolution o   | ications from the 1G generation t   | a the 5G generation  | Developi   | nent of                                |
|               | - Third generation  | n cellular communication system   | ns 3G. 3G cellular   | commur   | nication                               |
|               | systems. 3G network concept. CDMA2000 technology.   |   |  |  |  |
|               | - 4G is the four  | th generation of cellular comm  | nunication systems.  | OFDM   | l is an                                |
|               | orthogonal frequ  | ency division multiplexing techn  | ology.   | 1 1  | 50                                     |
|               | - 5G wireless sta   | ndards in action. Development   | of mobile network  | s based<br>m I TE t  | on 5G                                  |
|               | - Wi-Fi technolog   | v (IEEE 802.11). History of W   | i-Fi technology. W   | 'i-Fi tech   | nology                                 |
|               | certification. Org  | ganization of wireless local netwo  | orks.  |  |  |
|               | - Basic concepts of   | of IEEE 802.11 standards.   |  |  |  |
|               | - WiMAX standar   | rd (IEEE 802.16). The evolution   | of last mile wirele  | ss techno  | ologies.                               |
| <b>I</b> •    | Architecture of t   | ne IEEE 802.16 standard. Compa  | urison of mobile and   | $\frac{11 \times 10^{11} \text{ m}}{2 \times 10^{11} \text{ m}}$ | INIAX.                                 |
| Literature:   | Sh.U.Pulatov, U.T.Aliyev,<br>Abdukadirov, D.A. Davro<br>Davronbekov D.A., Sulton  | M.O.Sultonova. «Simsiz keng polosali texnol<br>nbekov. Mobil aloqa tizimlarining 4G avlor<br>nova, M.O., Tashmanov E.B., Aliev U.T. E | logiyalar». Darslik. T: "Alc<br>di. Uquv qullanma, T: 201<br>Darslik/ Simsiz aloqa tizin | 2. D.A.Dav<br>oqachi", 201<br>15. 4. Ibrain<br>nlari va das      | 7. 3. A.X.<br>mov R.R.,<br>turlari. T: |
|               | "Alogachi", 2017.   |   |  |  | l                                      |

| 6.5. Programmi                | ing in infocommunication   |                         |  |
|-------------------------------|--|-------------------------|--|
| Semestr:                      | 7  |                         |  |
| Date of last<br>modification: | 31.08.2023   |                         |  |
| Teachers:                     | Mukhammedinov Kobeysin Kuanishovich, Utegenov Akhmet Alish   | ner ugli                |  |
| Component:                    | Compulsory   |                         |  |
| Cycle:                        | Core   |                         |  |
| ECTS:                         | 6  |                         |  |
| Pre-requisities               | Fundamentals of network programming  |                         |  |
| Workload:                     | Types of classes   | Hours                   |  |
|                               | Total  | 180                     |  |
|                               | Lecture  | 42                      |  |
|                               | Practical works  | 30                      |  |
|                               | SAW (Student autonomous work)  | 108                     |  |
|                               | Form of final control  | Exam                    |  |
|                               | Final assessment method  | Testing                 |  |
| Control forms:                | Current control, Mid-term control, Final control   |                         |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control, |  |
| Short content:                | The theoretical basis of knowledge on programming in info<br>basic concepts and principles of programming in infocommunication   | communications, the     |  |
| Goal:                         | The purpose of mastering the subject is to provide theoretical knowledge and practical skills about programming in infocommunications.   |                         |  |
| Objective:                    | Creating client-server network programs based on web sockets, working with<br>Internet addresses on the network, creating applications based on the UDP protocol,<br>creating practical skills in creating JavaFX, AJAX and distributed client-server<br>applications  |                         |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Get an idea of programming in infocommunications, client-server architecture,<br>network protocols.<br>LO 2. Learns programming tools and programming languages in infocommunication, the<br>principles of organizing information exchange in infocommunication systems.<br>LO 3. Learns and uses Internet addresses (URLs and URIs) and JSON data exchange<br>format of programming in infocommunications.<br>LO 4. Have skills in socket-based network programming, using classes in network<br>programming.<br>LO 5. Asynchronous JavaScript and XML (AJAX)-based application creation, network<br>programming skills with JavaFX<br>LO 6. Gain skills in building distributed client-server applications (Remote Method<br>Invocation - RMI)   |                         |  |
| methods:                      | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies |                         |  |

|                             | In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.  | p critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and other  | such methods<br>Know-Want t<br>s are actively t  | as "Pre-<br>to Knov<br>ised duri  | diction wit<br>w-Learned<br>ing practica   |
|-----------------------------|--|--|--|---|--|
| Assessment of the student's |  | Type of task   | Number of points<br>(max)  |   | Total  |
| knowledge:                  | Comment a central  | Practical works (1-10)   | 30   | 40  |  |
|                             | Current control  | Independent work   | 10   | 40  | 100  |
|                             | Mid-term control   | Written work   | 10   |   | 100  |
|                             | Final control  | Exam (Testing)   | 50   |   |  |
| icciares.                   | <ul> <li>Applications bas</li> <li>Internet addresse</li> <li>URL links.</li> <li>Programs for nor</li> <li>Applications bas</li> <li>DatagramChanne</li> <li>IP Multicast capa</li> <li>Asynchronous Ja</li> <li>JavaFX capabilit</li> <li>Distributed cliem</li> </ul> | ed on web sockets.<br>In the UDP protocol.<br>In the UDP protocol.<br>In the UDP protocol.<br>In the sockets.<br>In th | ogy.   | - RMI).   |  |
| Literature:                 | 1. Object-oriented progra<br>Programming in Java. Int<br>208 p. 3. Java Servlet Pro<br>p. 4. Computer Networks<br>Network Programming<br>Highway North, Sebastor<br>Jan Graba. Springer Lond   | mming in Java. Study guide. N. Kh. Tursunov, A<br>roduction to the course with examples and practic<br>gramming. J.Hunter, W.Crawford2nd Edition.<br>. Andrew S. Tanenbaum 3rd ed London: Pre<br>4th Ed. by Elliotte Rusty Harold. 2014. Publish<br>pol. 502 p. 6. An Introduction to Network Progra<br>on Heidelberg New York Dordrech. 2013. 389 p.  | . Q. Ergashev T.:<br>cal tasks: textbook.<br>- Beijing; Mumbai:<br>ntice-Hall Internati<br>ed by O'Reilly Me<br>mming with Java. J | Alokachi,<br>A.V. Prusk<br>Oʻreilly, S<br>onal, 1996<br>dia, Inc., 1<br>ava 7 Com | 2018 146 p.<br>ov M.: 2018<br>SPD, 2005 75<br>813 p. 5. Jav<br>005 Gravenste<br>patible3rd E |

| 6.6. Image proc               | cessing   |  |  |
|-------------------------------|---|--|--|
| Semestr:                      | 6   |  |  |
| Date of last<br>modification: | 31.08.2023  |  |  |
| Teachers:                     | Mirzayev Namoz, Jaumitbaeva Mekhriban   |  |  |
| Component:                    | Compulsory  |  |  |
| Cycle:                        | Core  |  |  |
| Credit point:                 | 6   |  |  |
| Workload:                     | Types of classes  | Hours                                      |  |
|                               | Total   | 180  |  |
|                               | Lecture   | 42   |  |
|                               | Practical works   | 30   |  |
|                               | SAW (Student autonomous work)   | 108  |  |
|                               | Form of final control   | Exam                                       |  |
|                               | Final assessment method   | Testing                                    |  |
| Control forms:                | Current control, Mid-term control, Final control  |  |  |
| Assessment                    | Attendance at classes and 60% of academic progress in tota  | al for 2 types of                          |  |
| requirements                  | control, to obtain admission to the final control   |  |  |
| Final control                 | The final exam is taken in the form of a test, which contains 25 questions, worth   |  |  |
|                               | 2 points each, tests are divided into 3 levels of difficulty. Total example   | n time 60 minutes                          |  |
|                               | investigating how sounds, images and videos can be processed and analysed alongside<br>the fundamentals of how the human auditory and visual perception system functions (e.g.,<br>how your eyes and ears work with your brain). Concepts such as data encoding and<br>compression are provided with practical application of understanding signals in terms of<br>their frequency components, relating to their time and spatial components (e.g., audio<br>frequency components or the spatial frequency of an image) |  |  |
| Goal:                         | The purpose of the subject is to form in students general concepts of digital processing of audio signals and images, digital signal models, distortions, processing of audio signals in the time and frequency domains, filtering, coding, digitalization methods, compression, segmentation, calculation of characteristic features, recognition, formation of information on the practical application of methods and algorithms for digital processing of audio signals and images.                                 |  |  |
| Objective:                    | <ul> <li>-Knowledge of technologies and processes of digital processing of audio and video;</li> <li>-Knowledge of processes and methods of digital processing of images and sound;</li> <li>-Ability to analyze the current state of IT applications;</li> <li>-Ability to analyze the main models used in voice and image recognition.</li> </ul>   |  |  |
| Learning                      | On successful completion of this module, the student should   | d:   |  |
| outcome:                      | -Be familiar with various signal processing concepts, such as frequency analysis using<br>Fourier Transforms;<br>-Have gained experience in programmatically processing signals (including both signals<br>and images);   |  |  |
|                               | -Have gained an understanding of how humans perceptive signals<br>the computational signal processing we perform;<br>-Understand the issues that arise when designing and building signal   | and how this affects processing pipelines. |  |

| Teaching<br>methods:        | In the cond<br>in active and creati<br>that promote active<br>the acquisition of e<br>- technology of pro-<br>- technologies of e<br>- communication to<br>debates and other a<br>- case-study metho<br>- game technologie<br>games;<br>- information and o<br>In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.  | ditions of the credit system of educa<br>ive forms. Among the effective peda<br>e involvement of students in the search<br>experience in independent problem so<br>oblem- and project-based learning;<br>ducational and research activities;<br>echnologies (discussion, press-confe-<br>active forms and methods);<br>ed (analysis of situations);<br>es, in which students participate in<br>communication (including distance I<br>p critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and other   | tion, classes are<br>gogical method<br>ch and managen<br>olving should b<br>erence, brainsto<br>business, role-p<br>earning) techno<br>such methods a<br>Know-Want to<br>s are actively us                     | e condu<br>ls and to<br>nent of<br>be empl<br>rming,<br>rming,<br>blaying,<br>blaying,<br>blogies.<br>s "Preco<br>Mov<br>sed duri | cted ma<br>echnolo<br>knowle<br>hasized<br>educat<br>, simula<br>liction<br>v-Learn<br>ng prac | ainly<br>ogies<br>edge,<br>:<br>ional<br>ation<br>with<br>ned",<br>ctical |
|-----------------------------|---|---|--|---|--|---|
| Assessment of the student's |   | Type of task  | Number of p  | ooints  | Total  |   |
| knowledge:                  |   | Practical works   | ( <b>max</b> )   |   |  |   |
|                             | Current control   | Independent work  | 10   | 30  | 30 100   |   |
|                             | Current control   | Oral presentation   | 10   | 50  |  |   |
|                             | Mid term control  | Written work  | 20   |   |  |   |
|                             | Final control   | From (Testing)  | 50   |   | -  |   |
|                             | Filial control  | Exam (Testing)  |  |   |  |   |
|                             | <ul> <li>Fundamentals of<br/>concept of nois</li> <li>Systems, selection<br/>systems. Theory<br/>guantization.</li> <li>Delays and conse-<br/>nonlinear delay</li> <li>Digital filters. Au-<br/>additional filter</li> <li>Sound analysis. S<br/>Spectral model:</li> <li>Audio players in</li> <li>Rearrange sound</li> <li>Sound compression and</li> <li>File types for sto-<br/>file formats. W</li> <li>Determining statt</li> <li>Organizing imag</li> <li>Spatial filtering of<br/>Boolean transfor</li> </ul> | sound processing. Sound theory. Dr<br>e. Jitter. Loudness. The concept of d<br>on and quantization. Principles of dig<br>em of choice. Spectral representation<br>ition from a continuous-time system<br>equences. Audio and video delays ar<br>s of sound effects.<br>adio and image filters. MP3 audio fi<br>packages.<br>Sound modeling. Short-time Fourier<br>ing. Time models. Nonlinear models<br>Windows operating system.<br>in Mac OS. MacPlayer software.<br>on methods.<br>I decompression.<br>ring audio signals. AU, VOC, FIFF<br>orking with WAVE files.<br>ic properties of images.<br>e pixels based on pixel transformation<br>of images.<br>m – logical operations as morpholog | gitalization. Dis<br>ligital sound pro-<br>gital sound. Com<br>ns of discrete the<br>to a discrete-the<br>nd their causes.<br>lters, JPEG ima<br>transform. Line<br>s. Physical mode<br>and FIFF-C file<br>on. | scretiza<br>ocessing<br>atinuou:<br>me. Dis<br>me syst<br>Linear<br>ge filte<br>ear cod:<br>els.                                  | ts. Mus  | ime   |
| Literature:                 | - BOOlean transfor<br>Burger V., Burge M.J. Di<br>564 p. Digital Image Proc<br>New York: Springer, 2017<br>MATLAB environment. S<br>the subject "Sound and In<br>manual for performing lal<br>Video processing// Stud<br>Methodological manual."  | m – IOgICal Operations as morpholog<br>gital Image Processing: An Algorithmic Introduc<br>essing. Signal Processing and an Algorithmic Ap<br>7 468 p. R. Gonzalez., R. Woods., S. Eddins. Di<br>Sh. T. Kasimova, Sh. Chulliev, B. Boymurodov. M<br>mage Processing" Tashkent 2021. Sh. T. Kasimo<br>boratory work in the specialty "Sound and Image<br>y guideT.: "IMPRESS MEDIA". 2023 28<br>'IMPRESS MEDIA". 2023 204 p.  | gical operations.<br>tion Using Java Ne<br>proach [Text]: monog<br>gital processing is car<br>Methodical methodolo<br>va, B. Boymurodov,<br>Processing'' Tashken<br>8 p. Mukhamadiev                           | w York: S<br>graph / D.<br>rried out g<br>ogy of lab<br>Sh. Chull<br>tt 2021. B<br>A.Sh. Vi                                       | Springer, 2<br>Sundarar<br>raphically<br>oratory w<br>iev. Meth<br>eknazarov<br>deo proce      | 2007<br>rajan<br>v in the<br>ork on<br>nodical<br>va S.S.<br>essing.      |

| 6.7. Embedded                 | management systems   |                         |  |
|-------------------------------|--|-------------------------|--|
| Semestr:                      | 6  |                         |  |
| Date of last<br>modification: | 31.08.2023   |                         |  |
| Teachers:                     | Abaskhanova Halima Yunusovna, Abdurakhmanov Rustam Pattakh   | ovich                   |  |
| Component:                    | Compulsory   |                         |  |
| Cycle:                        | Core   |                         |  |
| ECTS:                         | 6  |                         |  |
| Pre-requisities               | Microprocessors, Fundamentals of building info-communication sy  | stems and networks      |  |
| Workload:                     | Types of classes   | Hours                   |  |
|                               | Total  | 180                     |  |
|                               | Lecture  | 42                      |  |
|                               | Practical works  | 30                      |  |
|                               | SAW (Student autonomous work)  | 108                     |  |
|                               | Form of final control  | Exam                    |  |
|                               | Final assessment method  | Testing                 |  |
| Control forms:                | Current control, Mid-term control, Final control   |                         |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control, |  |
| Final control                 | The final exam is taken in the form of a test, which contains 25 questions, worth 2 points each, tests are divided into 3 levels of difficulty. Total exam time 60 minutes   |                         |  |
| Short content:                | This course provides the necessary foundation for learning about embedded management systems, creating embedded management systems using high-level programming languages, and testing them based on hardware.   |                         |  |
| Goal:                         | The purpose of mastering the discipline is to give students systematized theoretical knowledge and practical skills in embedded management systems.  |                         |  |
| Objective:                    | -embedded management systems and their structure; -operating systems of<br>modern embedded systems; -organization of microcontrollers; -parallel information<br>processing tools; -hardware means of direct access to memory; -the principle of designing<br>and operating software tools of the embedded system; -methods of information exchange;<br>-creating programs in a high-performance programming language and configuring them<br>in hardware support, -implementation and organization of the principles of information<br>exchange in them, organization of means of connecting system devices with the control<br>object                                   |                         |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Gains an understanding of control systems and embedded control systems.<br>LO 2. Gain knowledge of hardware and software of real-time embedded systems.<br>LO 3. Acquire practical skills in solving problems in the design of embedded systems and<br>hardware design.<br>LO 4. Digital devices can choose ways to create and configure software for workflows.<br>LO 5. Knows the tools for creating software for automatic control of technological<br>processes and their configuration and organization   |                         |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations); |                         |  |

