MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION

TASHKENT UNIVERSITY OF INFORMATION TECHNOLOGIES

NAMED AFTER MUHAMMAD AL–KHWARIZMI

MODULE HANDBOOK

Educational Program

BA 60610600 – Software Engineering

Tashkent 2024

Table A – Curriculum of BA 60610600 – Software Engineering

1st semester	2nd semester	3rd semester	4th semester	5th semester	6th semester	7th semester	8th semester
PRG101 Programming 1 lectures 2/1 practical sessions 6 ECTS	PRG102 Programming 1 lectures 2/1 practical sessions 6 ECTS	DBM201 Database 2/1 lectures 1 practical sessions 6 ECTS	NWK201 Computer networks 2/1 lectures 1 practical sessions 6 ECTS	PMP301 Programming Methods and Paradigms 2/1 lectures 1 practical sessions 6 ECTS	SQA301 Software Quality Assurance 1 lectures 0/1 practical sessions 4 ECTS	DSS401 Design of Software Systems 2/1 lectures 1 practical sessions 6 ECTS	QPR402 Qualification Practice 2 6 ECTS
PHY101 Physics I 1 lectures 1 practical sessions and laboratory 6 ECTS	PHY102 Physics I 1 lectures 0/1 practical sessions and laboratory 4 ECTS	CSF201 Fundamentals of Cyber Security 2/1 lectures 1 practical sessions 6 ECTS	ISE201 Introduction to software engineering 2/1 lectures 1 practical sessions 6 ECTS	SOT301 Software Testing 2 lectures 1 practical sessions 8 ECTS	MAD301 Mobile Application Development 2/1 lectures 1 practical sessions 6 ECTS	*Elective Subject* ITS407/ITS408 2/1 lectures 1 practical sessions 6 ECTS	GQW403 Graduation Qualification Work 14 ECTS
MTH101 Calculus 2/1 lectures 1 practical sessions 6 ECTS	MTH102 Differential equations 1 lectures 0/1 practical sessions 4 ECTS	DSA201 Data structure and algorithms 2/1 lectures 1 practical sessions 6 ECTS	WAC201 Create web applications 2/1 lectures 1 practical sessions 6 ECTS	OPS301 Operating systems 2/1 lectures 1 practical sessions 6 ECTS	IDP301 Individual project 2/1 practical sessions 4 ECTS	*Elective Subject* ITS409/ITS410 2/1 lectures 1 practical sessions 6 ECTS	*Elective Subject* ITS415/ITS416 2/1 lectures 1 practical sessions 6 ECTS
HUM102 Religious studies 1 lectures 1 seminars 4 ECTS	MTH103 Discrete structures 1 lectures 0/1 practical sessions 4 ECTS	EAC201 Electronics and circuits 2/1 lectures 1 practical sessions 6 ECTS	MTH204 Probability and statistics 2/1 lectures 1 practical sessions 6 ECTS	*Elective Subject* ITS303/ITS304 2/1 lectures 1 practical sessions 6 ECTS	QPR301 Qualification Practice 1 6 ECTS	*Elective Subject* ITS411/ITS412 2/1 lectures 1 practical sessions 6 ECTS	*Elective Subject* ITS417/ITS418 1 lectures 0/1 practical sessions 4 ECTS
HUM103 Philosophy 1 lectures 1 seminars 4 ECTS	HUM101 The newest History of Uzbekistan 1 lectures 1 seminars 4 ECTS	CAO201 Computer organization 2/1 lectures 1 practical sessions 6 ECTS	*Elective Subject* ITS201/ITS202 2/1 lectures 1 practical sessions 6 ECTS	*Elective Subject* GEN301/GEN302 1 lectures 0/1 practical sessions 4 ECTS	*Elective Subject* GEN303/GEN304 1 lectures 0/1 practical sessions 4 ECTS	*Elective Subject* ITS413/ITS414 2/1 lectures 1 practical sessions 6 ECTS	
FRL101 Foreign language I 2/1 practical sessions 4 ECTS	FRL101 Foreign language II 2/1 practical sessions 4 ECTS				*Elective Subject* ITS305/ITS306 2/1 lectures 1 practical sessions 6 ECTS		
	AWR101 Academic writing 2/1 practical sessions 4 ECTS						
6 exams	7 exams	5 exams	5 exams	5 exams	4 exams, Course project Practice Report	5 exams	2 exams, Practice Report, State Attestation
30 ECTS	30 ECTS	30 ECTS	30 ECTS	30 ECTS	30 ECTS	30 ECTS	30 ECTS
TOTAL: 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 — General — Math and Science

Humanities — Fundamental — Core

Table B – Elective subjects for the Educational program BA 60610600 – Software Engineering

№	Code	1th subject	2nd subject
1.	ITS201/ITS202	Introduction to Computational Thinking and Programming	Introduction to Programming with Python
2.	GEN301/GEN302	Pedagogy. Psychology	Ecology
3.	GEN303/GEN304	Power supply of information communication systems	Life safety
4.	ITS303/ITS304	Construction of compilers	Software construction and evolution
5.	ITS305/ITS306	Introduction to game theory	Digital Image Processing
6.	ITS407/ITS408	Real time systems	Software architecture
7.	ITS409/ITS410	Pattern recognition	Data preprocessing technologies
8.	ITS411/ITS412	Programming in MATLAB	Optimization and development of web application
9.	ITS413/ITS414	System programming	SQL programming
10.	ITS415/ITS416	Intelligent and expert systems	Knowledge based systems
11.	ITS417/ITS418	Fundamentals of Action Research	Software requirements analysis