|               | - game technologie games;  | es, in which students participate in   | business, role-j   | playing,                              | simula                              | ation                   |
|---------------|--|--|--|---------------------------------------|-------------------------------------|-------------------------|
|               | - information and c  | communication (including distance l  | earning) techno  | ologies.                              |                                     |                         |
|               | In order to develop  | o critical thinking among students,  | such methods   | as "Prec                              | liction                             | with                    |
|               | open questions".   | "Cluster", "Cross-discussion", "I  | Know-Want to   | Knov                                  | v-Learr                             | ned".                   |
|               | "INSERT", hands-   | on activities, gamification and other  | s are actively u   | sed duri                              | ng prac                             | ctical                  |
|               | classes.   |  |  |                                       | <i>0</i> r                          |                         |
| Assessment of |  |  | Number of  | points                                |                                     |                         |
| the student's |  | Type of task   | (max)  | L                                     | Total                               | 1                       |
| knowledge:    | Current control  | Practical works (1-10)   | 30   | 40                                    |                                     | l                       |
|               |  | Independent work   | 10   | 40                                    | 100                                 | 1                       |
|               | Mid-term control   | Written work   | 10   |                                       | 100                                 | 1                       |
|               | Final control  | Exam (Testing)   | 50   |                                       |                                     | I <u> </u>              |
| Topics of     | - Introduction to th   | ne science of embedded control syste   | ems and their se   | oftware                               |                                     |                         |
| lectures:     | -Embedded mana   | gement systems, their classification   | and main featu   | res.                                  |                                     |                         |
|               | -Main features of embedded control systems: real-time mechanisms in embedded                                   |  |  |                                       |                                     |                         |
|               | systems.   |  |  |                                       |                                     |                         |
|               | - Structural princip<br>hardware and se  | bles of modern embedded systems. Toftware.   | The main comp  | onents a                              | are                                 |                         |
|               | -Structural princip  | oles of hardware support of embedde  | ed management  | system                                | IS.                                 |                         |
|               | -Structural princip  | ural principles of hardware support of embedded management systems.  |  |                                       |                                     |                         |
|               | -Structural princip  | -Structural principles of hardware support of embedded management systems.   |  |                                       |                                     |                         |
|               | -Hardware design tools for embedded management systems and their capabilities.                                 |  |  |                                       |                                     |                         |
|               | -Analysis of modeling issues of control systems to be embedded.  |  |  |                                       |                                     |                         |
|               | -Software design of embedded control systems: organization of system and application software.                 |  |  |                                       |                                     |                         |
|               | -Software of embedded management systems. Embedded operating systems.  |  |  |                                       |                                     |                         |
|               | - Instrumental tool  | s for designing embedded managem   | ent systems so   | ftware.                               |                                     |                         |
|               | -Principles of hard  | - Principles of hardware and software testing of embedded control systems  |  |                                       |                                     |                         |
|               | -Fields of applicat  | ion of embedded management syste   | ems. IoT princi  | oles and                              | and IT                              | C/OT                    |
|               | convergence. P   | rinciples of standardization of IoT.   |  | •                                     |                                     |                         |
|               | -Principles of IoT   | organization: WSN, SCADA, RFIL   | D, M2M.  |                                       |                                     |                         |
| Literature:   | 1. Abaskhanova H.Y., An  | nirsaidov U.B. Microprocessors. Study guide for  | r higher educational   | institution                           | s. "Scienc                          | ce and                  |
|               | technologies". Tashkent -<br>for higher educational inst<br>N.V. Microprocessor devi<br>Tashkent - 2023 347 p. | 2017 272 p. 2. Abaskhanova H.Y., Mirzaeva M<br>itutions. "Hihol Print". Tashkent - 2021200 p. 3<br>ces of radio communication, a textbook for higher | M.B., Parsiev S.S Mi<br>B. Abaskhanova H.Y.<br>educational instituti | croprocess<br>, Baltayev<br>ons. "IMP | sor. Study<br>J,.B., Yar<br>RESS ME | guide<br>onova<br>DIA". |

| 6.8. Fundament                | tals of building infocommunication systems and networks   |   |
|-------------------------------|---|---|
| Semestr:                      | 4   |   |
| Date of last<br>modification: | 31.08.2023  |   |
| Teachers:                     | Abdurakhmanov Rustam Pattakhovich, Allamuratova Zamira Juma   | muratovna   |
| Component:                    | Elective  |   |
| Cycle:                        | Core  |   |
| ECTS:                         | 6   |   |
| Pre-requisities               | Microprocessors, Discrete structures  |   |
| Workload:                     | Types of classes  | Hours   |
|                               | Total   | 180   |
|                               | Lecture   | 42  |
|                               | Laboratory works  | 30  |
|                               | SAW (Student autonomous work)   | 108   |
|                               | Form of final control   | Exam  |
|                               | Final assessment method   | Writing   |
| Control forms:                | Current control, Mid-term control, Final control  |   |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |
| Final control                 | The final exam is written in the form of 5 questions of questions consist of 2 parts: 3 theoretical questions and 2 practical cuestions is 80 minutes   | 10 marks each, the questions. Total exam  |
| Short content:                | Fundamentals of Infocommunication Systems and Network<br>you to understand the terminology and structural principles used in<br>Systems and the basic concepts of building an info communication  | ks course encourages<br>Info Communication<br>network.  |
| Goal:                         | The purpose of mastering the subject is to provide basic theoretical knowledge and practical skills in information communication systems and networks.  |   |
| Objective:                    | General concepts in the field of information communication; -connection; -<br>classification of infocommunication networks; -primary signals and communication<br>channels; -basic parameters and characteristics of channels; -elements of the theory of<br>teletraphy: -principles of multichannel transmission;  |   |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Gains understanding of the structure of info communication networks.<br>LO 2. Gain an understanding of key terms in info communication systems and networks<br>LO 3. Gain understanding and knowledge of the stages of development of info<br>communication networks.<br>LO 4. Learns the types of info communication networks.   |   |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manage<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brains<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role<br>games;<br>- information and communication (including distance learning) tech<br>In order to develop critical thinking among students, such method | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized:<br>storming, educational<br>e-playing, simulation<br>nologies.<br>s as "Prediction with |
|  | "INSERT", hands-   | on activities, gamification and other  | s are actively u  | sed duri  | ng practical   |  |
|--|--|--|---|---|--|--|
|  | classes.   |  |   |   |  |  |
| Assessment of<br>the student's<br>knowledge: |  | Type of task   | Number of points<br>(max)   |   | Total  |  |
|  | Comment a antrol   | Practical works (1-10)   | 30  | 40  |  |  |
|  | Current control  | Independent work   | 10  | 40  | 100  |  |
|  | Mid-term control   | Written work   | 10  |   | 100  |  |
|  | Final control  | Exam (Writing)   | 50  |   |  |  |
| Topics of                                    | -Fundamentals of   | f building infocommunication sy  | stems and net   | tworks  |  |  |
| lectures:                                    | -Classification of infocommunication networks  |  |   |   |  |  |
|  | -Primary signals and communication channels  |  |   |   |  |  |
|  | -Basic parameters and characteristics of channels  |  |   |   |  |  |
|  | -Elements of the theory of teletraphy  |  |   |   |  |  |
|  | -Principles of multichannel transmission   |  |   |   |  |  |
|  | -Digital transmission systems  |  |   |   |  |  |
|  | - The basics of building analog radio relay lines  |  |   |   |  |  |
|  | -Structure of radio transmission systems   |  |   |   |  |  |
|  | -Digital radio relay lines   |  |   |   |  |  |
|  | Principles of construction of satellite communication systems  |  |   |   |  |  |
|  | -Features of signal transmission in outer space  |  |   |   |  |  |
|  | - Transport networks   |  |   |   |  |  |
|  | - Features of the co   | onstruction of fiber-optic transmission  | on systems  |   |  |  |
| Literature:                                  | 1. Spezia Stefano (ed.) Di<br>— ISBN 978-1-77407-76<br>Technologies in the 5G Er<br>networks. Principles, tech<br>St. Petersburg, Peter, 201 | gital Communication Systems: Signals, Channel:<br>i8-9. 2. Sendin A., Matanza J., Ferrús R. Smart<br>a. 3. Kazanskiy N.L. (ed.) Photonics Elements for<br>nologies, protocols: A textbook for university stu<br>5. | s, and Signaling. Ar<br>Grid Telecommunic<br>Sensing and Optical<br>idents, Fifth Edition | cler Press,<br>cations: Fu<br>Conversio<br>" N.A. Oli | 2021. — 494 p.<br>ndamentals and<br>ns 4. "Computer<br>fer, V.G. Olifer, |  |

| 6.9. Info-comm                | unication technologies  |  |  |
|-------------------------------|---|--|--|
| Semestr:                      | 4   |  |  |
| Date of last<br>modification: | 31.08.2023  |  |  |
| Teachers:                     | Mirzaeva Malika Bakhadirovna, Tojieva Feruza Kobiljon kizi  |  |  |
| Component:                    | Elective  |  |  |
| Cycle:                        | Core  |  |  |
| ECTS:                         | 6   |  |  |
| Pre-requisities               | Discrete structures   |  |  |
| Workload:                     | Types of classes  | Hours  |  |
|                               | Total   | 180  |  |
|                               | Lecture   | 30   |  |
|                               | Laboratory works  | 42   |  |
|                               | SAW (Student autonomous work)   | 108  |  |
|                               | Form of final control   | Exam   |  |
|                               | Final assessment method   | Writing  |  |
| Control forms:                | Current control, Mid-term control, Final control  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,  |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes   |  |  |
| Short content:                | The task of course is to develop knowledge about the basics of info-<br>communication technologies and the scope of their application, about basic technologies,<br>other technologies and systems for signal transmission, multiplexing, multiple access and<br>switching, open info-communication systems and other technologies that underlie modern<br>info-communication technologies.   |  |  |
| Goal:                         | The purpose of teaching the subject is to train students comprehensive theoretical<br>and practical knowledge, skills and abilities in the field of organizing information<br>interaction in the process of various types of activities using info-communication<br>technologies  |  |  |
| Objective:                    | -understanding the fundamentals of basics of telecommunications network management;<br>-studying network protocols -developing practical skills in network configuration and<br>management; -analyzing and optimizing network performance; -troubleshooting network<br>issues: -exploring modern trends and technologies in networking  |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Understanding of the main types of info-communication technologies.<br>LO 2. Gain skills in the general concept technologies of data collection and storage<br>LO 3. Learns and uses technologies<br>of access to content, distribution and delivery of content on the Internet<br>LO 4. Studies the principles of technologies of content<br>distribution in real time, technologies of random access to content<br>LO 5. Studies technologies of random access to content<br>LO 6. Acquires skills in working with new technologies used in info-communications<br>network management systems |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manage<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;   | are conducted mainly<br>ods and technologies<br>gement of knowledge,<br>d be emphasized: |  |

|                             | <ul> <li>communication technologies (discussion, press-conference, brainstorming, educational debates and other active forms and methods);</li> <li>case-study method (analysis of situations);</li> </ul> |  |   |   |  |  |  |
|-----------------------------|--|--|---|---|--|--|--|
|                             | - game technologie   | es, in which students participate in   | business, role-   | plaving.  | simulatio  |  |  |
|                             | games:   | es, in which statemis participate in   | eusiness, rore  | piujing   | Simulatio  |  |  |
|                             | - information and c  | communication (including distance)   | earning) techn  | ologies.  |  |  |  |
|                             | In order to develop  | o critical thinking among students,  | such methods  | as "Prec  | liction wit  |  |  |
|                             | open questions",   | "Cluster", "Cross-discussion", "   | Know-Want to  | o Knov  | v-Learned'   |  |  |
|                             | classes.   | on activities, gammeation and other  | s are actively u  | seu uuri  | ng practica  |  |  |
| Assessment of the student's |  | Type of task   | Number of<br>(max)  | points  | Total  |  |  |
| knowledge:                  | Current control  | Practical works (1-10)   | 30  | 40  |  |  |  |
|                             |  | Independent work   | 10  | 40  | 100  |  |  |
|                             | Mid-term control   | Written work   | 10  |   | 100  |  |  |
|                             | Final control  | Exam (Writing)   | 50  |   |  |  |  |
| Topics of                   | -Info-communic   | ation technologies - a new stage of  | of developmen   | nt of sci   | entific and  |  |  |
| lectures:                   | technical progress   |  |   |   |  |  |  |
|                             | - Fundamentals of contentology   |  |   |   |  |  |  |
|                             | - Technologies of data accumulation and storage  |  |   |   |  |  |  |
|                             | -Storage Area Network (SAN) and RAID technologies  |  |   |   |  |  |  |
|                             | -Content access technologies   |  |   |   |  |  |  |
|                             | -XML technologies for semi-structured information  |  |   |   |  |  |  |
|                             | - Technologies of distribution and delivery of content on the internet   |  |   |   |  |  |  |
|                             | -Content-oriented Networks (CDNs)  |  |   |   |  |  |  |
|                             | -Software-configured networks (SDN)  |  |   |   |  |  |  |
|                             | -Real-time content distribution technologies   |  |   |   |  |  |  |
|                             | - Video conferencing and Instant messaging systems   |  |   |   |  |  |  |
|                             | - Mobile content a   | ccess technologies   |   |   |  |  |  |
|                             | -Peculiarities of the  | ne operation of applications based of  | n Android OS  |   |  |  |  |
|                             | - ICT in the knowl   | edge management system at the ent  | erprise   |   |  |  |  |
|                             | - ICT in infrastruc  | ture projects  |   |   |  |  |  |
| Literature:                 | 1. Info-communication te<br>Yavorska. Odesa, 2022. 2.<br>Textbook for universities<br>K.,•Mahmood A. (eds.) N  | chnologies: study guide / L.A. Nikityuk, Y.V. 1<br>31 p. 2. Velichko V.V., Katunin G.P., Shuvalov V<br>M.: Hotline-Telecom, 2009 712 p.: ill. — I<br>ovel Algorithms and Techniques in Telecommuni | Fleita, L.V.Bubentsc<br>P. Basics of info-co<br>SBN: 978-5-9912-00<br>cations and Network | ova, K.S. S<br>mmunicati<br>055-4. 3. S<br>ting. Spring | hulakova, O.M<br>on technologie<br>obh T., Elleith<br>ger, 2010. 502 |  |  |

| 6.10. Fundame                 | ntals of network programming   |  |  |
|-------------------------------|--|--|--|
| Semestr:                      | 7  |  |  |
| Date of last<br>modification: | 31.08.2023   |  |  |
| Teachers:                     | Akhmedova Khusniya Khusanovna, Berdimuradov Mirzohid Samio   | dulla ugʻli  |  |
| Component:                    | Elective   |  |  |
| Cycle:                        | Core   |  |  |
| ECTS:                         | 6  |  |  |
| Pre-requisities               | Programming II   |  |  |
| Workload:                     | Types of classes   | Hours  |  |
|                               | Total  | 180  |  |
|                               | Lecture  | 42   |  |
|                               | Laboratory works   | 30   |  |
|                               | SAW (Student autonomous work)  | 108  |  |
|                               | Form of final control  | Exam   |  |
|                               | Final assessment method  | Writing  |  |
| Control forms:                | Current control, Mid-term control, Final control   |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,  |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes  |  |  |
| Snort content:                | Teaching the basics of network programming includes lectures and laboratory<br>sessions, video lectures, presentations, and tasks and independent assignments based on<br>the credit system of education. Theoretical and practical information on the topics<br>indicated in the lectures and laboratory works is given, the procedure for performing<br>laboratory works and calculating the results is explained. Students study the educational<br>materials of science independently, tests, laboratory works are performed by students<br>individually |  |  |
| Goal:                         | The purpose of teaching the subject - to provide students wit<br>of network programming knowledge, the basic concepts and p<br>programming, and the ability to teach and create programs that wor  | h the theoretical basis<br>rinciples of network<br>k on the network. |  |
| Objective:                    | -to create knowledge about network programming, to create<br>server network programs, to work with databases on the network, to<br>servers, to create practical skills on creating dynamic web pages on  | TCP and UDP client-<br>o program servlets on<br>servers              |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Student will learn about the basics of programming, client-se<br>network protocols.  | erver architecture,  |  |
|                               | <ul> <li>LO 2. Learns network programming tools and programming languages, the principle organizing information exchange on a network.</li> <li>LO 3. Learn and use protocols in network programming, Internet addresses (URLs a URIs) in network programming, and the JSON data exchange format.</li> <li>LO 4. Learn and use CORBA architecture and IDL. Asynchronous JavaScript and X</li> </ul>  |  |  |
|                               | (AJAX) technology<br>LO 5. Have skills in socket-based network programming, using class<br>programming   | sses in network  |  |
|                               | LO 6. Learn the skills to create an e-mail network program, work w<br>network  | with a database on the   |  |
|                               | LO 7. Will have skills in programming servlets on servers, creating on servers   | dynamic web pages  |  |

| Teaching<br>methods:     | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned",<br>"INSERT", hands-on activities, gamification and others are actively used during practical<br>classes. |   |                |            |    |
|--------------------------|--|---|----------------|------------|----|
| Assessment of            |  | Type of task  | Number of poir | nts<br>Tot | al |
| the student's knowledge: |  | $\mathbf{D}_{\mathbf{r}} = \mathbf{f}_{\mathbf{r}} = \mathbf{f}_{\mathbf{r}} = \mathbf{f}_{\mathbf{r}}$ | (max)          |            |    |
|                          | Current control  | Independent work  | 10 4           | 40         |    |
|                          | Mid_term control   | Written work  | 10             | 10         | )  |
|                          | Final control  | Exam (Writing)  | 50             |            |    |
| Topics of                | Theoretical found  | lations and concents of network pro   | aramming       |            |    |
|                          | <ul> <li>Theoretical foundations and concepts of network programming</li> <li>Client-server networking software based on TCP and UDP sockets.</li> <li>Internet addresses (URLs and URIs) and JSON data exchange format in network programming, HTTP in network programming</li> <li>Program file transfers over the network (FTP and TFTP). Creating an email networking program</li> <li>Asynchronous JavaScript and XML (AJAX) technology. JavaFX capabilities in network programming</li> <li>Secure Sockets in Network Programming. Multithreading and Multiplexing in the network.</li> <li>Distributed client-server applications (RMI, CORBA). Working with a database on the network.</li> <li>Programming servlets on servers. Technology for creating dynamic web pages on servers</li> <li>Creating a TCP and UDP client-server network programs.</li> <li>Creating a multicast socket-based application.</li> <li>Working with Internet addresses and the JSON data exchange format</li> <li>Working with hypermats on the network.</li> <li>Creating a program that works on the basis of multitasking in the network</li> </ul>   |   |                |            |    |
| Literature:              | <ul> <li>Creating dynamic web pages on servers</li> <li>1. Computer networking: a top-down approach. James F. Kurose, Keith W. Ross6th yed. 2013.<br/>Pearson Yeducation, Inc., publis'hing as Addison-Wesley. –899 p. 2.TCP/IP protocol suite.<br/>Behrouz A. Forouzan4th yed. Publis'hed by McGraw-Hill, a business unit of The McGraw-Hill<br/>Companies, Inc., 2010. 1029 p. 3.JavaFX Working with JavaFX UI Components Release 8. Alla<br/>Redko, Irina Fedortsov. 2014 4.Distributed SystemsConcepts and Design. Fifth Edition. George<br/>Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair. 2012.</li> </ul>   |   |                |            |    |

| 6.11. Programm                | nable digital devices   |   |  |
|-------------------------------|---|---|--|
| Semestr:                      | 4   |   |  |
| Date of last<br>modification: | 31.08.2023  |   |  |
| Teachers:                     | Abaskhanova Khalima Yunusovna, Abdurakhmanov Rustam Pattal  | khovich   |  |
| Component:                    | Compulsory  |   |  |
| Cycle:                        | Core  |   |  |
| ECTS:                         | 6   |   |  |
| Pre-requisities               | Microprocessors, Electronics and circuits II  |   |  |
| Workload:                     | Types of classes Hours  |   |  |
|                               | Total   | 180   |  |
|                               | Lecture   | 42  |  |
|                               | Practical works   | 30  |  |
|                               | Independent work  | 108   |  |
|                               | Form of final control   | Exam  |  |
|                               | Final assessment method   | Writing   |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes   |   |  |
| Short content:                | The course is intended for undergraduate students, the concept of programmable digital devices, their structure and principles of operation, the main areas of application, the role, use and main tasks of PDDs in telecommunications, the principle of information exchange based on them, tasks, structural and teaches the theoretical basis of knowledge on the implementation and organization of organizational parts.   |   |  |
| Goal:                         | The goal of the discipline is to teach students the concept of program<br>their structure and principles of operation, the main fields of applica<br>main tasks of PDDs in telecommunications, the principle, tasks, stru<br>introducing organizational parts, working principles.  | mable digital devices,<br>tion, the role, use and<br>actural and consists of  |  |
| Objective:                    | The objective of discipline is digital devices in telecommunications, their programming, designing systems based on programmable digital devices, their role in the development of modern information and communication technologies, creating programs for digital devices in the Verilog programming language, developing programs for FPGAs, structural and algorithmic methods of describing digital devices in the software environment. methods and parallel programming processes, designing a simple combinational circuit to demonstrate its capabilities, and developing practical skills for testing them on the basis of hardware.  |   |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Types, methods and means of information transmission<br>information processing.<br>LO 2. Basic concepts, definitions and laws of logical algebra. Me<br>logical functions: truth tables, perfect disjunctive and conjunc<br>Elementary logical functions. Logical elements, their main paramete<br>Minimization of logical functions. The concept of adjacent minitern<br>the operation of combining them.<br>LO 3. Memoryless and memory digital devices. Their tasks and wo<br>Design of combinational digital devices; design stages and their con<br>of digital devices: basic concepts and definitions; task description<br>triggers and the principle of their operation. Schematic implementat<br>digital devices. | n. Digital devices in<br>ethods of establishing<br>ctive normal forms.<br>rs and characteristics.<br>ns and the meaning of<br>rking principles.<br>tent. Sequential types<br>on methods, two-step<br>ion of sequential type |  |

| Teaching<br>methods:                         | LO 4. Display information on programmable digital devices. Forms of providing<br>information. Data formats: encoding of text, graphics and audio information.<br>Programmable logic matrices (PLM). PLM working principle and application.<br>Disjunctive and conjunctive PLM.<br>LO 5. To study the main modern architectures of KIS, JKIS and SoC types. Functional<br>and logical design of digital devices and FPGA architecture. General principles, types and<br>structure of building modern FPGAs; Features of implementation of digital devices based<br>on FPGAs.<br>LO 6. Design digital devices using the Verilog HDL language. Basics of the Verilog HDL.<br>Parallel programming processes. VHDL models and algorithms.<br>LO 7. To create Verilog HDL software for FPGA, to be able to use basic tools and<br>configuration tools to create programs for systems; Design of combinational digital<br>devices; Design of digital devices using Verilog HDL language;<br>LO 8. To be able to select methods for creating and configuring parallel programming<br>supplies for digital devices workflows;<br>LO 9. To know the tools for creating software for automatic control of technological<br>processes and their configuration and organization;<br>In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies. |  |   |  |   |                         |
|--|---|--|---|--|---|-------------------------|
|  | - information and c<br>In order to develop<br>open questions",<br>"INSERT", hands-  | communication (including distance l<br>p critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and other   | learning) techno<br>such methods a<br>Know-Want to<br>s are actively us   | ologies.<br>as "Preco<br>Knov<br>sed duri                          | diction<br>w-Lear<br>ng prac                  | with<br>ned",<br>ctical |
| Assessment of                                | - information and c<br>In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.  | communication (including distance l<br>p critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and others  | learning) techno<br>such methods a<br>Know-Want to<br>s are actively us   | ologies.<br>as "Preco<br>Know<br>sed duri                          | diction<br>w-Lear<br>ng prac                  | with<br>ned",<br>ctical |
| Assessment of<br>the student's               | - information and c<br>In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.  | communication (including distance l<br>p critical thinking among students,<br>"Cluster", "Cross-discussion", "H<br>on activities, gamification and others<br><b>Type of task</b>   | learning) techno<br>such methods a<br>Know-Want to<br>s are actively us<br>Number of p<br>(max)                         | ologies.<br>as "Preco<br>Moved Know<br>aed duri<br>ooints          | diction<br>w-Lear<br>ng prac<br>Total         | with<br>ned",<br>ctical |
| Assessment of<br>the student's<br>knowledge: | - information and c<br>In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.  | communication (including distance l<br>p critical thinking among students,<br>"Cluster", "Cross-discussion", "H<br>on activities, gamification and others<br><b>Type of task</b><br>Practical works (1-10)   | learning) techno<br>such methods a<br>Know-Want to<br>s are actively us<br>Number of p<br>(max)<br>30                   | ologies.<br>as "Preco<br>o Know<br>sed duri<br>ooints<br>40        | diction<br>w-Learn<br>ng prac                 | with<br>ned",<br>ctical |
| Assessment of<br>the student's<br>knowledge: | current control   | communication (including distance I<br>p critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and others<br><b>Type of task</b><br>Practical works (1-10)<br>Independent work   | learning) techno<br>such methods a<br>Know-Want to<br>s are actively us<br>Number of p<br>(max)<br>30<br>10             | ologies.<br>as "Preco<br>o Know<br>eed duri<br><b>points</b><br>40 | diction<br>w-Learn<br>ng prac                 | with<br>ned",<br>ctical |
| Assessment of<br>the student's<br>knowledge: | <ul> <li>information and c</li> <li>information and c</li> <li>In order to develop</li> <li>open questions",</li> <li>"INSERT", hands</li> <li>classes.</li> </ul> Current control Mid-term control Eigel sector  | communication (including distance l<br>p critical thinking among students,<br>"Cluster", "Cross-discussion", "H<br>on activities, gamification and others<br><b>Type of task</b><br>Practical works (1-10)<br>Independent work<br>Written work   | learning) techno<br>such methods a<br>Know-Want to<br>s are actively us<br>Number of p<br>(max)<br>30<br>10<br>10       | ologies.<br>as "Preco<br>book Know<br>ced duri<br>cooints<br>40    | diction<br>w-Learn<br>ng prac<br>Total        | with<br>ned",<br>ctical |
| Assessment of<br>the student's<br>knowledge: | - information and c<br>In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.<br>Current control<br>Mid-term control<br>Final control  | communication (including distance l<br>p critical thinking among students,<br>"Cluster", "Cross-discussion", "H<br>on activities, gamification and others<br><b>Type of task</b><br>Practical works (1-10)<br>Independent work<br>Written work<br>Exam (Writing)<br>the discipline of "Programmable of | learning) techno<br>such methods a<br>Know-Want to<br>s are actively us<br>Number of p<br>(max)<br>30<br>10<br>10<br>50 | blogies.<br>as "Preco<br>bed duri<br>boints<br>40                  | diction<br>w-Learn<br>ng prac<br>Total<br>100 | with<br>ned",<br>ctical |

|             | timing diagram of asynchronous and synchronous trigger chains. Learning how to build                                    |
|-------------|---|
|             | a second type of trigger based on one type of trigger.  |
|             | - Representation of information on programmable digital devices.  |
|             | - Working principle and application of PLM.   |
|             | - Digital devices and FPGA architecture.  |
|             | - Integrated development for FPGA. Structural and algorithmic methods of describing                                     |
|             | digital devices in the software environment.  |
|             | - Verilog HDL program commands. Simple and complex programming processes.   |
|             | - Designing a simple combinatorial scheme to demonstrate parallel programming   |
|             | processes and possibilities.  |
|             | - Entry and exit at the project facility. Its conditional graphic representation.                                       |
|             | Representation of its operation in binary (logical) alphabet. Its conditional graphic                                   |
|             | representation. Representation of its operation in binary (logical) alphabet.   |
| Literature: | 1. X.Yu. Abaskhanova, U.B. Amirsaidov Microprocessors. Study guide for higher educational institutions. "Fan va         |
|             | texnologiyalar". Tashkent - 2017. – 272 p. 2. X.Yu. Abaskhanova "Digital technique". 5.55.01.01 – Textbook for students |
|             | studying telecommunication technologies. "Muhr-press", Tashkent - 2022. – 184 p. 3. X.Yu. Abaskhanova, :Juraev L.N.,    |
|             | Khoshimova F.R. "Digital technique". 5.55.01.01 - Study guide for students studying telecommunication technologies.     |
| 1           | "Muhr-press", Tashkent - 2022 200 p.  |

| 6.12. Modeling                | of Info-communication systems   |   |  |
|-------------------------------|---|---|--|
| Semestr:                      | 6   |   |  |
| Date of last<br>modification: | 31.08.2023  |   |  |
| Teachers:                     | Elov Jamshid Bekmurodovich, Berdimuradov Mirzokhid Samidulla  | ı ugli  |  |
| Component:                    | Elective  |   |  |
| Cycle:                        | Core  |   |  |
| ECTS:                         | 6   |   |  |
| Pre-requisities               | Fundamentals of building info-communication systems and network   | ks  |  |
| Workload:                     | Types of classes  | Hours   |  |
|                               | Total   | 180   |  |
|                               | Lecture   | 42  |  |
|                               | Practical works   | 30  |  |
|                               | SAW (Student autonomous work)   | 108   |  |
|                               | Form of final control   | Exam  |  |
|                               | Final assessment method   | Writing   |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total   | for 2 types of control,   |  |
| Fequirements                  | The final even is written in the form of 5 questions of   | 10 montra apple the   |  |
| Final control                 | questions consist of 2 parts: 3 theoretical questions and 2 practical | questions. Total exam   |  |
| Short content:                | Modeling of Info communication systems course encourages you to understand<br>the methods of creating modern information communication systems models, creating<br>simulation models based on experimental results, using software packages based on<br>experimental results, and building knowledge and practical skills in designing software   |   |  |
| Goal:                         | The purpose of mastering the subject is to provide sy<br>knowledge and practical skills on the basics of modeling Info comm   | ystematic theoretical nunication systems.   |  |
| Objective:                    | -fundamentals of information communication systems mod<br>of modeling; - practical software packages that enable processing<br>results of experiments; - methods of processing in the anal<br>communication systems.  | eling; - classification<br>and modeling of the<br>ysis of information   |  |
| Learning                      | After studying the discipline, students should be able to:  |   |  |
| outcome:                      | LO 1. Gain an understanding of information communication systems<br>environments and their software<br>LO 2. Knowledge of information such as systematic modeling, form   | modeling and design ing a system of linear  |  |
|                               | algebraic equations<br>LO 3. To be able to use the graphical capabilities of modern informa<br>applied mathematical packages at different stages and draw conclus<br>LO 4. To study the modern state of system modeling issues, princi<br>modeling, classification of models and their classification symbol<br>computational experience, assessment of model suitability, meth<br>sensitivity assessment, basic tools and tuning tools<br>LO 5. Must have tools for creating automatic control models of tec<br>and skills for their adjustment.   | tion technologies and<br>ions based on this<br>ples of mathematical<br>pls, understanding of<br>ods of stability and<br>chnological processes |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;  | are conducted mainly<br>ods and technologies<br>gement of knowledge,<br>d be emphasized:  |  |

|                             | <ul> <li>- communication technologies (discussion, press-conference, brainstorming, educational debates and other active forms and methods);</li> <li>- case-study method (analysis of situations);</li> <li>- game technologies, in which students participate in business, role-playing, simulation games;</li> <li>- information and communication (including distance learning) technologies.</li> <li>In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned" "INSERT", hands-on activities, gamification and others are actively used during practica classes.</li> </ul>  |  |  |                              |       |  |
|-----------------------------|---|--|--|------------------------------|-------|--|
| Assessment of the student's |   | Type of task   | Number of<br>(max)   | points                       | Total |  |
| knowledge:                  | Current control   | Practical works (1-10)   | 30   | 40                           |       |  |
|                             | Current control   | Independent work   | 10   | 40                           | 100   |  |
|                             | Mid-term control  | Written work   | 10   |                              | 100   |  |
|                             | Final control   | Exam (Writing)   | 50   |                              |       |  |
| lectures:                   | <ul> <li>- Dasic concepts of</li> <li>- Principles of a sy</li> <li>- The main stages</li> <li>- General features</li> <li>- Modeling of rand</li> <li>- Methods of mode</li> <li>- Methods and too</li> <li>- Computer model</li> <li>- Information com</li> <li>- Modeling and co</li> <li>- Design and mode</li> <li>- Simulink packag</li> <li>- Analysis of dyna</li> </ul>  | vstematic approach to modeling<br>of modeling<br>of random variable modeling metho<br>lom processes<br>eling random processes<br>erence and signals in information co<br>ls of structural modeling of systems<br>ing. Statistical modeling<br>munication systems modeling enviro-<br>ntrol of complex systems based on t<br>eling of control systems<br>eling of communication systems<br>e libraries<br>mic systems using Simulink LTI-Vi | nds<br>mmunication s<br>and processes<br>onment – Math<br>he Simulink pa | ystems<br>ab/ Simu<br>ackage | ılink |  |
| Literature:                 | <ul> <li>- Analysis of dynamic systems using Simulink LTI-Viewer</li> <li>1. Fomina E.S. Modeling of communication networks in the Matlab/Simulink environment. Khabarovsk: Pacific Publishing<br/>House. state University, 2020 103 p. 2. Amirsaidov U. B. Modeling and simulation of data transmission networks:<br/>guidelines for course design / TUIT. Muharrirlik nasr, 2015 42 p Bibliography: p. 40. 3. B. A. Kumar, S. B. Goyal,<br/>S.B. Goyal. Cognitive Computing Models in Communication Systems. Beverly, MA 01915, USA. 4. Vasiliev, K. K.<br/>Mathematical modeling of communication systems: textbook / K. K. Vasiliev, M. N. Sluzhivy. – Ulyanovsk: Ulyanovsk<br/>State Technical University, 2008. – 170 p. 5. Nersesyants A.A. Modeling of infocommunication systems and<br/>communication networks. Tutorial. Rostov-on-Don: SKF MTUSI, 2016 – 115 p.</li> </ul> |  |  |                              |       |  |

| 6.13. Methods of              | of modeling data transmission networks  |  |  |
|-------------------------------|---|--|--|
| Semestr:                      | 6   |  |  |
| Date of last<br>modification: | 31.08.2023  |  |  |
| Teachers:                     | Abaskhanova Khalima Yunusovna, Akhmedova Khusniya Khusano   | ovna   |  |
| Component:                    | Elective  |  |  |
| Cycle:                        | Core  |  |  |
| ECTS:                         | 6   |  |  |
| Pre-requisities               | Fundamentals of building info-communication systems and network   | KS   |  |
| Workload:                     | Types of classes  | Hours  |  |
|                               | Total   | 180  |  |
|                               | Lecture   | 42   |  |
|                               | Laboratory works  | 30   |  |
|                               | SAW (Student autonomous work)   | 108  |  |
|                               | Form of final control   | Exam   |  |
|                               | Final assessment method   | Writing  |  |
| Control forms:                | Current control, Mid-term control, Final control  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,  |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes   |  |  |
| Short content:                | Methods of modeling data transmission networks course w<br>understand basic concepts and types of simulation of systems and<br>networks   | vill encourage you to telecommunications   |  |
| Goal:                         | The purpose of mastering the discipline is to give st<br>theoretical knowledge and practical skills in Methods of modelin<br>networks.  | udents systematized<br>ng data transmission  |  |
| Objective:                    | -basic concepts and types of simulation of systems and<br>networks; -mathematical schemes of simulation of systems an<br>networks; -random graphs and networks; -queuing systems and net<br>queuing system (QS); -exponential queuing networks (QN); -algorit<br>systems and data transmission networks.  | telecommunications<br>ad data transmission<br>etworks; -exponential<br>thms of simulation of   |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Have basic concepts of simulation of systems and telecommunication networks.<br>LO 2. Gains an understanding of mathematical schemes for simulating systems and data<br>transmission networks.<br>LO 3. Acquire knowledge about random graphs and networks, queuing systems and<br>networks.<br>LO 4. Knows algorithms for simulating systems and data transmission networks.   |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brains<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role<br>games; | are conducted mainly<br>ods and technologies<br>gement of knowledge,<br>d be emphasized:<br>storming, educational<br>e-playing, simulation |  |