SYLLABUSES

1. Humanities

<table>
<tr><td colspan="2">1.1. The newest history of Uzbekistan</td></tr>
<tr><td>Semester:</td><td>2</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Babadjanov Khasan, Nodira Raxmanovna Mahkamova</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Secondary</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre-requisities</td><td>-</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Seminars</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>60</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid-term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Understanding the essence and content of the historical path traversed by the state during the years of independence, the significance of the changes that have occurred in the modern history of Uzbekistan</td></tr>
<tr><td>Goal:</td><td>reveal the essence and content of the fact that Uzbekistan is one of the regions that have made a great contribution to the development of world civilization, that the Uzbek people have a rich historical past and priceless cultural heritage, important changes in the Republic of Uzbekistan during the years of independence, to reveal the essence and content of fundamental reforms , as well as the study of the subject should contribute to students' awareness of their place in society, social lifestyle, self-awareness of young people, awareness of such concepts as personality, citizen.</td></tr>
<tr><td>Objective:</td><td>Make an excursion into the rich historical past, in particular into the history of Uzbek statehood, reveal the essence and content of the history of Uzbekistan at the end of the 20th – beginning of the 21st centuries, explain to students the difficult socio-political and economic situation that developed in Uzbekistan on the eve and in the first years of independence, reveal the essence of the state management, socio-economic, political reforms, transformations in the spiritual sphere, highlight the main directions of the foreign policy of the Republic of Uzbekistan during the years of independence, reveal the main essence of the Action Strategy and the Development Strategy of New Uzbekistan, educate students in the spirit of devotion and love for the Motherland, as well as form them national pride and spirit.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Know and understand the essence and content of the historical path traversed by the state during the years of independence, the significance of the changes that have occurred in the modern history of Uzbekistan
LO 2. From the standpoint of historicism and objectivity, understand such processes as the integration of Uzbekistan into the world community, ensuring security, interethnic harmony and interreligious tolerance, the place and increase in the authority of the Republic of Uzbekistan in international rankings and indices</td></tr>
</table>

<table>
<tr><td></td><td>LO 3. Have the skills to study the problems of the modern history of Uzbekistan, 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;
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.</td></tr>
<tr><td>Teaching methods:</td><td>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:
- technology of problem- and project-based learning;
- technologies of educational and research activities;
- communication technologies (discussion, press-conference, brainstorming, educational debates and other active forms and methods);
- case-study method (analysis of situations);
- game technologies, in which students participate in business, role-playing, simulation games;
- information and communication (including distance learning) technologies.
In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross-discussion", "INSERT", "Fishbone" method, "I know, I found out, I want to know" hands-on activities, gamification and others are actively used during practical classes.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Seminars</td><td>30</td><td rowspan="2">40</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Mid-term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction. Subject, goals and objectives of the academic discipline “Modern History of Uzbekistan”, its theoretical and methodological principles.
- Formation of Uzbek statehood and stages of its development.
- Socio-political processes in Uzbekistan on the eve of achieving independence.
- Historical significance of the formation of the independent Republic of Uzbekistan. A unique path of Uzbekistan to freedom and progress.
- Formation of the foundations of a democratic civil society in Uzbekistan, political reforms.
- Socio-economic changes in Uzbekistan during the years of independence.
- Spiritual and cultural progress in Uzbekistan during the years of independence.
- Republic of Karakalpakstan during the years of independence.
- Uzbekistan and the world community.
- From action strategy to development strategy.</td></tr>
<tr><td>Literature:</td><td>1. Action strategy on five priority areas of development of the Republic of Uzbekistan in 2017-2021. - Tashkent: Spirituality, 2017. 2. History of independent Uzbekistan. Responsible editor A. Sabirov. - Tashkent: Academy, 2013. 3. New history of Uzbekistan. Project manager and editor. M.A. Rakhimov. - Tashkent: Literary sparks, 2018. 4. The latest history of Uzbekistan. Editors: R.H. Murtazayeva, A.A. Ermetov, A.A. Odilov. - Tashkent, 2023. 5. "Development Strategy". Decree of the Republic of Uzbekistan No. PF-60 dated 28.01.2022.</td></tr>
</table>

<table>
<tr><td colspan="2">1.2. Religious studies</td></tr>
<tr><td>Semester:</td><td>1</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Kasimova Zumrad Sabirzhanovna</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Secondary</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>60</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Gives an idea of religion, helps students develop their worldview positions. By mastering this discipline, the student gains the skills to communicate with people of different ideological positions. Religious studies through its means contributes to the realization of freedom of conscience, that is, the choice of religion or free thought.</td></tr>
<tr><td>Goal:</td><td>Is to form theoretical knowledge about the content and essence of religion in the minds of students and youth, about the religious image of the world, about the relationship of religious and philosophical views, about the process of globalization and modern religious movements, about the formation of skills in the fight against the negative consequences of such concepts as religious fanaticism , extremism and terrorism, the struggle for the security of the state and society</td></tr>
<tr><td>Objective:</td><td>In accordance with the state educational standard of higher professional education are to form students’ ideas about: the subject and social functions of religion in their historical development; about the main historical types of religious worldviews; about the main directions of modern religion; about religious views on the crisis of modern civilization and ways out of it.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. The student will learn to demonstrate knowledge of the main stages of the historical development of religion, its main directions and the trends of its functioning in the modern world;
LO 2. Studying the history of the development of religious teachings, the formation of knowledge and the ability to distinguish the original content of religion from its false interpretations;
LO 3. The ability to determine the causes of extremism and terrorism, and a socio–philosophical analysis of its consequences;
LO 4. Formation of logical and critical thinking skills in relation to religious and secular processes;
LO 5. Prevention of religious fanaticism and application of acquired theoretical knowledge in practical life;
LO 6. Student will have the ability to form ideological immunity against various religious ideas, to express his free and fair attitude towards their evil intentions.
LO 7. Formation of students’ skills in using acquired knowledge in independent learning.</td></tr>
</table>

	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 methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations); – game technologies, in which students participate in business, role–playing, simulation games; – information and communication (including distance learning) technologies. In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross–discussion", "INSERT", "Fishbone" method, "I know, I found out, I want to know" hands–on activities, gamification and others are actively used during practical classes.
Assessment of the student's knowledge:	

Type of task		**Number of points (max)**		**Total**
Current control	Seminars	30	40	100
	Independent work	10		
Mid-term control	Written work	10		
Final control	Exam (Testing)	50		

Topics of lectures:	- The importance of religion as a phenomenon of social culture - National religions - Zoroastrianism - Buddhism - Christianity - Islam - Dogmatic directions and schools of Islamic religion - The role of the Hanafi madhhab in the history of Central Asia - Religious organizations operating in Uzbekistan - Modern religious movements and sects - Social danger of spreading religious beliefs - in cyberspace. - Political and social danger of missionary and proselytism - History and directions of religious fundamentalism, - radicalism and terrorism - The experience of the world community in the fight against extremism and - terrorism - The meaning of achieving the unity of secular knowledge and religious faith
Literature:	1. Muratov D., Alimova M., Karimov J. Religious studies, textbook. – Tashkent, "Navroz" publishing house, 2019. – 264 p. 2. Rakhimdzhanov D., Ernazarov O. Introduction to religious studies. Study guide. – T.: Publishing House "National Society of Philosophers of Uzbekistan", 2018. – 304 p. 3. Isoqjanov R. Comparative religious studies. Study guide. – T.: OOO "Complex print", 2020. – 198 p. 4. Kamilov D. Religious studies. Study guide. – T.: Lesson Press, 2021. –128 p.Methodological manual of "Religious Studies"./Sh. Alimova. – T. 2018. –140 p.

<table>
<tr><td colspan="2">1.3. Philosophy</td></tr>
<tr><td>Semester:</td><td>1</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Abdullayeva Ziyoda Nabiyevna</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Secondary</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>60</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Worldview and its historical forms, philosophical thoughts in the stages of development of Eastern and Western philosophical thinking, "Philosophy of Being", its philosophical analysis, philosophical understanding of the world, its problems, "Philosophy of Knowledge", forms and levels of knowledge, basic laws and categories of philosophy content, science of logic, its object of research, laws and forms of thinking, their structure and the foundations of its understanding, society, value, culture, human problem, moral categories, ideas about sophistication, globalization and global problems, etc. took place.</td></tr>
<tr><td>Goal:</td><td>It is to create a generalized system of students' worldview and show a person's place in it, to form a person's cognition, socio–political, ethical, aesthetic and other relations to the world, and to teach the skill of correct thinking in the process of logical reasoning.</td></tr>
<tr><td>Objective:</td><td>Is to equip young people with philosophical knowledge based on the achievements of modern science, and to develop self–awareness and correct thinking skills, skills and qualifications in them.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
students know the essence of philosophical knowledge, laws, and categories related to the development of nature, society, and human thinking; they can reveal the role and importance of a person in life by forming a personal attitude towards them;
They will have information about the characteristics and laws of philosophical thinking;
They study the leading ideas, scientific and spiritual heritage of Eastern and Western philosophy;
They should be able to understand the methodological importance of philosophy in professional activity, the role of analytical and synthetic, logical thinking in global processes;
They will have an idea about the essence of the reforms being carried out in Uzbekistan;
By studying philosophy, they should understand the essence of social and political processes in the life of society;
They should be able to evaluate socio–political processes from the point of view of philosophical and systematic thinking and should be able to collect, store and use information about the development of society;</td></tr>
</table>