|                             | - information and c<br>In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.   | communication (including distance le<br>o critical thinking among students, s<br>"Cluster", "Cross-discussion", "H<br>on activities, gamification and others   | earning) techno<br>such methods a<br>Know-Want to<br>are actively us                     | logies.<br>s "Prec<br>Knov<br>ed duri              | liction with<br>v-Learned",<br>ng practical                           |  |  |
|-----------------------------|--|--|--|--|---|--|--|
| Assessment of the student's |  | Type of task   | Number of p<br>(max)   | oints  | oints Total   |  |  |
| knowledge:                  | Cumont control   | Practical works (1-10)   | 30   | 40   |   |  |  |
|                             | Current control  | Independent work   | 10   | 40   | 100   |  |  |
|                             | Mid-term control   | Written work   | 10   |  | 100   |  |  |
|                             | Final control  | Exam (Writing)   | 50   |  |   |  |  |
| lectures:                   | <ul> <li>Mathematical sch</li> <li>Random graphs a</li> <li>Queuing systems</li> <li>Exponential queu</li> <li>Exponential queu</li> <li>Algorithms of sir</li> <li>Simulation mode</li> <li>Constructing the</li> <li>Statistical modell</li> <li>Simulation of rar</li> <li>Genetic algorithm</li> <li>The operators of</li> <li>Application of g<br/>cluster</li> </ul> | <ul> <li>Basic concepts and types of simulation of systems and telecommunications networks</li> <li>Mathematical schemes of simulation of systems and data transmission networks</li> <li>Random graphs and networks</li> <li>Queuing systems and networks</li> <li>Exponential queuing system (QS)</li> <li>Exponential queuing networks (QN)</li> <li>Algorithms of simulation of systems and data transmission networks</li> <li>Simulation modelling of systems</li> <li>Constructing the simulation algorithm</li> <li>Statistical modelling</li> <li>Simulation of random factors</li> <li>Genetic algorithms in simulation</li> <li>The operators of genetic algorithm</li> <li>Application of genetic algorithm to solve the problem of fault tolerance computing</li> </ul> |  |  |   |  |  |
| Literature:                 | 1. Niazi M.A. (Ed.) Mode<br>Technology, 2019. — 44<br>Communicating Systems.<br>Simulation of systems a<br>Petersburg, RSHU Publish  | ling and Simulation of Complex Communication<br>42 p. — ISBN 978-1-78561-355-5. 2. Groote 3<br>MIT Press, 2014. — 393 p. — ISBN: 978026202<br>nd telecommunications networks: mmathematic<br>hers, 2012. – 136 pp.   | Networks. The Instit<br>J.F., Mousavi M. M<br>27717. 3. Kutuzov, O<br>al schemes and alg | tution of l<br>odeling a<br>.I. and Ta<br>orithms. | Engineering and<br>and Analysis of<br>atarnikova, T.M.<br>A manualSt. |  |  |

| 6.14. Data communications     |  |                         |  |  |
|-------------------------------|--|-------------------------|--|--|
| Semestr:                      | 5  |                         |  |  |
| Date of last<br>modification: | 31.08.2023   |                         |  |  |
| Teachers:                     | Allamuratova Zamira Jumamuratovna, Abaskhanova Khalima Yunusovna   |                         |  |  |
| Component:                    | Elective   |                         |  |  |
| Cycle:                        | Core   |                         |  |  |
| ECTS:                         | 6  |                         |  |  |
| Pre-requisities               | Data structure and algorithms  |                         |  |  |
| Workload:                     | Types of classes   | Hours                   |  |  |
|                               | Total  | 180                     |  |  |
|                               | Lecture  | 42                      |  |  |
|                               | Laboratory works   | 30                      |  |  |
|                               | SAW (Student autonomous work)  | 108                     |  |  |
|                               | Form of final control  | Exam                    |  |  |
|                               | Final assessment method  | Writing                 |  |  |
| Control forms:                | Current control, Mid-term control, Final control   |                         |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control, |  |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes  |                         |  |  |
| Short content:                | Data communications course will encourage you to understand data communications, protocols and standards, physical layer, analog and digital transmission, bandwidth, data link layer and its protocols.   |                         |  |  |
| Goal:                         | The purpose of mastering the discipline is to give students systematized theoretical knowledge and practical skills in data communications.  |                         |  |  |
| Objective:                    | -introduction to Data Communications; -protocols and standards; -physical<br>layer; -digital signals; -digital transmission; -analog Transmission; -bandwidth Utilization;<br>data Link Layer; -data Link Protocols; -error Detection and Correction; -Media Access<br>Control (MAC); -wireless LAN; -mobile networks overview; -mobile networks and other<br>wireless networks.   |                         |  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Explores the methods of information transmission.<br>LO 2. Understands the process of transferring data on the Internet.<br>LO 3. Gains an understanding of the protocols and standards of data exchange.<br>LO 4. Explores ways to increase network bandwidth.<br>LO 5. Learns modern methods of data collection, sorting, processing, and transmission in<br>information communication   |                         |  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games; |                         |  |  |
|                               | - information and communication (including distance learning) tech   | nologies.               |  |  |

|                             | In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.  | p critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and other  | such methods a<br>Know-Want to<br>s are actively us   | s "Prec<br>Knov<br>ed duri                                  | liction w<br>w-Learne<br>ng practi  | vith<br>ed",<br>ical                                |
|-----------------------------|--|--|---|---|---|---|
| Assessment of the student's |  | Type of task   | Number of points<br>(max)   |   | Total   |   |
| knowledge:                  |  | Practical works (1-10)   | 30  | 40  |   |   |
|                             | Current control  | Independent work   | 10  | 40  | 100   |   |
|                             | Mid-term control   | Written work   | 10  |   | 100   |   |
|                             | Final control  | Exam (Writing)   | 50  |   |   |   |
|                             | <ul> <li>Physical layer</li> <li>Digital signals</li> <li>Digital transmiss</li> <li>Analog Transmis</li> <li>Bandwidth Utiliz</li> <li>Data Link Layer</li> <li>Data Link Protoc</li> <li>Error Detection a</li> <li>Media Access Co</li> <li>Wireless LAN</li> <li>Mobile Networks</li> <li>Mobile Networks</li> </ul> | ion<br>ssion<br>cation<br>ond Correction<br>ontrol (MAC)<br>s Overview<br>s and other Wireless networks  |   |   |   |   |
| Literature:                 | 1. Buhrouz A.Forouzan, E<br>0-07-296775-3. 2. Rachn<br>Information Exchange in<br><i>Directions</i> , Wiley, 2023, 1<br>J. Guo, "Frequency-Hopp<br><i>qayta ishlash</i> , IEEE, 202  | Data Communications and Networking fourth edit<br>a Jain; Kanta Prasad Sharma; Rana Majumdar;<br>Distributed IoT Environment," in <i>Evolving Netwo</i><br>pp.41-54, doi: 10.1002/9781119836667.ch3. 3. Ka<br>ing MIMO Radar-based Data Communications",<br>4, pp.275-294, doi: 10.1002/9781119795568.ch10 | ion NewYork, NY 10<br>Dac-Nhuong Le, "I<br>orking Technologies:<br>ay Vu; Jian A. Zhang;<br>Joint Radar Commun.<br>). | 020, 2007<br>Data Com<br>Developm<br>Xiaojing<br>ications u | 7. ISBN-139<br>munication<br><i>pents and Fu</i><br>Huang; Yin<br><i>chun signall</i> | 978-<br>and<br><i>ture</i><br>igjie<br><i>larni</i> |

| 6.15. Program                 | ning structure in telecommunications   |  |  |  |
|-------------------------------|--|--|--|--|
| Semestr:                      | 7  |  |  |  |
| Date of last<br>modification: | 31.08.2023   |  |  |  |
| Teachers:                     | Elov Jamshid Bekmurodovich, Berdimuradov Mirzokhid Samidulla   | a ugli                                     |  |  |
| Component:                    | Elective   |  |  |  |
| Cycle:                        | Core   |  |  |  |
| ECTS:                         | 6  |  |  |  |
| Pre-requisities               | Fundamentals of network programming  |  |  |  |
| Workload:                     | Types of classes   | Hours                                      |  |  |
|                               | Total  | 180  |  |  |
|                               | Lecture  | 42   |  |  |
|                               | Practical works  | 30   |  |  |
|                               | SAW (Student autonomous work)  | 108  |  |  |
|                               | Form of final control  | Exam                                       |  |  |
|                               | Final assessment method  | Writing                                    |  |  |
| Control forms:                | Current control, Mid-term control, Final control   | <u>.</u>                                   |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,                    |  |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes  |  |  |  |
| Short content:                | The Programming structure in telecommunications course encourages you to<br>understand the fundamentals of programming and maintaining processes that enable<br>telecommunications systems and networks to interconnect and interoperate.  |  |  |  |
| Goal:                         | The purpose of mastering the subject is to provide the<br>knowledge of programming in telecommunication networks, progr<br>and network programming model skills.   | pretical and practical amming technologies |  |  |
| Objective:                    | - network programming models; - service architecture of the network; - organization of a database in programming in telecommunications; - device and network security; -addressing in the network; -programming based on streams; - hardware and software design in telecommunications; - designing practical applications based on sockets; - design of communication system programs based on telecommunication client-server theory.  |  |  |  |
| Learning<br>outcome:          | <ul> <li>After studying the discipline, students should be able to:</li> <li>LO 1. Gain an understanding of network programming models, network services architecture, database organization in telecommunications programming, and device and network security.</li> <li>LO 2. Understands network addressing, flow-based programming, hardware and software design in telecommunications, and socket-based application design.</li> <li>LO 3. Learns to design and create communication systems programs based on the client-server theory of telecommunications and acquires the skills to use them.</li> <li>LO 4. Master the skills of creating a client-server program for data exchange based on the TCP protocol.</li> <li>LO 5. To have the skills to create a client-server program for data exchange based on the UDP protocol</li> </ul> |  |  |  |
|                               | and use network devices  | us, learns to program                      |  |  |

| Teaching<br>methods:        | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned",<br>"INSERT", hands-on activities, gamification and others are actively used during practical<br>classes.   |   |  |   |   |                                     |
|-----------------------------|--|---|--|---|---|-------------------------------------|
| Assessment of the student's |  | Type of task  | Number of j<br>(max)   | points  | Total   |                                     |
| knowledge:                  | Current control  | Practical works (1-10)<br>Independent work  | 30<br>10   | 40  | 100   |                                     |
|                             | Mid-term control   | Written work  | 10   |   | 100   |                                     |
|                             | Final control  | Exam (Writing)  | 50   |   |   |                                     |
| lectures:<br>Literature:    | <ul> <li>Final control Exam (Writing) 50</li> <li>Introduction to "Programming structure in telecommunications". The purpose and basic concepts of science.</li> <li>Architecture of telecommunication networks. Communication model. Connections. Applications and network services.</li> <li>Step model of the network. ISO/IP-RM model of communication processes and protocols. Definition of the OSI model. Tasks of the steps of the OSI model.</li> <li>Network protocol model. TCP/IP model definition. A set of protocols in the TCP/IP model. Communication software and protocols.</li> <li>Protocol engineering. Principles of programming based on protocols. Protocol specification. Definition of formal languages (FSM, SDL).</li> <li>Network programming models. Programming device drivers.</li> <li>Principles of architectural design. Design models. Object-oriented design.</li> <li>Network programming. Provision of services and organization of the network. "Client-server" programming model. Streams and their types. Stream programming through "client-server" technology.</li> <li>Network programming. Host-to-host data transfer. Hardware and software organization of peer-to-peer and Internet applications.</li> <li>Service architecture of the network. Provision and maintenance of resources. Service architecture of the network. Data transfer interface. Consolidation of interfaces.</li> <li>Organization of the database. Database models in telecommunications. Rates of relational, network and hierarchical models.</li> <li>Device and network security. General security issues of IP. Role model definition and duties. Concepts of Sandbox and Middleware.</li> </ul> |   |  |   | ions.<br>and<br>P/IP<br>tocol<br>ocket<br>ient-<br>ough<br>ation<br>rvice<br>tions<br>es of<br>a and<br>DT.<br>tephan |                                     |
| Literature:                 | 1. Behrouz A. Forouzen.<br>Rupp, Gerd Siegmund, Tei<br>3. G.J. Holzmann, Design<br>http://www.spinroot.com/s<br>Saddle River, NJ: Prentice   | "Data communication and networking", Mc Gra<br>lecommunication Software Engineering - Lecture<br>and validation of computer protocols, Chapter 8-1<br>spin/Doc/Book91.html 4. Stallings, William. Data<br>Hall, 2010. | w-Hill Springer, Ne<br>Notes. Edition: V 0.<br>1, Prentice- Hall, 19<br>and Computer Com | ew York 20<br>2,20/ http:/<br>991, ISBN<br>munication | 010. 2. S<br>//www.sru<br>0-13-539<br>is, 8th ed.   | tephan<br>upp.de<br>925-4,<br>Upper |

| 6.16. Design of               | digital devices in signal processors  |   |  |
|-------------------------------|---|---|--|
| Semestr:                      | 7   |   |  |
| Date of last<br>modification: | 31.08.2023  |   |  |
| Teachers:                     | Abaskhanova Halima Yunusovna, Tojieva Feruza Kobiljon kizi  |   |  |
| Component:                    | Elective  |   |  |
| Cycle:                        | Core  |   |  |
| ECTS:                         | 6   |   |  |
| Pre-requisities               | Signals and systems   |   |  |
| Workload:                     | Types of classes  | Hours   |  |
|                               | Total   | 180   |  |
|                               | Lecture   | 42  |  |
|                               | Practical works   | 30  |  |
|                               | SAW (Student autonomous work)   | 108   |  |
|                               | Form of final control   | Exam  |  |
|                               | Final assessment method   | Writing   |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,   |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes   |   |  |
| Short content:                | This course provides the necessary foundation for developing knowledge of signal processors, designing digital devices using signal processors using high-level programming languages, and testing them against hardware.   |   |  |
| Goal:                         | The goal of the Digital Signal Processors course is to teach students the basics of using modern hardware to process digital data streams in real time.   |   |  |
| Objective:                    | - Features of the architecture of systems on a chip; - Signal processing tasks, architectural features of signal processors; - Signal processing tasks, architectural features of signal processors; -DSP architecture. Fixed-point DSP structure and basic blocks; - System interface and information input/output channels in the DSP |   |  |
| Learning                      | After studying the discipline, students should be able to:  |   |  |
| outcome:                      | LO 1. Explores the characteristics of systems-on-chip architecture.   |   |  |
|                               | LO 2. Gain an understanding of signal processing tasks, architectu  | ral features of signal  |  |
|                               | LO 3. Signal processing tasks, explores the architectural features of LO 4. System interface and information input/output channels in I memory map, interrupt handling; will have an understanding of the command system.   | signal processors.<br>DSP; program model,<br>ne general features of |  |
| Teaching                      | In the conditions of the credit system of education, classes  | are conducted mainly  |  |
| methods:                      | in active and creative forms. Among the effective pedagogical meth  | ods and technologies  |  |
|                               | that promote active involvement of students in the search and manage<br>the acquisition of experience in independent problem solving shoul<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;  | d be emphasized:  |  |
|                               | - communication technologies (discussion, press-conference, brained<br>debates and other active forms and methods);   | storming, educational   |  |
|                               | - game technologies, in which students participate in business, rol games;  | e-playing, simulation   |  |
|                               | - information and communication (including distance learning) tech  | nnologies.  |  |

|                             | In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.   | o critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and other   | such methods<br>Know-Want to<br>s are actively u                                 | as "Preo<br>o Knov<br>sed duri        | diction<br>w-Learn<br>ing prac          | with<br>ned",<br>ctical     |
|-----------------------------|---|---|--|---------------------------------------|---|-----------------------------|
| Assessment of the student's |   | Type of task  | Number of points<br>(max)  |                                       | Total                                   |                             |
| knowledge:                  |   | Practical works (1-10)  | 30   | 40                                    |   |                             |
|                             | Current control   | Independent work  | 10   | 40                                    | 100                                     |                             |
|                             | Mid-term control  | Written work  | 10   |                                       | 100                                     |                             |
|                             | Final control   | Exam (Writing)  | 50   |                                       |   |                             |
| lectures:<br>Literature:    | <ul> <li>Classification, ar</li> <li>Areas of applicat</li> <li>Sequence of com</li> <li>Architecture of d</li> <li>Characteristics of</li> <li>Structure and mod</li> <li>Principles of men</li> <li>Processor core. F</li> <li>Principles of organization of the processing.</li> <li>General principles in microprocession</li> <li>Digital processors from</li> <li>Digital processors from</li> <li>Digital processors from</li> <li>Digital processor</li> <li>Multi-core proce</li> <li>Architecture and software Tools f</li> <li>Next generation for the process from</li> </ul> | Imal control       [Exam (Writing)       50         General information about digital signal processors.       Classification, architecture and characteristics of signal processors.         Areas of application and classification of signal processors.         -Sequence of command processing in microprocessors.         -Architecture of digital signal processors.         -Architecture of digital signal processors.         -Characteristics of digital signal processors.         -Structure and modules of a digital signal processor.         -Principles of memory modules. Types of addressing.         -Processor core. Peripherals.         -Principles of organizing data input and output to the processor. Real-time signal processing.         -General principles of organizing data input-output. Organization and interrupt systems in microprocessors.         -Signal processors from leading manufacturers.         -Digital processors from Analog Devices.         -Description of the Blackfin processor         -Processors from Ceva-X         -Digital processors from Texas Instruments         -Digital processors         -Digital processors         -Digital processors         -Architecture and characteristics of multi-core signal processors         -Architecture and characteristics of multi-core signal processors         -Digital processors         -Digital processors |  |                                       |   |                             |
| Literature:                 | 1 Abasxanova X.Yu., Am<br>-2017. – 272 p. 2 Abasx<br>print". Tashkent -2021. –<br>qurilmalari Textbook for  | ursaidov U.B. Mikroprotsessorlar. Textbook for u<br>anova X.Yu., Mirzaeva M.B., Parsiev S.S Mikro<br>200 p. 3 Abasxanova X.Yu., Baltayev J,.B., Ya<br>universities. "IMPRESS MEDIA". Tashkent -202  | iniversities. "Fan va<br>oprotsessor. Textboo<br>ronova N.V. Radio<br>3. –347 p. | texnologi<br>ok for univ<br>aloqaning | yalar." Ta<br>versities. '<br>mikroprot | shkent<br>"Hihol<br>tsessor |