<table>
<tr><td></td><td>Logical analysis of information, observes information related to his professional activity based on analytical and synthetic thinking and should make independent decisions based on observational thinking;
They should be able to independently acquire new knowledge, improve it and systematically organize their work on the basis of scientificity and creativity;
They should know how to express their thoughts and views in a constructive and logical manner based on the rules of the literary language orally and in writing.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross–discussion", "INSERT", "Fishbone" method, "I know, I found out, I want to know" hands–on activities, gamification and others are actively used during practical classes.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Seminars</td><td>30</td><td rowspan="2">40</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Mid-term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>MODULE 1. PHILOSOPHY AND LOGIC
- Philosophy and its role in society
- Stages of development of philosophical thinking: Eastern philosophy
- Stages of development of philosophical thinking: Western philosophy
- Being (ontology) and the philosophy of development
- Philosophy of knowledge (epistemology)
- Logic.
- Forms of thought: understanding, judgment and conclusion.
- Philosophy of society
- Philosophy of Man (Philosophical Anthropology)
- Philosophy of values (axiology)
MODULE 2. THE PHILOSOPHY OF MORALS AND ELEGANCE. CORRUPTION IS A GLOBAL PROBLEM TODAY
- Moral philosophy (Ethics)
- Philosophy of elegance (Aesthetics)
- Philosophy of globalization and sustainable development
- World experience of fight against corruption
- Anti–corruption policy of Uzbekistan</td></tr>
<tr><td>Literature:</td><td>1. Davronov Z., Shermuhamedova N, Kahharova M, Nurmatova M, Husanov B, Sultonova A. Philosophy. – Tashkent: TMU, 2019. 2. Madaeva Sh. Shermuhamedova N. and others. Philosophy is a study guide. – Tashkent: 2019. 3. Muhammadjonova L.A. Abdulla Sher, Shodimetova G. Moral philosophy. – Tashkent: Vneshinvestprom, 2023. Saifnazarov I. Mukhtorov A., Sultanov T., Usmanov F. Philosophy. Textbook. – T.: Innovative development publishing house – printing house, 2021.– 424 p. 4. Saifnazarov I.S., Abdullakhanova G.S., Ernazarov D.Z. Philosophy (Logic, Ethics, Aesthetics). Textbook for higher educational institutions. LAMBERT Academic Publishing RU. 2019. –134 pages. 5. Shermuhamedova N. Philosophy. – Tashkent: Idris Abdurauf Nashr, 2021. p. 667</td></tr>
</table>

2. Languages

<table>
<tr><td colspan="2">2.1. Foreign Language I (English Language)</td></tr>
<tr><td>Semester:</td><td>1</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Alimukhamedova Khabiba Rustamovna, Dospanova Dilara Urakbaevna</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Secondary</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Practical lessons</td><td>48</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>72</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>English course will encourage students to improve their general English and learn to use English language according to their specialty. Moreover, they will learn IT terms a strong grammar syllabus with the specialist vocabulary students need to succeed in their area and the course includes tasks that covers 4 skills (listening, reading, speaking and writing) of learning language. The course includes topics such as Jobs and professions, IT acronyms, Computer hardware and computer software, websites, website development, database basics, data storage and back up, E– commerce, transactions, Network, its types, network range and speed, software repair, hard ware repair, security solutions.</td></tr>
<tr><td>Goal:</td><td>The purpose of mastering the discipline is to give students systematized theoretical knowledge and practical skills in implementing English language in IT sphere.</td></tr>
<tr><td>Objective:</td><td>The course forms the knowledge and skills necessary to understand and express ICT–related knowledge in a foreign language.
This course prepares students to communicate in English in their future professional activities.
Expands vocabulary related to ICT and IT, in particular, develops listening comprehension, speaking, reading and writing skills.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. understand and use familiar everyday expressions and simple expressions;
LO 2. introduce himself and others, ask and answer questions about personal information such as address of residence, place of study and work, family, daily routine;
LO 3. provide information about computer hardware and software;
LO 4. know the lexicon of computer hardware and software;
LO 5. distinguish between word groups and parts of speech;
LO 6. make simple and complex sentences using present, past and future tenses;
LO 7. read a simple text and understand its content;</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;</td></tr>
</table>

<table>
<tr><td></td><td>– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical Assignments 1–2</td><td>20</td><td rowspan="2">50</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>30</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of practical lessons:</td><td>- Jobs and professions. Working in the IT industry. Meeting people: Introducing yourself and others
- Jobs in IT: Describing your job.
- Schedules: Describing your daily routine.
- Spelling: IT acronyms
- Computer systems. Computer hardware:
- Computer software:
- Working with computers.
- Computer usage: Understand computer usage.
- Websites. Website purpose
- Website analytics
- Website development
- The best websites
- Databases. Database basic: Understanding database product.
- Data Processing: Describing data processing steps.
- Data storage and back up
- E–commerce. E–commerce Companies
- E–commerce feature
- Transaction security: Talking about security. Networks.
- Network system Types of network
- Network range and speed
- IT support. Fault diagnosis: Understanding faults.
- Hardware repair: Using toolkits and making repairs.
- Security solutions: Describing security solutions.
- Reporting incidents: Reporting a security incident.</td></tr>
<tr><td>Literature:</td><td>Maja Olejniczak. “English for Information Technology” 1 Vocational English Course Book, Pearson, 2011.</td></tr>
</table>