| 6.17. Design of digital devices in programmable logic integrated circuits |  |  |  |
|---|--|--|--|
| Semestr:  | 7  |  |  |
| Date of last<br>modification:   | 31.08.2023   |  |  |
| Teachers:   | Allamuratova Zamira Jumamuratovna, Mirzaeva Malika Baxadirov   | ma   |  |
| Component:  | Elective   |  |  |
| Cycle:  | Core   |  |  |
| ECTS:   | 6  |  |  |
| Pre-requisities   | Programmable digital devices   |  |  |
| Workload:   | Types of classes   | Hours  |  |
|   | Total  | 180  |  |
|   | Lecture  | 42   |  |
|   | Practical works  | 30   |  |
|   | SAW (Student autonomous work)  | 108  |  |
|   | Form of final control  | Exam   |  |
|   | Final assessment method  | Writing  |  |
| Control forms:  | Current control, Mid-term control, Final control   |  |  |
| Assessment  | Attendance at classes and 60% of academic progress in total  | for 2 types of control,  |  |
| requirements  | to obtain admission to the final control   |  |  |
| Final control   | The final exam is written in the form of 5 questions of questions consist of 2 parts: 3 theoretical questions and 2 practical c time is 80 minutes   | 10 marks each, the juestions. Total exam   |  |
| Short content:  | besign of digital devices in programmable logic integrated<br>encourage you to understand mathematical hardware of mode<br>technology of programmable logic integrated circuits (FPGA), prog<br>and software and hardware tools available for building radio engine  | rn integrated circuits<br>ramming capabilities<br>ering devices.                         |  |
| Goal:   | The purpose of mastering the discipline is to give students systematized theoretical knowledge and practical skills in design of digital devices in programmable logic integrated circuits   |  |  |
| Objective:  | -fundamentals of Boolean algebra; -Boolean functions; -functionally complete<br>systems; -perfect forms; -minimization of Boolean functions; -theory of finite automata.<br>Methods of definition and description; -triggers as finite automata; -research and<br>synthesis of finite automata; -FPGA designs, design and implementation technologies.<br>Manufacturers; -FPGA programming; -programming options, CAD; -modeling of<br>products on EPGA  |  |  |
| Learning<br>outcome:  | After studying the discipline, students should be able to:<br>LO 1. Has an understanding of the main methods and means of obtaining, storing and<br>processing information.<br>LO 2. Acquires the skills to perform computer modeling of devices, systems and<br>processes using universal packages of practical computer programs.<br>LO 3. Acquires concepts of instrumentation and hardware placement for programming<br>and debugging devices in FPGAs.<br>LO 4. The ability to organize the installation and adjustment of info-communication<br>equipment increases: |  |  |
| <b>T</b> 1:   | LO 5. Can apply modern methods of maintenance and repair;  |  |  |
| Teaching<br>methods:  | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;   | are conducted mainly<br>ods and technologies<br>gement of knowledge,<br>d be emphasized: |  |

|                             | <ul> <li>communication to<br/>debates and other a</li> <li>case-study methoding<br/>games;</li> <li>information and of<br/>In order to develop<br/>open questions",</li> <li>"INSERT", hands-<br/>classes.</li> </ul>  | echnologies (discussion, press-conf<br>active forms and methods);<br>d (analysis of situations);<br>es, in which students participate in<br>communication (including distance I<br>o critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and other  | erence, brainsto<br>business, role-<br>earning) techno<br>such methods<br>Know-Want to<br>s are actively u | playing,<br>playing,<br>ologies.<br>as "Prec<br>o Knov<br>sed duri | educational<br>, simulation<br>diction with<br>w-Learned",<br>ng practical |
|-----------------------------|--|---|--|--|--|
| Assessment of the student's |  | Type of task  | Number of<br>(max)   | points   | Total  |
| knowledge:                  | Comment a antrol   | Practical works (1-10)  | 30   | 40   |  |
|                             | Current control  | Independent work  | 10   | 40   | 100  |
|                             | Mid-term control   | Written work  | 10   |  | 100  |
|                             | Final control  | Exam (Writing)  | 50   |  |  |
| lectures:                   | <ul> <li>Introduction. Basic definitions of Boolean algebra.</li> <li>Finite state machine (FA) definition. Types of spaceships: Mealy and Moore submachine guns.</li> <li>Triggers as Finite State Machines. Trigger types: RS, JK, D. Synchronous triggers.</li> <li>Combined schemes. Encrypters and decryptors.</li> <li>Pulse counters. Registers.</li> <li>Pulse distributors. Code converters.</li> <li>Types of FPGA designs. Technologies and equipment for FPGA production.</li> <li>Software packages for FPGA design.</li> <li>FPGA manufacturing companies.</li> <li>FPGA programming languages.</li> <li>FPGA programming automation systems.</li> <li>Basic rules for modeling products on FPGAs.</li> <li>Software packages for modeling digital systems.</li> </ul> |   |  |  |  |
| Literature:                 | 1. Shakhov V.G. Audiovi<br>house of OmskGTU, 201<br>O.V. Batenkova Omsk<br>theoretical principles, ele<br>Publishing house of Om<br>engineering: textbook. ele<br>Gokova; OmskGTU Or   | <ul> <li>-Simulation-based design of numerical systems.</li> <li>1. Shakhov V.G. Audiovisual means and technologies: a textbook / V.G. Shakhov, O.V. Batenkova Omsk: Publishing house of OmskGTU, 2011 97 p. (marked); 2. Shakhov V.G. Digital information processing: a textbook / V.G. Shakhov, O.V. Batenkova Omsk: Publishing house of OmskGTU, 2011 100 p. 3. Nikonov I.V. Digital circuit engineering: theoretical principles, element base: textbook. electronic publication of local distribution / I.V. Nikonov Omsk: Publishing house of OmskGTU, 2013 1 electronic optical disk (CD-ROM) (EBS). 4. Analog and digital circuit engineering: textbook. electronic publication of local distribution: textbook. manual / A.V. Buboov, K.N. Gvozdenko, M.V. Colour of OmsleCTU 2015 1 electronic optical disk (CD-ROM) (EBS).</li> </ul> |  |  |  |

| 6.18. Machine l               | earning technologies in infocommunication systems   |   |  |
|-------------------------------|---|---|--|
| Semestr:                      | 7   |   |  |
| Date of last<br>modification: | 31.08.2023  |   |  |
| Teachers:                     | Mukhammedinov Kobeysin Kuanishovich   |   |  |
| Component:                    | Elective  |   |  |
| Cycle:                        | Core  |   |  |
| ECTS:                         | 6   |   |  |
| Pre-requisities               | Embedded management systems, Image processing   |   |  |
| Workload:                     | Types of classes  | Hours   |  |
|                               | Total   | 180   |  |
|                               | Lecture   | 42  |  |
|                               | Practical works   | 30  |  |
|                               | SAW (Student autonomous work)   | 108   |  |
|                               | Form of final control   | Exam  |  |
|                               | Final assessment method   | Writing   |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total   | for 2 types of control,   |  |
| Final control                 | The final evam is written in the form of 5 questions of   | 10 marks each the   |  |
|                               | questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes  |   |  |
| Short content.                | includes several disciplines such as probability theory, statistics, and convex optimization. This course first introduces learning algorithms and the definition of "learning" in the context of machine learning. Based on this, it suggests some commonly used machine learning algorithms. Our students will learn about some basic concepts such   |   |  |
| Goal:                         | The purpose of mastering the subject is to equip stude  | ents with systematic  |  |
| Goui.                         | theoretical knowledge and practical skills in the field of information<br>engineering, specifically within the context of machine learning.   | n and communication   |  |
| Objective:                    | -understanding the fundamentals of machine learning;<br>learning's algoritms; -developing practical skills in machine learning<br>optimizing machine learning technologies; -troubleshooting mach<br>exploring modern trends and technologies in machine learning.  | -studying machine<br>ning; -analyzing and<br>nine learning issues; -                      |  |
| Learning                      | After studying the discipline, students should be able to:  |   |  |
| outcome:                      | <ul> <li>LO 1. Understanding of the structure and main characteristics of machine learning.</li> <li>LO 2. Gain skills in the general concept of building a machine learning.</li> <li>LO 3. Learns and uses common types of machine learning (supervised learning, unsupervised learning, semi-supervised learning, reinforcement learning).</li> <li>LO 4. Studies the overall process of machine learning.</li> <li>LO 5. Studies model parameters and hyperparameters.</li> </ul> |   |  |
| Tagakina                      | In the conditions of the gradit system of advection where   | me learning.  |  |
| methods:                      | in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;  | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized: |  |
|                               | <ul> <li>- communication technologies (discussion, press-conference, brains debates and other active forms and methods);</li> <li>- case-study method (analysis of situations);</li> </ul>  | storming, educational   |  |

|                             | - game technologie<br>games;<br>- information and c<br>In order to develop<br>open questions",<br>"INSERT", hands-(<br>classes.  | es, in which students participate in the communication (including distance less critical thinking among students, so "Cluster", "Cross-discussion", "Hon activities, gamification and others  | business, role-<br>earning) techno<br>such methods<br>Know-Want to<br>s are actively us | playing,<br>ologies.<br>as "Prec<br>o Knov<br>sed duri | simula<br>liction<br>v-Learn<br>ng prac | ation<br>with<br>ned",<br>ctical |
|-----------------------------|--|---|---|--|---|----------------------------------|
| Assessment of the student's |  | Type of task  | Number of (max)   | points   | Total                                   |                                  |
| knowledge:                  |  | Practical works (1-10)  | 30  | 40   |   |                                  |
|                             | Current control  | Independent work  | 10  | 40   | 100                                     |                                  |
|                             | Mid-term control   | Written work  | 10  | I  | 100                                     |                                  |
|                             | Final control  | Exam (Writing)  | 50  |  |   |                                  |
| lectures:                   | <ul> <li>Python Data Ty</li> <li>Python Control I<br/>Numbers. Pytho</li> <li>Python Lists, Tup</li> <li>Python user-defir</li> <li>Introduction to</li> <li>Basics of working</li> <li>Introduction to</li> <li>Algorithms. Ma</li> <li>Types of Machi<br/>supervised Lear</li> <li>The Overall Proc</li> <li>Feature Selection</li> <li>Model Parameter</li> <li>Common Algorit</li> <li>Decision Tree. Su</li> <li>Ensemble Learni</li> <li>Case Study. Cour</li> </ul> | Final control       Exam (Writing)       50         - Introduction Python. Program structure. Data output and input. Python Variables. Python Data Types. Python Operators.       - Python Data Types. Python Operators.         - Python Control Flow – Decision Making. Python Control Flow – Looping. Python Numbers. Python Strings.       - Python Control Flow – Decision Making. Python Control Flow – Looping. Python Numbers. Python Strings.         - Python Lists, Tuples, Sets, Python Dictionaries.       - Python user-defined Functions. Python Modules.         - Introduction to numpy, pandas.       - Basics of working with matplotlib, pyplot, seaborn libraries.         - Introduction to Machine Learning. Rational Understanding of Machine Learning Algorithms. Major Problems Solved by Machine Learning.         - Types of Machine Learning. Supervised Learning. Unsupervised Learning. Semi-supervised Learning. Reinforcement Learning.         - The Overall Process of Machine Learning. Data Collection. Data Cleaning.         - Feature Selection. The Construction of Machine Learning Models. Model Evaluation.         - Model Parameters and Hyperparameters. Gradient Descent. Validation Set and Hyperparameter Search. Cross-validation.         - Common Algorithms of Machine Learning. Linear Regression. Logistic Regression.         - Decision Tree. Support Vector Machine. K-Nearest Neighbor Algorithm. Naive Bayes.         - Ensemble Learning. Clustering Algorithm. |   |  |   |                                  |
| Literature:                 | Literature 1. "Python Crass<br>Textbooks for Huawei ICT<br>& Telecom Press 2023. 3.<br>Machine Learning Models   | h Course, 2nd Edition". William Pollock. by No S<br>[ Academy: "Artificial Intelligence Technology".<br>"Machine Learning Lab Guide". Huawei Techn<br>s with Python". Ali Madami. Packt Pulishing 202.  | tarch Press, Inc. Eric<br>Huawei Technologie<br>ologies Co., Ltd. 20<br>3.              | c Matthes. 2<br>es Co., Ltd.<br>23.                    | 2019. 2. C<br>Springer<br>4. "Debu      | )fficial<br>: Posts<br>ugging    |

| 6.19. Application             | on of machine learning in info-communications  |   |  |
|-------------------------------|--|---|--|
| Semestr:                      | 7  |   |  |
| Date of last<br>modification: | 31.08.2023   |   |  |
| Teachers:                     | Utegenov Akhmet Alisher uli'   |   |  |
| Component:                    | Elective   |   |  |
| Cycle:                        | Core   |   |  |
| ECTS:                         | 6  |   |  |
| Pre-requisities               | Machine learning technologies in info-communication systems  |   |  |
| Workload:                     | Types of classes   | Hours   |  |
|                               | Total  | 180   |  |
|                               | Lecture  | 42  |  |
|                               | Practical works  | 30  |  |
|                               | SAW (Student autonomous work)  | 108   |  |
|                               | Form of final control  | Exam  |  |
|                               | Final assessment method  | Writing   |  |
| Control forms:                | Current control, Mid-term control, Final control   |   |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control   |   |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes  |   |  |
| Short content:                | This course explores the practical applications of machine learning (ML)<br>in the field of info-communications, focusing on how these technologies can<br>optimize and innovate various aspects of telecommunications and information<br>systems. Students will gain insights into the fundamental principles of machine<br>learning and how they can be applied to solve real-world problems in the info-<br>communications sector. Key topics include data handling, ML algorithms for<br>predictive analytics, network optimization, customer experience enhancement,<br>and security improvements. Through a blend of theoretical knowledge and<br>practical exercises, participants will learn to design, implement, and evaluate<br>machine learning models tailored to the unique challenges and opportunities |   |  |
| Goal:                         | The objective of this course is to provide students with compunderstanding and practical competencies in information engineering, with a specific focus on machine learning applications   | prehensive theoretical<br>and communication                                     |  |
| Objective:                    | -examining the algorithms used in machine learning; -cultivatin<br>machine learning; -evaluating and enhancing machine learning tec<br>challenges encountered in machine learning implementat<br>contemporary trends and innovations in machine learning.  | g hands-on skills in<br>hnologies; -resolving<br>ions; -investigating           |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Comprehend the architecture and key features of machine lea<br>LO 2. Develop proficiency in constructing basic machine learning in<br>LO 3. Understand and apply various machine learning paradigms<br>unsupervised, semi-supervised, and reinforcement learning.<br>LO 4. Explore the comprehensive workflow of machine learning pr<br>LO 5. Examine and manipulate model parameters and hyperparame<br>LO 6. Gain expertise in utilizing prevalent machine learning algorit  | rning systems.<br>nodels.<br>including supervised,<br>ojects.<br>eters.<br>hms. |  |

| Teaching<br>methods:        | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned",<br>"INSERT", hands-on activities, gamification and others are actively used during practical<br>classes.   |   |   |  |                               |  |
|-----------------------------|--|---|---|--|-------------------------------|--|
| Assessment of the student's |  | Type of task  | Number of poin<br>(max)   | nts<br>Tota                                    | 1                             |  |
| knowledge:                  | Current control<br>Mid-term control<br>Final control   | Practical works (1-10)<br>Independent work<br>Written work<br>Exam (Writing)  |   | 100  | _                             |  |
| Topics of<br>lectures:      | Mid-term control       Written work       10         Final control       Exam (Writing)       50         - Introduction to Python (Program Structure, Data Input and Output, Variables in Pythor Data Types in Python, Operators in Python).       -Python Control Structures (Decision-Making Structures, Looping Structures, Managin Numbers and Strings in Python).         - Python Collections (Lists, Tuples, and Sets, Dictionaries in Python).       -Python Functions and Modules (Defining User Functions, Utilizing Python Modules).         - Introduction to NumPy and Pandas.       - Visualization with Matplotlib, Pyplot, and Seaborn.         - Foundations of Machine Learning (Fundamental Understanding of Machine Learning, Algorithms, Key Issues Addressed by Machine Learning).         - Machine Learning Types (Supervised Learning, Unsupervised Learning, Semi supervised Learning, Reinforcement Learning).         - Machine Learning Workflow (Data Collection and Cleaning, Feature Selection an Model Building, Model Evaluation).         - Model Optimization (Understanding Model Parameters and Hyperparameters Implementing Gradient Descent, Managing Validation Sets and Hyperparameters Implementing Gradient Descent, Managing Validation Sets and Hyperparameters and Support Vector Machines, K-Nearest Neighbors and Naive Bayes).         - Advanced Machine Learning Strategies (Ensemble Learning Techniques, Clusterin Methods). |   |   |  |                               |  |
| Literature:                 | 1. "Automate the Boring S<br>Scikit-Learn, Keras, and<br>Introduction" by Richard<br>Ng, Self-published, 2021.   | Stuff with Python" by Al Sweigart, No Starch Pres<br>TensorFlow" by Aurélien Géron, O'Reilly Mo<br>S. Sutton and Andrew G. Barto, MIT Press, 2018 | ss, 2020. 2. "Hands-On Media, 2019. 3. "Reinford<br>e. 4. "Machine Learning Y | lachine Learni<br>ement Learni<br>Yearning" by | ing with<br>ing: An<br>Andrew |  |

| 6.20. Telecomn                | nunications Network Management  |   |  |  |  |
|-------------------------------|---|---|--|--|--|
| Semestr:                      | 7   |   |  |  |  |
| Date of last<br>modification: | 31.08.2023  |   |  |  |  |
| Teachers:                     | Akhmedova Khusniya Khusanovna, Abaskhanova Halima Yunusov   | Akhmedova Khusniya Khusanovna, Abaskhanova Halima Yunusovna |  |  |  |
| Component:                    | Elective  |   |  |  |  |
| Cycle:                        | Core  | Core  |  |  |  |
| ECTS:                         | 6   |   |  |  |  |
| Pre-requisities               | Embedded management systems   |   |  |  |  |
| Workload:                     | Types of classes  | Hours   |  |  |  |
|                               | Total   | 180   |  |  |  |
|                               | Lecture   | 42  |  |  |  |
|                               | Laboratory works  | 30  |  |  |  |
|                               | SAW (Student autonomous work)   | 108   |  |  |  |
|                               | Form of final control   | Exam  |  |  |  |
|                               | Final assessment method   | Writing   |  |  |  |
| Control forms:                | Current control, Mid-term control, Final control  |   |  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,                                     |  |  |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes   |   |  |  |  |
| Short content:                | The task of cource is to create knowledge about the basics of network<br>management, analysis of network structures, network management methods, network<br>characteristics, criteria for managing telecommunication networks, as well as the<br>formation of practical skills in network design methods based on network management    |   |  |  |  |
| Goal:                         | The purpose of teaching the subject is to train students in the basics of telecommunications network management, the structures and characteristics of networks, the characteristics of data flows transmitted over the network, the construction and analysis of telecommunications network management system skills                   |   |  |  |  |
| Objective:                    | -understanding the fundamentals of basics of telecommunications network management;<br>-studying network protocols -developing practical skills in network configuration and<br>management; -analyzing and optimizing network performance; -troubleshooting network<br>issues; -exploring modern trends and technologies in networking. |   |  |  |  |
| Learning                      | After studying the discipline, students should be able to:  |   |  |  |  |
| outcome:                      | LO 1.Understanding of the structure and main characteristics of<br>networks.<br>LO 2. Gain skills in the general concept of building a telecomr<br>management system  | f telecommunication<br>nunications network                  |  |  |  |
|                               | LO 3. Learns and uses common data management protocols and management.  | services in network   |  |  |  |
|                               | LO 4. Studies the principles of service quality management in<br>networks   | telecommunication   |  |  |  |
|                               | LO 5. Studies network management methods, principles of organizi<br>in the network  | ng data transmission  |  |  |  |
|                               | LO 6. Acquires skills in working with new technologies used in network management systems   | telecommunications  |  |  |  |

| Teaching<br>methods:        | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned",<br>"INSERT", hands-on activities, gamification and others are actively used during practical  |   |  |   |  |  |
|-----------------------------|---|---|--|---|--|--|
|                             | classes.  |   | -  |   |  |  |
| Assessment of the student's |   | Type of task  | Number of p<br>(max)   | ooints  | Total  |  |
| knowledge:                  | Current control   | Practical works (1-10)  | 30   | 40  |  |  |
|                             | Current control   | Independent work  | 10   | 40  | 100  |  |
|                             | Mid-term control  | Written work  | 10   |   | 100  |  |
|                             | Final control   | Exam (Writing)  | 50   |   |  | 1                                      |
| Topics of<br>lectures:      | <ul> <li>Introduction to the basics of telecommunications network management. Basic concepts and characteristics of telecommunication networks.</li> <li>Structure and main characteristics of telecommunication networks.</li> <li>General concept of building a telecommunications network management system.</li> <li>Dynamic management of network resources.</li> <li>ITU-T recommended standards, protocols, communication network management interfaces</li> <li>Concept, structure, functions and protocols of TMN Network layer. Network protocols. Network layer protocols (IP, ICMP)</li> <li>Quality of Service (QoS) in IP Networks Routing (static and dynamic). Routing protocols (RIP, OSPF, BGP)</li> <li>Control systems, general structure and features of the OSS/BSS class Application layer protocols (HTTP, FTP, SMTP, DNS).</li> <li>Application of the e-TOM principle in the management of telecommunication networks and services.</li> <li>Fundamentals and principles of TINA architecture Network Management and Monitoring. Tools and methods for network monitoring</li> <li>Concepts of distributed control (CORBA)Internet of Things (IoT). 5G networks. SDN (Software-Defined Networking)</li> </ul> |   |  |   |  |  |
| Literature:                 | Literature 1. Computer N<br>in One). Rassel Scott, 20<br>Pearson Education Limite<br>4. "Computer networks. P<br>V.G. Olifer, St. Petersbur   | etworking: This Book Includes: Computer Network<br>19. 2. A Top-Down Approach: Computer Network<br>d. 3. Computer Networks, Fourth Edition. Andrew<br>rinciples, technologies, protocols: A textbook for<br>g, Peter, 2016. | orking for Beginners a<br>orking, James F. Kurc<br>V S. Tanenbaum. Publi<br>university students, F | and Begini<br>ose, Keith<br>isher; Pren<br>Tifth Editio | ners Guic<br>W. Ross<br>tice Hall,<br>on" N.A. ( | le (All<br>2017.<br>, 2011.<br>Olifer, |

| 6.21. Info-com                | nunication systems and networks  |  |  |  |
|-------------------------------|--|--|--|--|
| Semestr:                      | 8  |  |  |  |
| Date of last<br>modification: | 31.08.2023   |  |  |  |
| Teachers:                     | Berdimuradov Mirzohid Samidulla ugʻli, Utegenov Akhmet Alisher   | ugli   |  |  |
| Component:                    | Elective   |  |  |  |
| Cycle:                        | Core   |  |  |  |
| ECTS:                         | 6  |  |  |  |
| Pre-requisities               | Modeling of Info-communication systems   |  |  |  |
| Workload:                     | Types of classes   | Hours  |  |  |
|                               | Total  | 180  |  |  |
|                               | Lecture  | 42   |  |  |
|                               | Practical works  | 30   |  |  |
|                               | SAW (Student autonomous work)  | 108  |  |  |
|                               | Form of final control  | Exam   |  |  |
|                               | Final assessment method  | Writing  |  |  |
| Control forms:                | Current control, Mid-term control, Final control   |  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,  |  |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes  |  |  |  |
| Short content:                | Info communication systems and networks course will encourage you to learn the main characteristics of info communication systems and networks, the analysis of the characteristics of data flow through the network, methods of optimizing network structures, mathematical models for calculating the parameters of data flow through the network. |  |  |  |
| Goal:                         | The purpose of mastering the discipline is to give students systematized theoretical knowledge and practical skills in understanding the characteristics of information communication networks and systems.  |  |  |  |
| Objective:                    | -understanding the architecture of info communication network stru-<br>organization of data transmission in information communication net<br>methods of optimization of info communication networks, -evalu-<br>transmission of channels, -exploring the generating models of<br>networks.   | uctures, -studying the<br>works, -analyzing the<br>uation the quality of<br>info communication |  |  |
| Learning                      | After studying the discipline, students should be able to:   |  |  |  |
| outcome:                      | LO 1. Imagining about the architecture of the information comnetwork structures.<br>LO 2. Understanding the principles of data transmission organiz communication networks.  | munication network,  |  |  |
|                               | LO 3. Possess skills to determine the methods of optimization of networks, characteristics of channel throughput.  | info communication   |  |  |
| Teaching                      | In the conditions of the credit system of education, classes   | are conducted mainly   |  |  |
| methods:                      | in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities:                   | and technologies<br>gement of knowledge,<br>d be emphasized:                                   |  |  |
|                               | <ul> <li>- communication technologies (discussion, press-conference, brains debates and other active forms and methods);</li> <li>- case-study method (analysis of situations);</li> </ul>   | storming, educational  |  |  |

|                             | - game technologie<br>games;<br>- information and c<br>In order to develop<br>open questions",<br>"INSERT", hands-o<br>classes.   | es, in which students participate in<br>communication (including distance l<br>o critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and others   | business, role-<br>earning) techno<br>such methods<br>Know-Want to<br>s are actively us                            | playing,<br>ologies.<br>as "Prec<br>o Knov<br>sed durin              | simula<br>liction v<br>v-Learn<br>ng pract                        | tion<br>with<br>ed",<br>tical           |
|-----------------------------|---|---|--|--|---|---|
| Assessment of the student's |   | Type of task  | Number of j<br>(max)   | points   | Total   |   |
| knowledge:                  | Cumont control  | Practical works (1-10)  | 30   | 40   |   |   |
|                             | Current control   | Independent work  | 10   | 40   | 100   |   |
|                             | Mid-term control  | Written work  | 10   |  | 100   |   |
|                             | Final control   | Exam (Writing)  | 50   |  |   |   |
|                             | <ul> <li>Information communication systems and networks, basic concepts and construction methods. Network topology and characteristics.</li> <li>Data flow and characteristics in information communication networks.</li> <li>Methods of data flow routing in information communication networks. Identify shortcuts. Dijkstra method.</li> <li>Methods of data flow routing in information communication networks. Identify shortcuts. Dijkstra method.</li> <li>Calculation of the main characteristics of information communication networks. Data flow intensity. Load calculation.</li> <li>Calculation of the main characteristics of information communication networks. Data flow intensity. Load calculation.</li> <li>Calculation of the main characteristics of information communication networks. Data flow intensity. Load calculation.</li> <li>Management of information communication networks. Traffic management in information communication networks.</li> <li>Public service models. Mathematical models for calculating time-probability characteristics (VEX) of data flow.</li> <li>Public service models. Mathematical models for calculating time-probability characteristics (VEX) of data flow.</li> <li>Infocommunication network resources. Communication channel throughput. Data transmission technologies.</li> <li>Methods for calculating viability and reliability parameters of the infocommunication network.</li> <li>Optimization and analysis of information communication network structures. Network optimization criteria.</li> <li>Optimization and analysis of information communication network structures. Network optimization criteria.</li> <li>Providing quality service (QoS) to users in information communication networks.</li> </ul> |   |  |  |   |   |
| Literature:                 | Literature 1. Goldshtein E<br>Samuilov, N.V. Serebrenn<br>company. Textbook, M.: I<br>Volume 3. Multiservice no<br>Communication network  | B.S.: Infocommunication networks and systems.<br>ikova, A.V. Chukarin, N.V. Yarkina. An extended<br>RUDN, 2008. – 183 p. 3. Velichko V.V. and othe<br>etworks M.: Hotline – Telecom, 2005. 4. Dyma<br>management: principles, protocols, applied tasks. | - SPb.: BXV-Peterbu<br>d map of the processo<br>ers. Telecommunicat<br>ursky Ya. S., Krutyal<br>- M: ITC "Mobile C | urg, 2019.<br>es of a telec<br>ion system<br>kova N.P.,<br>Communica | - 208 p. 2.<br>communica<br>s and netw<br>Yanovsky<br>tions", 200 | K.E.<br>ations<br>vorks.<br>G.G.<br>03. |

| 6.22. Virtualiza              | tion of network functions and services  |   |  |
|-------------------------------|---|---|--|
| Semestr:                      | 8   |   |  |
| Date of last<br>modification: | 31.08.2023  |   |  |
| Teachers:                     | Tojieva Feruza Kobiljon kizi, Utegenov Akhmet Alisher ugli  |   |  |
| Component:                    | Elective  |   |  |
| Cycle:                        | Core  |   |  |
| ECTS:                         | 6   |   |  |
| Pre-requisities               | Machine learning technologies in info-communication systems   |   |  |
| Workload:                     | Types of classes  | Hours   |  |
|                               | Total   | 180   |  |
|                               | Lecture   | 42  |  |
|                               | Practical works   | 30  |  |
|                               | SAW (Student autonomous work)   | 108   |  |
|                               | Form of final control   | Exam  |  |
|                               | Final assessment method   | Writing   |  |
| Control forms:                | Current control, Mid-term control, Final control  | <u>.</u>  |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total   | for 2 types of control,   |  |
| requirements                  | to obtain admission to the final control  |   |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, the questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes   |   |  |
| Short content:<br>Goal:       | Virtualization of network functions and services course i<br>concept, architecture, and individual components of network fun<br>(NFV) systems associated with software-defined networking (SDN).<br>The purpose of mastering the discipline is to give st   | ntroduces you to the<br>nctions virtualization<br>).<br>tudents systematized  |  |
| Objective                     | theoretical knowledge and practical skills in Virtualization of ne<br>services.   | etwork functions and  |  |
|                               | concept of virtualization of network functions sdn and nfv; - NF (nfvi); - virtual infrastructure manager vim; -manager of virtual n (vnfm).  | V infrastructure<br>etwork functions vnf  |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Understand the basic concepts and terms of the concept of vi<br>LO 2. Gain knowledge of NFV infrastructure.<br>LO 3. Explores policy structure in sdn/nfv.<br>LO 4. Explore the features of nfv architecture.<br>LO 5. Review IMS functionality in sdn/nfv.<br>LO 6. Explores the functions of a virtual network functions manage   | rtual networks.<br>er.  |  |
| Teaching<br>methods:          | In the conditions of the credit system of education, classes a<br>in active and creative forms. Among the effective pedagogical meth-<br>that promote active involvement of students in the search and manag-<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brains<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, rol-<br>games; | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized:<br>storming, educational<br>e-playing, simulation |  |
|                               | - information and communication (including distance learning) tech  | nnologies.  |  |

|                             | In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.   | o critical thinking among students,<br>"Cluster", "Cross-discussion", "I<br>on activities, gamification and other   | such methods a<br>Know-Want to<br>s are actively us  | as "Prec<br>5 Knov<br>sed duri                                  | diction<br>w-Learn<br>ng prac                                    | with<br>ned",<br>ctical               |
|-----------------------------|---|---|--|---|--|---------------------------------------|
| Assessment of the student's |   | Type of task  | Number of points<br>(max)  |   | Total  |                                       |
| knowledge:                  |   | Practical works (1-10)  | 30   | 10  |  |                                       |
|                             | Current control   | Independent work  | 10   | 40  | 100  |                                       |
|                             | Mid-term control  | Written work  | 10   |   | 100  |                                       |
|                             | Final control   | Exam (Writing)  | 50   |   | -  |                                       |
|                             | <ul> <li>Architecture of the concept of virtual networks</li> <li>Architecture of the concept of virtualization of network functions sdn and nfv</li> <li>NFV infrastructure (nfvi)</li> <li>Virtual infrastructure manager vim</li> <li>Manager of virtual network functions vnf (vnfm)</li> <li>Vnf descriptors (vnfd) and their main functions</li> <li>general orchestrator of services eeo (end-to-end orchestration)</li> <li>End-to-end network service descriptors eensd</li> <li>Policy structure in sdn/nfv</li> <li>Control architecture and structure of the sdn controller</li> <li>Interfaces of the sdn/nfv architecture</li> <li>Features of the nfv architecture</li> <li>Deployment of vnf in the nfvi infrastructure</li> <li>Reliability and availability of vnf</li> <li>IMS functions in sdn/nfv</li> <li>Functions of the core packet network epc</li> </ul> |   |  |   |  |                                       |
| Literature:                 | 1. Dokuchaev V.A., Ievle<br>infrastructure (part 1). Ge<br>V.A., Ievlev O.P., Makla<br>(part 2). Deployment prin<br>Smelyansky R.L. SDN an  | v O.P., Maklachkova V.V., Shalaginov A.V. Sof<br>neralized architecture of the SDN and NFV conce<br>chkova V.V., Shalaginov A.V. Software-defined<br>ciples and elements of SDN and NFV: tutorial /<br>d NFV technologies: new opportunities for teleco | tware-defined archiv<br>pt: tutorial / MTUCI<br>architecture of appl<br>Ed. A.V. Shalaginov<br>mmunications. // Ve | ecture of a<br>M., 202<br>ications an<br>v / MTUC<br>stnik svya | applicatio<br>0. 2. Doku<br>nd infrastr<br>I M., 20<br>zi – 2014 | ns and<br>uchaev<br>ucture<br>020. 3. |

| 6.23. Software configurable network |  |   |  |  |
|-------------------------------------|--|---|--|--|
| Semestr:                            | 8  |   |  |  |
| Date of last<br>modification:       | 31.08.2023   |   |  |  |
| Teachers:                           | Abdurakhmanov Rustam Pattakhovich, Allamuratova Zamira Juma  | muratovna   |  |  |
| Component:                          | Elective   |   |  |  |
| Cycle:                              | Core   |   |  |  |
| ECTS:                               | 6  |   |  |  |
| Pre-requisities                     | Programming structure in telecommunications  |   |  |  |
| Workload:                           | Types of classes   | Hours   |  |  |
|                                     | Total  | 180   |  |  |
|                                     | Lecture  | 42  |  |  |
|                                     | Practical works  | 30  |  |  |
|                                     | SAW (Student autonomous work)  | 108   |  |  |
|                                     | Form of final control  | Exam  |  |  |
|                                     | Final assessment method  | Writing   |  |  |
| Control forms:                      | Current control, Mid-term control, Final control   |   |  |  |
| Assessment<br>requirements          | Attendance at classes and 60% of academic progress in total to obtain admission to the final control   | for 2 types of control,   |  |  |
| Final control                       | The final exam is written in the form of 5 questions of 10 m   | narks each, the   |  |  |
|                                     | questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total exam time is 80 minutes   |   |  |  |
| Short content.                      | in emerging networking techniques that enable access to and sharing of data anywhere<br>and anytime, such as new generation wireless networks or Internet of Things (IoT)<br>platforms; and the wide application of solutions enabling optimal utilization of the<br>resources used (programmable networks, cloud computing) require a new approach to |   |  |  |
| Goal:                               | The purpose of mastering the discipline is to give st<br>theoretical knowledge and practical skills in software configurable   | tudents systematized network.   |  |  |
| Objective:                          | -Access Control; - Role-Based Access Control (RBAC); -<br>Access Control; -Software defined networks principles; -Software<br>Routing Mechanisms; -SDN Role in Improving Network Secur<br>Transfer Over SDN; -The Concept of Risk-Aware Routing in SDN<br>-Implementation of Risk-Aware SDN Controller   | Risk Management in<br>e-Defined Routing; -<br>rity; -Protected Data<br>; -RAR Architecture; |  |  |
| Learning                            | After studying the discipline, students should be able to:   |   |  |  |
| outcome:                            | LO 1. Explores the principles of software-defined networking.  |   |  |  |
|                                     | LO 2. Understands software-defined routing mechanisms.   |   |  |  |
|                                     | LO 4. Will have the skills to deploy CS in SDN-based systems.  |   |  |  |
|                                     | LO 5. Gain an understanding of the application of risk-aware routing   | to DCS enforcement.   |  |  |
| Teaching                            | In the conditions of the credit system of education, classes a   | are conducted mainly  |  |  |
| methods:                            | in active and creative forms. Among the effective pedagogical meth<br>that promote active involvement of students in the search and manag<br>the acquisition of experience in independent problem solving should<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities:                     | nods and technologies<br>gement of knowledge,<br>d be emphasized:                           |  |  |
|                                     | - communication technologies (discussion, press-conference, brains<br>debates and other active forms and methods);   | storming, educational   |  |  |
|                                     | <ul> <li>case-study method (analysis of situations);</li> <li>game technologies, in which students participate in business, role games;</li> </ul>   | e-playing, simulation   |  |  |