<table>
<tr><th colspan="2">2.2. Foreign Language II (English Language)</th></tr>
<tr><td>Semester:</td><td>2</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Alimukhamedova Khabiba Rustamovna, Dospanova Dilara Urakbaevna</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Secondary</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>Foreign language I (English language)</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Practical lessons</td><td>48</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>72</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>English course will encourage students to improve their general English and learn to use English language according to their specialty. Moreover, they will learn IT terms a strong grammar syllabus with the specialist vocabulary students need to succeed in their area and the course includes tasks that covers 4 skills (listening, reading, speaking and writing) of learning language. The course includes topics such as working in the it industry, it systems. data communication, databases, internet, web design, software development, IT solutions.</td></tr>
<tr><td>Goal:</td><td>The purpose of mastering the discipline is to give students systematized theoretical knowledge and practical skills in implementing English language in IT sphere.</td></tr>
<tr><td>Objective:</td><td>The course forms the knowledge and skills necessary to understand and express ICT–related knowledge in a foreign language. This course prepares students to communicate in English in their future professional activities. Expands vocabulary related to ICT and IT, in particular, develops listening comprehension, speaking, reading and writing skills.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. understand and use familiar everyday expressions and simple expressions;
LO 2. introduce himself and others, ask and answer questions about personal information such as address of residence, place of study and work, family, daily routine;
LO 3. provide information about computer hardware and software;
LO 4. know the lexicon of computer hardware and software;
LO 5. distinguish between word groups and parts of speech;
LO 6. make simple and complex sentences using present, past and future tenses;
LO 7. read a simple text and understand its content;</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);</td></tr>
</table>

<table>
<tr><td></td><td>– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical Assignments 1–2</td><td>20</td><td rowspan="2">50</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>30</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of practical lessons:</td><td>- Working in IT. IT jobs and duties.
- IT organisations.
- IT workplace rules. Meetings
- IT systems. System specifications
- GUI operations. Multimedia hardware
- Operating systems
- Data communication .Internet browsing
- Networks
- Mobile computing. Email
- Administration.Spreadsheets and formulae
- Data base and system administration
- Peripherals
- Choice.Web hosting
- IT costs
- Product research. Making recommendations
- Interactions.Enterprise social media
- Video conferencing
- E–commerce. Training users
- Development. Requirements analysis
- Website design and architecture
- Software development.Project management.
- IT solutions.Investigations
- Diagnosis
- Solutions. Your future in IT.</td></tr>
<tr><td>Literature:</td><td>David Hill: “English for Information Technology” 2 Vocational English Course Book, Pearson 2012.</td></tr>
</table>

<table>
<tr><td colspan="2">2.3. Academic Writing</td></tr>
<tr><td>Semester:</td><td>2</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Medentseva Natalya Petrovna</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Secondary</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Practical works</td><td>48</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>72</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>The course provides mastery of the main features of the scientific style of speech, the study of the most common genres of oral and written academic discourse, both educational and scientific, the formation of skills in creating written and oral educational academic texts based on an idea of their goals, structure, stylistic features, genre differences , mastery of the basic principles of communication in an academic environment. During the course, the features of such genres will be discussed: abstract, abstract, review, special attention will be paid to learning how to write a text, based on the existing rules for creating a thematic text</td></tr>
<tr><td>Goal:</td><td>The purpose of teaching the subject “Academic writing “ is to apply specialist language knowledge – vocabulary and terms in students, correct and logical composition of sentences and texts, formation of speech etiquette and knowledge, skills and qualifications in the skills of eloquence, to prepare an educated, ingenious, oral and written literacy mature specialist in the specialty.</td></tr>
<tr><td>Objective:</td><td>– to introduce the features of academic genres (abstract, analytical review, etc.); – increase the level of scientific communication (written and oral); – to teach the rules of structuring texts for presentation purposes; – to learn the rules for using graphic organizers.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Possession of skills in writing, editing and processing various types of texts and information.
LO 2. Conducting a literature review on the topic.
LO 3. Abstracting scientific and popular science texts.
LO 4. Structuring presentations.
LO 5.Writing analytical texts of various genres.
LO 6.Transformation of information from one type to another (graphic, text, etc.)
LO7. Able to distinguish the structure and content of an academic text</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;</td></tr>
</table>

<table>
<tr><td></td><td>– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical Assignments 1–2</td><td>20</td><td rowspan="2">50</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>30</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Academic writing and information. Types of information.
- Text and its types. Text–forming means of communication.
- Principles of text rubrication. Plan. Types of plan.
- Abstract. Types of notes.Note–taking methods.
- Functional speech styles.
- Annotation. Annotation Types. Lexico–grammatical cliches for annotation.
- Essay. Types of essays.
- Abstract as a genre of secondary text. Types of abstracts. Structure and language clichés for abstracts.
- Scientific review and course work.Coursework structure
- Report. Structure of the report.
- Project. Project characteristics.
- Theses. Types of theses.
- Review. Types of reviews. Review structure.
- Presentation speech as a type of public speech. Presentation structure.
- Representation of facts, objects, processes and conclusions in scientific text.
- Creation of research text. Selecting a topic. Citation. Paraphrase.</td></tr>
<tr><td>Literature:</td><td>Literature 1. Korotkina I. B. Academic writing: process, product and practice Textbook for universities. Moscow: Yurayt, 2021 2. Kuvshinskaya Yu.M., Zevakhina N.A. , Akhapkina Ya.E., Gordienko E.I. Academic writing from research to text. Textbook and workshop for universities. Moscow: Yurayt 2022 3. Jerald Alred, Charles Brusaw, Walter Oliu. Hahdbook of technical writing. New York, Copyright 2003. 4. Stephen Bailey. Akademic writing. Handbook for international student`s. London, 2015 5. Beaufort A. College writing and beyond: A new framework for university writing instruction. Logan, Utah: Utah State University Press, 2007. 6. Irvin L. What Is “Academic” Writing? // http://wac.colostate.edu/books/ writingspaces1/irvin—what–is–academic–writing.</td></tr>
</table>