|                             | - information and o<br>In order to develop<br>open questions",<br>"INSERT", hands-<br>classes.   | communication (including distance<br>o critical thinking among students,<br>"Cluster", "Cross-discussion", "<br>on activities, gamification and other   | learning) techn<br>such methods<br>Know-Want t<br>s are actively t                      | ologies.<br>as "Pre-<br>to Know<br>used duri           | diction with<br>w-Learned"<br>ing practica                              |
|-----------------------------|--|---|---|--|---|
| Assessment of the student's |  | Type of task  | Number of<br>(max)  | points<br>)  | Total   |
| knowledge:                  | Comment or set and   | Practical works (1-10)  | 30  | 40   |   |
|                             | Current control  | Independent work  | 10  | 40   | 100   |
|                             | Mid-term control   | Written work  | 10  |  | 100   |
|                             | Final control  | Exam (Writing)  | 50  |  |   |
|                             | <ul> <li>Risk Managemer</li> <li>Software defined</li> <li>Software-Defined</li> <li>Routing Mechani</li> <li>SDN Role in Imp</li> <li>Protected Data T</li> <li>The Concept of H</li> <li>RAR Architectur</li> <li>Implementation of</li> <li>Risk-Aware Rou</li> <li>CS Deployment f</li> <li>Common Labelli</li> <li>DCS Integration</li> </ul> | at in Access Control<br>networks principles<br>d Routing<br>isms<br>proving Network Security<br>ransfer Over SDN<br>Risk-Aware Routing in SDN<br>e<br>of Risk-Aware SDN Controller<br>ting Applicability for DCS Enforce<br>in SDN-Based Systems<br>ng Approach for All Content<br>with SDN-Based Zero Trust System | ment  |  |   |
| Literature:                 | 1. Marek Amanowicz · Se<br>Konrad Wrona Military U<br>Rothenberg, C.E., Azodol<br>14–76 (2015). 3. Masoudi   | bastian Szwaczyk · Konrad Wrona, Data-Centric<br>iniversity of Technology Warszawa, Poland, 202<br>molky, S., Uhlig, S.: Software-defined networkin<br>, R., Ghaffari, A.: Software defined networks: a s   | Security in Softward<br>4. 2. Kreutz, D., Raing: a comprehensive<br>urvey. J. Netw. Com | e Defined N<br>mos, F.M.,<br>survey. Pro<br>put. Appl. | Vetworks (SDN)<br>Verissimo, P.E.<br>oc. IEEE 103(1)<br>67, 1–25 (2016) |

| 6.24. Network                 | Smart Devices Software   |  |  |
|-------------------------------|--|--|--|
| Semestr:                      | 8  |  |  |
| Date of last<br>modification: | 31.08.2023   |  |  |
| Teachers:                     | Tojieva Feruza Kobiljon kizi   |  |  |
| Component:                    | Elective   |  |  |
| Cycle:                        | Core   |  |  |
| ECTS:                         | 4  |  |  |
| Pre-requisities               | Programming structure in telecommunications  |  |  |
| Workload:                     | Types of classes   | Hours  |  |
|                               | Total  | 120  |  |
|                               | Lecture  | 30   |  |
|                               | Practical works  | 18   |  |
|                               | SAW (Student autonomous work)  | 72   |  |
|                               | Form of final control  | Exam   |  |
|                               | Final assessment method  | Writing  |  |
| Control forms:                | Current control, Mid-term control, Final control   |  |  |
| Assessment                    | Attendance at classes and 60% of academic progress in total  | for 2 types of control,  |  |
| requirements                  | to obtain admission to the final control   |  |  |
| Final control                 | The final exam is written in the form of 5 questions of 10 marks each, th questions consist of 2 parts: 3 theoretical questions and 2 practical questions. Total examine is 80 minutes   |  |  |
|                               | (IoT), exploring data exchange across various devices like Arduino a<br>connects everyday objects, embedding them with intellige<br>intercommunication. It serves as a platform where electronic team<br>merging physical and digital realms to innovate new products and<br>course covers critical IoT aspects such as monitoring and contro<br>analytics, and collaborative information sharing. It emphasizes the<br>system and infrastructure that supports personalized and city-w<br>services. | and Raspberry Pi. IoT<br>ence for networked<br>as share specific data,<br>business models. The<br>ol, big data, business<br>he IoT as an integral<br>vide applications and |  |
| Goal:                         | The purpose of teaching the subject is to train students in smart devices software, the structure and characteristics of networks devices, characteristics of data streams transmitted over the network exchange of these data through devices.  | the basics of network<br>s, their operation with<br>ork and processes of   |  |
| Objective:                    | -understanding the fundamentals of basics of telecommunications no<br>devices software; - studying network protocols with devices -deve<br>in network configuration and devices; -analyzing and optimizing n<br>software; -troubleshooting network smart devices issues; -explorin<br>technologies in network smart devices software.  | etwork network smart<br>loping practical skills<br>network smart devices<br>ng modern trends and   |  |
| Learning                      | After studying the discipline, students should be able to:   |  |  |
| outcome:                      | LO 1. Understanding of the structure and main characteristics of n   | etwork smart devices   |  |
|                               | LO 2. Gain skills in the general concept of building a network sr  | nart devices software  |  |
|                               | system   | ices software  |  |
|                               | LO 4. Learns data exchange in smart devices and its software   | icos sontware  |  |
|                               | LO 5. Learns the methods of programming and controlling smart d  | levices, the principles  |  |
|                               | of organizing data transmission in the device  |  |  |
|                               | LO 6. Acquires skills in working with new technologies used in susystems   | mart devices software  |  |

| Teaching<br>methods:        | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned",<br>"INSERT", hands-on activities, gamification and others are actively used during practical<br>classes.   |  |   |   |  |    |
|-----------------------------|--|--|---|---|--|----|
| Assessment of the student's |  | Type of task   | Number of p<br>(max)  | oints   | Total                                      |    |
| knowledge:                  |  | Practical works (1-10)   | 30  | 40  |  |    |
|                             | Current control  | Independent work   | 10  | 40  | 100  |    |
|                             | Mid-term control   | Written work   | 10  |   | 100  |    |
|                             | Final control  | Exam (Writing)   | 50  |   |  |    |
| Topics of<br>lectures:      | <ul> <li>Introduction to the basics of network smart devices software.</li> <li>How the internet of things started. Areas of application of the internet of things.</li> <li>Architecture of the internet of things. Information, signals, digital communication system and criteria for communication quality.</li> <li>Arduino basics and internet connectivity. IoT protocols. Hardware requirements. Software requirements. Challenges in IoT.</li> <li>Internet connectivity. Arduino Uno wireless connectivity (WiFi). Arduino Yún wireless connectivity (WiFi). Wireless setup.</li> <li>Communication protocols. HTTP protocols. MQTT protocols.</li> <li>Prototypes. Complex flows: Node-RED. External libraries. Read sensor data.</li> <li>IoT Patterns: Realtime clients. Data publish. Standard functions.</li> <li>IoT Patterns: Remote control. Learning objectives. Screen logic. Code (Arduino).</li> <li>On-demand clients. Database table (MySQL). Database connection.</li> <li>Location aware. Get GPS coordinates. Coding exercises for location aware.</li> <li>Machine to machine. Light sensor device. Analog and digital sensors. Lighting control device.</li> <li>Cloud platforms for IoT. Cloud computing, benefits. Examples for cloud platforms.</li> </ul> |  |   |   |  |    |
| Literature:                 | Literature 1. "Introduction<br>2.Dimitrios Serpanos, Ma<br>Springer International Put<br>Experiments with Real-W<br>Yourself Projects with Ar  | a to the internet of things". P.A. Kokunin., I.I. Lat<br>rilyn Wolf "Internet-of-Things (IoT) Systems", A<br>blishing AG 2018. 3.Adeel Javed, "Building Ardu<br>orld Applications", Illinois/USA, 2016. 4. Donald<br>duino, Raspberry Pi and BeagleBone Black", Un | ypov., L.S. Latypov.<br>rchitectures, Algorith<br>ino Projects for the Ir<br>1 Norris, "The Interne<br>ited States, 2015. | 2022. Kaz<br>nms, Meth<br>nternet of<br>et of Thing | zan.<br>odologies<br>Things:<br>gs: Do-It- | ·, |

| 6.25. Info-comm               | nunication intelligent management systems   |  |  |
|-------------------------------|---|--|--|
| Semestr:                      | 8   |  |  |
| Date of last<br>modification: | 31.08.2023  |  |  |
| Teachers:                     | Abaskhanova Khalima Yunusovna, Mirzaeva Malika Baxadirovna  |  |  |
| Component:                    | Elective  |  |  |
| Cycle:                        | Core  |  |  |
| ECTS:                         | 4   |  |  |
| Pre-requisities               | Embedded management systems   |  |  |
| Workload:                     | Types of classes  | Hours  |  |
|                               | Total   | 120  |  |
|                               | Lecture   | 30   |  |
|                               | Practical works   | 18   |  |
|                               | SAW (Student autonomous work)   | 72   |  |
|                               | Form of final control   | Exam   |  |
|                               | Final assessment method   | Writing  |  |
| Control forms:                | Current control, Mid-term control, Final control  |  |  |
| Assessment<br>requirements    | Attendance at classes and 60% of academic progress in total to obtain admission to the final control  | for 2 types of control,  |  |
| Final control                 | The final exam is written in the form of 5 questions of questions consist of 2 parts: 3 theoretical questions and 2 practical c time is 80 minutes  | 10 marks each, the questions. Total exam   |  |
| Shori content:                | systems within the field of info-communications. Students will explore the intersection<br>of control theory, machine learning, and communication technologies to develop,<br>optimize, and manage intelligent control systems. The curriculum covers theoretical<br>foundations, design methodologies, and practical implementation strategies for intelligent<br>systems that can autonomously manage communication networks and services. Key<br>topics include the basics of system control, application of artificial intelligence (AI) in<br>network management, real-time data processing, and the integration of IoT devices into<br>control frameworks. Through lectures, case studies, and hands-on projects, students will<br>learn how to design and implement robust intelligent control systems that enhance the<br>afficiency and reliability of info communication infrastructures. |  |  |
| Goal:                         | The primary aim of this course is to educate students on<br>software for network smart devices, the architecture and key featu<br>their interaction with devices. Students will also learn about the n<br>transmitted across networks and the mechanisms involved in the e<br>through devices. The course is designed to provide a comprehens<br>how intelligent systems can be leveraged to enhance network fun-<br>interoperability.  | the fundamentals of<br>irres of networks, and<br>ature of data streams<br>exchange of this data<br>ive understanding of<br>ctionality and device |  |
| Objective:                    | -grasp the core principles and foundational aspects of<br>network and software for smart devices; - examine various network<br>interactions with devices; -develop hands-on skills in config<br>associated devices; -evaluate and enhance the performance of softw<br>smart devices; -diagnose and resolve issues related to network smart<br>current trends and emerging technologies in the software developmed<br>devices.   | telecommunications<br>k protocols and their<br>uring networks and<br>ware used in network<br>t devices; -investigate<br>ent for network smart    |  |
| Learning<br>outcome:          | After studying the discipline, students should be able to:<br>LO 1. Comprehend the architecture and essential features of softward<br>devices.<br>LO 2. Develop competencies in designing software systems for network  | are for network smart<br>work smart devices.   |  |

| Teaching                                     | <ul> <li>LO 3. Understand and apply network protocols and services relevant to smart devices software.</li> <li>LO 4. Understand the processes involved in data exchange within smart devices and their software.</li> <li>LO 5. Acquire knowledge of programming techniques and data transmission principles for controlling smart devices.</li> <li>LO 6. Gain proficiency in utilizing emerging technologies in the development of software for smart devices.</li> </ul>  |                                   |    |        |       |
|--|---|-----------------------------------|----|--------|-------|
| methods:                                     | <ul> <li>in the conditions of the creat system of education, classes are conducted mainly in active and creative forms. Among the effective pedagogical methods and technologies that promote active involvement of students in the search and management of knowledge, the acquisition of experience in independent problem solving should be emphasized:</li> <li>technology of problem- and project-based learning;</li> <li>technologies of educational and research activities;</li> <li>communication technologies (discussion, press-conference, brainstorming, educational debates and other active forms and methods);</li> <li>case-study method (analysis of situations);</li> <li>game technologies, in which students participate in business, role-playing, simulation games;</li> <li>information and communication (including distance learning) technologies.</li> <li>In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross-discussion", "Know-Want to Know-Learned", "INSERT", hands-on activities, gamification and others are actively used during practical classes.</li> </ul>   |                                   |    |        |       |
| Assessment of<br>the student's<br>knowledge: |   | Type of task Number of p<br>(max) |    | points | Total |
| Momenge.                                     |   | Practical works (1-10)            | 30 | 40     |       |
|  | Current control   | Independent work                  | 10 | 40     | 100   |
|  | Mid-term control  | Written work                      | 10 | 1      | 100   |
|  | Final control   | Exam (Writing)                    | 50 |        |       |
| Topics of<br>lectures:                       | <ul> <li>Introduction to network smart devices software (foundations of software for network smart devices).</li> <li>Overview of the Internet of Things (IoT) (historical development and areas of application, architectural design, signal processing, digital communications, and quality criteria).</li> <li>Arduino and IoT connectivity (basics of arduino and its internet capabilities, IoT protocols, hardware and software requirements, challenges in the IoT landscape).</li> <li>Wireless communication and connectivity (configuring wireless connectivity with arduino Uno and Arduino Yún, setup procedures for WiFi connections).</li> <li>IoT communication protocols (understanding HTTP and MQTT protocols).</li> <li>IoT System design and implementation (prototyping and complex flows using Node-RED, utilizing external libraries and reading sensor data).</li> <li>Advanced IoT patterns (real-time clients and data publishing techniques, remote control systems, including screen logic and Arduino coding).</li> <li>Client-server interactions in IoT (building on-demand clients, integrating MySQL databases for data management).</li> <li>Location-based services in IoT (acquiring and coding for GPS coordinates, practical coding exercises for location-aware applications).</li> <li>Human-Machine interaction (designing effective workflows and process creation).</li> <li>Machine-to-Machine communication (utilizing light sensors and controlling lighting devices, differentiating between analog and digital sensors).</li> <li>IoT and cloud integration (exploring cloud platforms for IoT, benefits of cloud computing in IoT deployments).</li> </ul> |                                   |    |        |       |
|             | - IoT development tools (introduction to microcontrollers, mini-PCs, and debugging kits for IoT projects).   |
|-------------|--|
| Literature: | Literature 1. "The Internet of Things: A Primer" by Daniel Minoli, published by Wiley, 2021. 2. "IoT and Data Management: Techniques, Technologies, and Applications" by Raghvendra Kumar, Anand Nayyar, and Dac-Nhuong Le, Apple Academic Press, 2022. 3. "Building Internet of Things Projects with Arduino IOT Cloud" by Fabio Biondi, Packt Publishing, 2021. 4. "Advanced Internet of Things (IoT) Projects" by Agus Kurniawan, Apress, 2020. |

| 6.26. Individual project  |  |   |
|---|--|---|
| Semestr:  | 5  |   |
| Date of last<br>modification:   | 31.08.2023   |   |
| Teachers:   | Allamuratova Zamira Jumamuratovna  |   |
| Component:  | Compulsory   |   |
| Cycle:  | Core   |   |
| Credit point:   | 4  |   |
| Pre-requisites  | -  |   |
| Workload:   | Types of classes   | Hours   |
|   | Total  | 120   |
|   | Lecture  | -   |
|   | Practical works  | 48  |
|   | SAW (Student autonomous work)  | 72  |
|   | Form of final control  | Report  |
| Control forms:  | Report   |   |
| Final control:  | The student defends the completed project by presenting it to the common member of the commission evaluates the work.  | ommission, and each   |
| Short content:  | This course is an independent scientific research work of the student, which is carried out independently on the basis of in-depth mastering of the scientific and theoretical foundations of specialized subjects, study, analysis and generalization of international and national economic problems   |   |
| Goal:   | The goal of the individual project course is to deeply master the scientific and theoretical foundations of specialized subjects by students.  |   |
| Objective:  | Concept of individual project, project activity, project culture; Goals, design tasks, problems in the modern world.   |   |
| Learning<br>outcome:  | <ul> <li>After studying the discipline, students should be able to:</li> <li>LO 1. Understand the problematic topic in the field of computer engineering.</li> <li>LO 2. To develop students' ability to set a specific problem and solve it.</li> <li>LO 3. Development of proposals and recommendations aimed at the implementation of a problematic topic.</li> <li>LO 4. Increase the potential of students to effectively use scientific literature, practical analytical-statistical data and other materials in scientific-practical activities.</li> </ul> |   |
| <i>methods:</i> In the conditions of the credit system of education, classes are condu-<br>in active and creative forms. Among the effective pedagogical methods and<br>that promote active involvement of students in the search and management of<br>the acquisition of experience in independent problem solving should be emp<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities; |  | are conducted mainly<br>nods and technologies<br>gement of knowledge,<br>d be emphasized: |
|   | <ul> <li>debates and other active forms and methods);</li> <li>- case-study method (analysis of situations);</li> <li>- game technologies, in which students participate in business, role-playing, simulation games;</li> <li>- information and communication (including distance learning) technologies</li> </ul>   |   |
|   | In order to develop critical thinking among students, such method<br>open questions", "Cluster", "Cross-discussion", "INSERT", "Fishbo<br>I found out, I want to know" hands-on activities, gamification and ot<br>during practical classes.   | s as "Prediction with<br>ne" method, "I know,<br>hers are actively used                   |