3. Math and Sciences

<table>
<tr><td colspan="2">3.1. Calculus</td></tr>
<tr><td>Semester:</td><td>1</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Chay Zoya Sergeevna</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Calculus is a branch of mathematics focused on the study of change and motion. It is divided into two main branches: differential calculus and integral calculus. Calculus is fundamental to many fields, including physics, engineering, economics, and biology, as it provides tools for modeling and analyzing dynamic systems.</td></tr>
<tr><td>Goal:</td><td>The purpose of studying calculus is to develop a deep understanding of how quantities change and accumulate, providing essential tools for solving problems in science, engineering, economics, and beyond. Calculus forms the foundation for advanced study in mathematics and its applications in other disciplines, allowing students to model and solve complex problems involving dynamic systems.</td></tr>
<tr><td>Objective:</td><td>To master the fundamental concepts of differential and integral calculus, including limits, derivatives, integrals, and their applications, for analyzing and understanding change and motion in various contexts.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Familiarization with the basic definitions and theorems of the subject “Calculus“
LO 2. The study of the basic concepts and methods of the subject “Calculus“
LO 3. Formation of problem–solving abilities based on theoretical knowledge.
LO 4. Ability to solve mathematical problems in the main sections of higher mathematics.
LO 5. The study of the basics of integral and differential calculus, complex numbers, functions of several variables, the theory of numerical and functional series, checking the convergence of a series, decomposition of functions into Taylor and Maclaurin series, Fourier series.
LO 6. Obtaining skills in calculating multiples, curvilinear and surface integrals.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);</td></tr>
</table>

<table>
<tr><td></td><td>– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical works (1–3)</td><td>25</td><td rowspan="2">37</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>12</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">13</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>-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 1st and 2nd are wonderful limits. The equivalence of infinitesimal functions. Comparison of infinitesimal functions.
-The continuity of the function. Classification of function breakpoints.
-The concept of a derivative 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.
-Integration of trigonometric functions.
-The concept of a definite integral. The mean value theorem. The Newton–Leibniz formula. Applications of a certain integral.
-Improper 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 continuity of the function of two variables. Partial derivatives.
-The complete differential of a function of many variables. Partial derivatives and differentials of higher orders.</td></tr>
<tr><td>Literature:</td><td>Literature. 1. Robert Adams., Christopher Essex., Calculus: A Complete Course 9th edition. Pearson 2018. 2. George Thomas., Joel Hass., Christopher Heil., Przemyslaw Bogacki., Maurice Weir., José Zuleta Estrugo., Calculus Early Transcendentals 15th edition. Pearson 2024. 3. James Stewart., Stephen Kokoska., Calculus: Concepts and Contexts 5th edition. Cengage Learning 2023.</td></tr>
</table>

<table>
<tr><td colspan="2">3.2. Physics I</td></tr>
<tr><td>Semester:</td><td>1</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Abdurakhmanov Kahar Pattakhovich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>40</td></tr>
<tr><td>Practical works</td><td>20</td></tr>
<tr><td>Laboratory</td><td>10</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>110</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>The content of basic physical phenomena and laws, the fundamental unity of the laws of physics, the importance of physical science in the development of technology, fundamental concepts, laws of physical science related to parts of mechanics, molecular physics, thermodynamics, electromagnetism, vibrations and waves are studied.</td></tr>
<tr><td>Goal:</td><td>Training and familiarization of students with physical processes and laws, their scientific foundations, physical concepts and competitors necessary for solving theoretical and practical engineering problems.</td></tr>
<tr><td>Objective:</td><td>– formation of a scientific approach and understanding of the world, theoretical knowledge, practical skills and physical processes; – learning to draw conclusions by analyzing the essence of physical laws; – train students to apply the acquired knowledge and skills in their professional activities.</td></tr>
<tr><td>Learning outcome:</td><td>As a result of mastering the subject, the student must:
• 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;
• 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;
• Have the ability to analyze physical processes and make decisions based on theoretical and practical knowledge obtained from physics in future professional activities.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);</td></tr>
</table>

<table>
<tr><td></td><td>– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works</td><td>15</td><td rowspan="3">41</td><td rowspan="5">100</td></tr>
<tr><td>Laboratory work</td><td>8</td></tr>
<tr><td>Independent work</td><td>18</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">9</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>– Subject of physics. Kinematics of translational and rotational motion of a material point.
– Dynamics of a material point.
– Rotational motion of a rigid body.
– Law of conservation of energy in mechanics
– Relativistic mechanics.
– Molecular physics
– Thermodynamics.
– Electrical interactions.
– Work of the electrostatic field during charge transfer
– Dielectrics and conductors in an electric field
– Electricity.
– A magnetic field. Biot–Savart–Laplace Law.
– Laws of Lorentz and Ampere. Hall effect.
– Magnetic properties of matter
– The phenomenon of electromagnetic induction.</td></tr>
<tr><td>Literature:</td><td>Literature 1. Q.P.Abdurakhmanov, V.S.Xamidov, N.A.Akhmedova. "PHYSICS" Textbook. Tashkent. 2018. 2. Physics: Principles with Applications 6th Edition by Douglas C. Giancoli , 2014. 3. I.I.Savelev. The course is general physics. Roof 1,2,3. Moscow, 2018. 4. Serway R.A., Jewett J.W. Physics for Scientists and Engineers with Modern Physics, 8ed., Brooks Cole, 2010.5. Kh.M.Kholmedov, B.Ibragimov, Kh.N.Karimov. Methodical guide for practical training in physics. "Mechanics" part 1. TUIT, 2020.6.A.S.Ganiyev, Kh.N.Bakhronov, I.O.Jumaniyazov. Methodical guide for practical training in physics. " Electromagnetism " part 3. TUIT, 2020.</td></tr>
</table>

<table>
<tr><td colspan="2">3.3. Physics II</td></tr>
<tr><td>Semester:</td><td>2</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Bakhronov Khayot Nurovich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>Physics I</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Lecture</td><td>20</td></tr>
<tr><td>Practical works</td><td>20</td></tr>
<tr><td>Laboratory</td><td>10</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>70</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Creation of a theoretical base in physics for future engineers, formation of a scientific approach and worldview in explaining theoretical knowledge, practical skills and physical processes, physics of vibrations and waves, optics, fundamentals of quantum mechanics, solid state physics, contact phenomena, atomic and nuclear physics.</td></tr>
<tr><td>Goal:</td><td>Training and familiarization of students with physical processes and laws, their scientific foundations, physical concepts and competitors necessary for solving theoretical and practical engineering problems.</td></tr>
<tr><td>Objective:</td><td>– formation of a scientific approach and understanding of the world, theoretical knowledge, practical skills and physical processes; – learning to draw conclusions by analyzing the essence of physical laws; – train students to apply the acquired knowledge and skills in their professional activities.</td></tr>
<tr><td>Learning outcome:</td><td>As a result of mastering the subject, the student must:
LO 1. 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;
LO 2. 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;
LO 3. Have the ability to analyze physical processes and make decisions based on theoretical and practical knowledge obtained from physics in future professional activities.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);</td></tr>
</table>

	– case–study method (analysis of situations); – game technologies, in which students participate in business, role–playing, simulation games; – information and communication (including distance learning) technologies. 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.

Assessment of the student's knowledge:

Type of task		Number of points (max)		Total
Current control	Practical works	15	41	100
	Laboratory work	8		
	Independent work	18		
Mid–term control	Written work	9		
Final control	Exam (Testing)	50		

Topics of lectures:

- Oscillatory movements.
- Damped and forced mechanical vibrations. Electromagnetic vibrations.
- Wave processes.
- Superposition of waves.
- Electromagnetic waves.
- Light emission
- Light diffraction
- Dispersion and polarization of light
- Quantum optics
- Linear spectra of atoms
- Solid state physics
- Proprietary semiconductors
- Impurity semiconductors
- Contact phenomena
- Physics of the atomic nucleus

Literature:

Literature 1. Q.P.Abdurakhmanov, V.S.Xamidov, N.A.Akhmedova. "PHYSICS" Textbook. Tashkent. 2018. 2. Physics: Principles with Applications 6th Edition by Douglas C. Giancoli , 2014. 3. I.I.Savelev. The course is general physics. Roof 1,2,3. Moscow, 2018. 4. Serway R.A., Jewett J.W. Physics for Scientists and Engineers with Modern Physics, 8ed., Brooks Cole, 2010.5. Abdurakhmanov K.P., Ochilova O., Tohirov U.H., Khaidarov K.B.. A methodological guide to practical classes in physics. Part 4. Harmonic vibrations, mechanical and electromagnetic vibrations, mechanical and electromagnetic waves. Tashkent, 2021.6. Imamov E., Rakhmatullayeva M., Mukhamedaminova L. and others, A methodological guide to practical classes in physics. Part 6. Solid state Physics. Atomic and nuclear physics. Tashkent, 2021.

<table>
<tr><th colspan="2">3.4. Differential Equations</th></tr>
<tr><td>Semester:</td><td>2</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Mamatov Abdugani Ermamatovich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>Calculus</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>18</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>72</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Differential equations course involves solving mathematical equations that describe the relationship between a function and its derivatives. They are essential in modeling various physical systems and phenomena, including physics, engineering, biology, and economics. There are two main types of differential equations: ordinary differential equations (ODEs), which involve functions of a single variable and their derivatives, and partial differential equations (PDEs), which involve functions of multiple variables and their partial derivatives.</td></tr>
<tr><td>Goal:</td><td>The purpose of studying differential equations is to equip students with the mathematical tools necessary to model, predict, and analyze the behavior of real–world systems that change over time. This knowledge is essential for understanding natural phenomena, designing engineering systems, and conducting scientific research.</td></tr>
<tr><td>Objective:</td><td>To understand and solve equations that describe the relationship between a function and its derivatives, enabling the modeling and analysis of dynamic systems in various fields such as physics, engineering, biology, and economics.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Familiarization with the basic definitions and theorems of the subject “Differential equations“
LO 2. Study of the basic concepts and methods of the subject “Differential equations“
LO 3. Obtaining skills in the application of mathematical concepts and studied methods of analysis.
LO 4. Ability to solve mathematical problems in the main sections of the differential equation.
LO 5. Obtaining skills for solving an ordinary first–order differential equation and higher–order differential equations of various types.
LO 6. Obtaining skills for solving differential equations and systems of linear differential equations by the Laplace transform method.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;</td></tr>
</table>