| Assessment of the student's | Type of task  | Number of points<br>(max)   | Total   |  |
|-----------------------------|---|---|---|--|
| knowledge:                  | Completeness of theoretical material  | 0-20  |   |  |
|                             | Implementation of the practical part of the project   | 0-30  | 0-100   |  |
|                             | To answer the given questions clearly and succinctly  | 0-50  |   |  |
| Topics of<br>lectures:      | <ul> <li>Introduction to Computer Engineering</li> <li>Concept of "Individual project, project activity, proj<br/>problems in the modern world. 2</li> <li>Methodology and technology of project activity. Detention of the project evidence, validity.</li> <li>Methods of determining the goal and dividing it in with the topic. Review of key materials on the topic.</li> <li>Logic of actions and sequence of steps in personal calendar schedule of your activity.</li> <li>Information search and systematization. Information sources. Information processing tools - methods, tec</li> <li>Use of information technologies in research and project. Methods and for</li> <li>Presentation of the results of the educational project. Methods and for</li> <li>Presentation of the project, formation of conclust presenting results. A basis for the design process. Expected results, project plan.</li> </ul> | ect culture". Goals,<br>sign thinking method<br>t. Design concept.<br>to tasks, originality<br>l project planning. On<br>culture. Types of<br>hniques, technologie<br>roject activities. Wo<br>ure. Introduction to o<br>ject results. Use of<br>ms of data submissio<br>roject. Analysis of<br>sions. Prepare possil<br>cplanation of the obta<br>. Correction of defa<br>ar projects.<br>hesis, relevance, re | design ta<br>ds.<br>Relevan<br>, complia<br>Calculate<br>informa<br>es.<br>orking on<br>catalogs.<br>informa<br>on.<br>informa<br>ole forms<br>ained res<br>ects. Sea | asks,<br>ce -<br>ance<br>the<br>tion<br>tion,<br>tion,<br>s for<br>ults.<br>arch,<br>plan, |
| Literature:                 | 1. Andrew S. Tanenbaum. Computer Networks, Fourth Edition. Publisher; P<br>W. Ross "A Top-Down Approach: Computer Networking", 2017. Pearson Ed<br>systems and networks". Tashkent.: "Alokachi" publishing house, 2013. Chapt<br>institutions. 4. Miryusupov Z. Z., Djumanov J. Kh. Computer networks: s<br>TATTOO T.: Alokachi, 2020 144 p.  | Prentice Hall, 2011. 2. James<br>ducation Limited 3. Musaev<br>er 8. 394 pages Guide for I<br>tudy guide, Muhammad Al   | F. Kurose,<br>M.M. "Con<br>nigher educa<br>-Khorazmi  | Keith<br>nputer<br>ational<br>name.  |

| 6.27. Qualification Practice 1 (Practical Training) |   |                         |
|---|---|-------------------------|
| Semestr:  | 6   |                         |
| Date of last<br>modification:                       | 31.08.2023  |                         |
| Teachers:   | Allamuratova Zamira Jumamuratovna   |                         |
| Component:  | Compulsory  |                         |
| Cycle:  | Core  |                         |
| Credit point:                                       | 6   |                         |
| Pre-requisites                                      | Individual project  |                         |
| Workload:   | Types of classes  | Hours                   |
|   | Total   | 180                     |
|   | Lecture   | -                       |
|   | Practical works   | -                       |
|   | SAW (Student autonomous work)   | 180                     |
|   | Form of final control   | Practice Report         |
| Control forms:                                      | Practice Report   |                         |
| Final control:                                      | The report is the practice work of the student in the form of a of the graduation qualification work.   | a report on the subject |
| Short content:                                      | Development and formation of general professional competences, as well as acquisition by students of the necessary skills and experience of practical work in their specialty in modern conditions, and preparation for graduation qualification work   |                         |
| Goal:   | The goal of production practice is comprehensive development of all types of professional activity of students in their fields.   |                         |
| Objective:  | The direct management of practice in enterprises is carried out by the engineering<br>and technical staff of these enterprises. The head of the enterprise assigns the<br>responsibility for the organization of the operation to the chief specialist or his deputy.   |                         |
| Learning<br>outcome:                                | After studying the discipline, students should be able to:<br>LO 1. Understand the problematic topic in the field of computer engineering.<br>LO 2. Search for information, critically analyze and synthesize, apply a systematic<br>approach to solving given problems.<br>LO 3. Development of proposals and recommendations aimed at the implementation of<br>a problematic topic.<br>LO 4. To be able to carry out social communication and fulfill one's role in the team,<br>control technological process parameters, product quality and production control in the<br>field of approach   |                         |
| Teaching<br>methods:                                | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "INSERT", "Fishbone" method, "I know,<br>I found out, I want to know" hands-on activities, gamification and others are actively used<br>during practical classes |                         |

| Assessment of the student's | Type of task  | Number of points<br>(max)   | Total  |  |
|-----------------------------|---|---|--|--|
| knowledge:                  | Complete and accurate completion of the task  | 0-50  |  |  |
|                             | Being able to demonstrate the ability to think<br>independently within the framework of pre-graduate<br>work practice   | 0-20  | 0-100  |  |
|                             | To answer the given questions clearly and succinctly  | 0-30  |  |  |
| Topics of<br>lectures:      | <ul> <li>The direct management of practice in enterprises is a technical staff of these enterprises. The head of the enfor the organization of the operation to the chief spector Study of normative and technical literature on the topic Get technical safety instructions.</li> <li>Get the topics of the graduation thesis. Identifying privork. Forming a group.</li> <li>Determining the main goals and tasks of the graduate Standards for the development of a technical assign work. Development of requirements for graduate work. Projecting. Search and systematization of information.</li> <li>Projecting. Creating a model on the subject of a grade of conclusions. Prepare possible forms for present obtained results.</li> <li>Recommendations and analysis of reported errors compare, and identify strengths and weaknesses of Preparation of reports.</li> <li>Initial public presentation: topic, working hypoth expected results, thesis plan.</li> <li>Final presentation. Presentation of work carried out graduation qualification work</li> </ul> | arried out by the eng<br>terprise assigns the r<br>cialist or his deputy.<br>pic of practice.<br>roblematic situations<br>e work.<br>ment for a graduate<br>ork<br>on on the topic of gra<br>luate thesis.<br>ion qualification work<br>ting results. Explan<br>. Correction of def<br>f similar graduate q<br>hesis, relevance, re-<br>ut within the frame | gineering<br>responsit<br>for grad<br>qualifica<br>iduate w<br>rk, forma<br>nation of<br>ects. Sea<br>ualificat<br>search p<br>work of | g and<br>pility<br>luate<br>ation<br>ork.<br>ation<br>f the<br>arch,<br>ions.<br>plan,<br>pre- |
| Literature:                 | 1. Project Solving Basic Technique Third edition, Fujitsu Learning Med.<br>Tanenbaum. Computer Networks, Fourth Edition. Publisher; Prentice Hall,<br>Top-Down Approach: Computer Networking", 2017. Pearson Education Lim<br>networks". Tashkent.: "Alokachi" publishing house, 2013. Chapter 8. 394 pag<br>5. Miryusupov Z. Z., Djumanov J. Kh. Computer networks: a study gu<br>TATTOO T.: Alokachi, 2020 144 p.   | ia Ltd. – 2011, 2013. –62<br>2011. 3. James F. Kurose, J<br>hited 4. Musaev M.M. "Com<br>es Guide for higher educa<br>ide, named after Muhamm   | p. 2. And<br>Keith W. Ro<br>puter syster<br>tional institu<br>ad Al-Kho  | rew S.<br>oss "A<br>ns and<br>utions.<br>razmi.  |

| 6.28. Qualification Practice 2 (Pre-Graduation Work Practice) |   |                        |
|---|---|------------------------|
| Semestr:  | 8   |                        |
| Date of last<br>modification:                                 | 31.08.2023  |                        |
| Teachers:   | Allamuratova Zamira Jumamuratovna   |                        |
| Component:  | Compulsory  |                        |
| Cycle:  | Core  |                        |
| Credit point:   | 6   |                        |
| Pre-requisites  | Qualification Practice 1 (Practical Training)   |                        |
| Workload:   | Types of classes  | Hours                  |
|   | Total   | 180                    |
|   | Lecture   | -                      |
|   | Practical works   | -                      |
|   | SAW (Student autonomous work)   | 180                    |
|   | Final assessment method   | Practice Report        |
| Control format  | Prostice Deport   | ·                      |
| Eingl control   | The report is the individual work of the student in the for   | up of a non-out on the |
| Final control   | subject of the graduation qualification work.   | rm of a report on the  |
| Short content:  | In modern conditions, mastering the necessary skills and ex-<br>work in one's specialty and preparing for graduation work.  | xperience of practical |
| Goal:   | The goal of pre-graduation practice is comprehensive developrofessional activities of students in their fields.   | opment of all types of |
| Objective:  | The direct management of practice in enterprises is carried out by the engineering<br>and technical staff of these enterprises. The head of the enterprise assigns the<br>responsibility for the organization of the operation to the chief specialist or his deputy.   |                        |
| Learning<br>outcome:  | <ul> <li>After studying the discipline, students should be able to:</li> <li>LO 1. Understand the problematic topic in the field of computer engineering.</li> <li>LO 2. Search for information, critically analyze and synthesize, apply a systematic approach to solving given problems.</li> <li>LO 3. Development of proposals and recommendations aimed at the implementation of a problematic topic.</li> <li>LO 4. To be able to carry out social communication and fulfill one's role in the team, control technological process parameters, product quality and production control in the field of computer engineering.</li> </ul>  |                        |
| Teaching<br>methods:  | In the conditions of the credit system of education, classes are conducted mainly<br>in active and creative forms. Among the effective pedagogical methods and technologies<br>that promote active involvement of students in the search and management of knowledge,<br>the acquisition of experience in independent problem solving should be emphasized:<br>- technology of problem- and project-based learning;<br>- technologies of educational and research activities;<br>- communication technologies (discussion, press-conference, brainstorming, educational<br>debates and other active forms and methods);<br>- case-study method (analysis of situations);<br>- game technologies, in which students participate in business, role-playing, simulation<br>games;<br>- information and communication (including distance learning) technologies.<br>In order to develop critical thinking among students, such methods as "Prediction with<br>open questions", "Cluster", "Cross-discussion", "INSERT", "Fishbone" method, "I know,<br>I found out, I want to know" hands-on activities, gamification and others are actively used |                        |

| Assessment of the student's | Type of task   | Number of points<br>(max)   | Total  |  |
|-----------------------------|--|---|--|--|
| knowledge:                  | Complete and accurate completion of the task   | 0-50  |  |  |
|                             | Being able to demonstrate the ability to think<br>independently within the framework of pre-graduate<br>work practice  | 0-20  | 0-100  |  |
|                             | To answer the given questions clearly and succinctly   | 0-30  |  |  |
| Topics of<br>lectures:      | <ul> <li>The direct management of practice in enterprises is c<br/>technical staff of these enterprises. The head of the en-<br/>for the organization of the operation to the chief spect.</li> <li>Study of normative and technical literature on the top.</li> <li>Get technical safety instructions.</li> <li>Get the topics of the graduation thesis. Identifying privork. Forming a group.</li> <li>Determining the main goals and tasks of the graduat</li> <li>Standards for the development of a technical assign<br/>work. Development of requirements for graduate work.</li> <li>Projecting. Search and systematization of information.</li> <li>Projecting. Creating a model on the subject of a grad.</li> <li>Analysis of information, implementation of graduation of conclusions. Prepare possible forms for present obtained results.</li> <li>Recommendations and analysis of reported errors compare, and identify strengths and weaknesses of Preparation of reports.</li> <li>Initial public presentation: topic, working hypoth expected results, thesis plan.</li> <li>Final presentation. Presentation of work carried ou graduation qualification work</li> </ul> | arried out by the eng<br>terprise assigns the r<br>cialist or his deputy.<br>pic of practice.<br>roblematic situations<br>e work.<br>ment for a graduate<br>ork<br>on on the topic of gra<br>luate thesis.<br>on qualification wor<br>ting results. Explar<br>. Correction of def<br>f similar graduate q<br>hesis, relevance, re-<br>at within the frame | gineering<br>responsit<br>for grad<br>qualifica<br>aduate w<br>rk, forma<br>nation of<br>ects. Sea<br>ualificat<br>esearch | g and<br>pility<br>luate<br>ation<br>ork.<br>ation<br>f the<br>arch,<br>ions.<br>plan,<br>pre- |
| Literature:                 | 1. Project Solving Basic Technique Third edition, Fujitsu Learning Med Tanenbaum. Computer Networks, Fourth Edition. Publisher; Prentice Hall, Top-Down Approach: Computer Networking", 2017. Pearson Education Lim networks". Tashkent.: "Alokachi" publishing house, 2013. Chapter 8. 394 pag 5. Miryusupov Z. Z., Djumanov J. Kh. Computer networks: a study gu TATTOO T.: Alokachi, 2020 144 p.  | ia Ltd. – 2011, 2013. –62<br>2011. 3. James F. Kurose, J<br>ited 4. Musaev M.M. "Com<br>es Guide for higher educa<br>ide, named after Muhamm  | p. 2. And<br>Keith W. Ro<br>puter systen<br>tional institutional Al-Kho  | rew S.<br>oss "A<br>ns and<br>utions.<br>razmi.  |

| 6.29. Graduation qualification work |  |                                   |                     |        |
|-------------------------------------|--|-----------------------------------|---------------------|--------|
| Semestr:                            | 8  |                                   |                     |        |
| Date of last<br>modification:       | 31.08.2023   |                                   |                     |        |
| Teachers:                           | Allamuratova Zamira Jumamuratovna  |                                   |                     |        |
| Component:                          | Compulsory   |                                   |                     |        |
| Cycle:                              | Core   |                                   |                     |        |
| Credit point:                       | 14   |                                   |                     |        |
| Pre-requisites                      | _  |                                   |                     |        |
| Workload:                           | Types of classes   |                                   | Hours               |        |
|                                     | Total  |                                   | 420                 |        |
|                                     | Lecture  |                                   | -                   |        |
|                                     | Practical works  |                                   | -                   |        |
|                                     | SAW (Student autonomous work)  |                                   | 420                 |        |
|                                     | Form of final control  | State                             | Attestati           | on     |
| Control forms:                      | State Attestation  |                                   |                     |        |
| Final control:                      | The defense is conducted through a presentation of the given 10 minutes, followed by time for questions from   | completed work. The commission me | ne presen<br>mbers. | ter is |
| Short content:                      | This work aims to show the student's competence in analyzing, researching, and addressing complex issues within their field of study, reflecting their readiness for professional practice. Additionally, it serves to assess the student's proficiency in conducting independent research, critical thinking, and effective communication of their findings.  |                                   |                     |        |
| Goal:                               | The goal of the graduation qualification work is to demonstrate the student's ability to independently apply the knowledge and skills acquired during their studies to solve specific professional tasks.  |                                   |                     |        |
| Objective:                          | Applying Theoretical Knowledge: To apply the theoretical concepts and methodologies learned during the course of study to real-world problems within the student's field. Conducting Independent Research: To develop and implement a research plan, including data collection, analysis, and interpretation, demonstrating the student's ability to conduct independent research.   |                                   |                     |        |
| Learning<br>outcome:                | LO 1. Applying Theoretical Knowledge: To apply the theoretical concepts and<br>methodologies learned during the course of study to real-world problems within the<br>student's field.<br>LO 2. To develop and implement a research plan, including data collection, analysis, and<br>interpretation, demonstrating the student's ability to conduct independent research.<br>LO 3. To identify and analyze a specific problem or question relevant to the field,<br>proposing viable solutions or approaches.<br>LO 4. To enhance the student's ability to critically evaluate existing literature, theories,<br>and practices related to the chosen topic.<br>LO 5. To encourage the exploration of new ideas, techniques, or approaches within the<br>field, contributing to the advancement of knowledge or practice.<br>LO 6. To effectively communicate research findings and arguments in a clear, concise,<br>and well-structured manner, both in written and oral forms. |                                   |                     |        |
| Teaching<br>methods:                | -  |                                   |                     |        |
| Assessment of the student's         | Type of task   | Number of points<br>(max)         | Total               |        |
| knowledge:                          | Completeness of theoretical material   | 0-20                              | 0-100               |        |
|                                     | Implementation of the practical part of the project  | 0-30                              |                     |        |
|                                     | To answer the given questions clearly and succinctly   | 0-50                              |                     |        |

| Topics of<br>lectures: | <ul> <li>Choosing a topic: Selecting and agreeing on a thesis topic that should be relevant, significant, and aligned with the field of study.</li> <li>Creating a plan: Developing a detailed plan of the work, including the main sections and the order in which they will be completed. The plan is approved by the academic advisor.</li> </ul>  |
|------------------------|---|
|                        | - Literature review and analysis: Searching for and studying scientific sources, literature, and data related to the research topic. This stage involves analyzing previous studies and forming the theoretical foundation of the work.   |
|                        | - Conducting research: Developing and implementing the research methodology, collecting necessary data, conducting experiments, surveys, interviews, and other research procedures.   |
|                        | - Data analysis and processing: Processing the collected data using appropriate methods, analyzing them, and interpreting the results.  |
|                        | - Writing the thesis: Composing the theoretical and practical sections of the work, including the introduction, main sections, conclusion, and bibliography. The work must adhere to the formatting requirements set by the university.   |
|                        | - Editing and revisions: Reviewing the text to ensure it meets the requirements, correcting errors, and refining details. Editing the work based on feedback from the academic advisor  |
|                        | <ul> <li>Preparation for defense: Preparing a presentation, thesis summary, and speech for the defense of the thesis before the committee.</li> </ul>   |
|                        | - Thesis defense: Presenting and defending the thesis before the examination committee and answering questions from the committee members.  |
|                        | - Final submission: Making any necessary corrections based on the defense results, finalizing the thesis, and submitting it to the university archive.  |
| Literature:            | <ol> <li>Karimov, I. (2020). Methods of scientific research. Tashkent: National Encyclopedia of Uzbekistan. 2. Rahimov, B. (2019). Methodology of conducting scientific research works. Tashkent: Science and Technology. 3. Mirzaev, M. (2018). A guide to writing and defending graduate theses. Tashkent: Ministry of Higher and Secondary Special Education. 4. Bell, J., &amp; Waters, S. (2018). Doing Your Research Project: A Guide for First-time Researchers. McGraw-Hill Education. 5. Robson, C., &amp; McCartan, K. (2016). Real World Research. Wiley. 6. Resnik, D. B. (2020). The Ethics of Research with Human Subjects. Springer, 7. Jones, L. (2011). Academic Interrity: A Guide for Students. University of Oueensland Press.</li> </ol> |