<table>
<tr><td></td><td>– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical works (1–3)</td><td>25</td><td rowspan="2">37</td><td rowspan="4">100</td></tr>
<tr><td>Independent work (1–2)</td><td>12</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">13</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to the subject. Differential equations with separable variables.
- Homogeneous and reducible to homogeneous differential equations. Application to applied tasks.
- Linear differential equations. Solution of linear differential equations by Lagrange and Bernoulli methods. Application to applied tasks.
- Bernoulli's equations.Equations in full differentials. Integrating multipliers.
- The differential equation is unresolved with respect to the derivative. The Lagrange and Clerault equations.
- Higher–order differential equations admitting a decrease in order.
- Linear differential equations of higher orders. Vronskian. Fundamental solutions. Basic theorems.
- Linear homogeneous differential equations with constant coefficients. The characteristic equation.
- Linear inhomogeneous differential equations with constant coefficients with a special right–hand side.
- Differential equations of the second order and their solution using the method of variation of arbitrary constants. The Ostrogradsky–Liouville formula.
- Approximate methods for solving differential equations (using mathematical packages).
- A system of differential equations. Methods of solutions.
- Original and image. Laplace transformations.
- Basic properties of the Laplace transform.
- Solving differential equations and systems of differential equations by the method of operational calculus.</td></tr>
<tr><td>Literature:</td><td>Literature 1. Khasanov Compiled A.B., An introduction to the theory of ordinary differential equations, Turan–Press 2019. 2.Yuzhov A.Q., Mirzakarimov E.M., Ordinary differential equations in the Maple system, Tashkent 2013. 3. Norbert Euler. A First Course in Ordinary Differential Equations.bookboon.com G. Black Mike, Mike Dunn, Programming Android with Kotlin, O'reilly Media, 2021.</td></tr>
</table>

<table>
<tr><th colspan="2">3.5. Probability and Statistics</th></tr>
<tr><td>Semester:</td><td>4</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Sadaddinova Sanobar Sabirovna, Islamova Odila Abduraimovna</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Differential Equations</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Probability and statistics course is branch of mathematics dealing with data, uncertainty, and the analysis of random phenomena. Probability theory provides a mathematical framework for quantifying the likelihood of events and understanding random processes. Statistics involves collecting, analyzing, interpreting, and presenting data. The course is essential foundamentally for students.</td></tr>
<tr><td>Goal:</td><td>The purpose of studying probability and statistics is to prepare students to handle data and uncertainty in scientific research, engineering, business, and everyday life. This subject provides the skills necessary to collect, analyze, and draw meaningful conclusions from data, enabling informed decision–making and effective problem–solving in a wide range of fields.</td></tr>
<tr><td>Objective:</td><td>To learn the principles of probability theory and statistical methods for analyzing, interpreting, and making decisions based on data, with an emphasis on understanding randomness and variability in various contexts.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Familiarization with the basic definitions and theorems of the subject “Probability and statistics “
LO 2. The study of the basic concepts and methods of the subject “Probability and statistics“
LO 3. Obtaining skills in the application of mathematical concepts and studied methods of analysis.
LO 4. Mastering the skills of representation and allocation of continuous and discrete models
LO 5. Information–related process analysis skills.
LO 6. Increases the giftedness of students, manifests the skills of logical and algorithmic thinking in students.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;</td></tr>
</table>

– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.

Assessment of the student's knowledge:

Type of task		Number of points (max)		Total
Current control	Practical works (1–3)	25	37	100
	Independent work (1–2)	12		
Mid–term control	Written work	13		
Final control	Exam (Testing)	50		

Topics of lectures:

- The subject and tasks of Probability and Statistics. Random events. The space of elementary events. Operations on events. Elements of combinatorics.
- Probability definitions. Statistical, classical, geometric definition of probability. Determination of probability when the space of elementary events is countable. Kolmogorov's axioms.
- Theorems of addition and multiplication of probabilities. Conditional probability. Theorems of addition of probabilities of joint and incompatible events. A complete group of events. Opposite events. The probability of occurrence of at least one event. Dependent and independent events. Theorems of multiplication of probabilities of dependent and independent events.
- Conditional probability. The formula of total probability. Probabilities of hypotheses (assumptions). The Bayes formula.
- A sequence of independent tests. Bernoulli's scheme. The Bernoulli formula. Poisson's theorem. Local and integral theorems of Moivre–Laplace. The most probable number of occurrences of an event in the Bernoulli scheme. Experience with multiple events in the Bernoulli scheme.
- Random variables. Types of random variables. Ways to set them.
- The main numerical characteristics of random variables. Mathematical expectation, variance, mean square deviation, initial and central moments of the kth order, mode, median.
- The most common distributions are of the discrete type. Bernoulli distribution. Binomial, geometric and Poisson distributions, negative binomial distribution, hypergeometric distribution.
- The most common distributions are of the continuous type. Uniform, exponential, and normal distributions. The law of three sigma. Asymmetry and excess. Chi square distribution.
- A system of two random variables. The law (matrix) of the probability distribution of a discrete two–dimensional random variable. The distribution function and its properties. The distribution density of a continuous two–dimensional random variable and its properties
- Numerical characteristics of a random vector. The coefficient of covariance. The correlation coefficient and its properties. Two–dimensional normal and uniform distributions.
- The law of large numbers. The central limit theorem. Chebyshev's inequality. The law of large numbers for a sequence of independent random variables. Chebyshev's theorem. Bernoulli's theorem. The central limit theorem for identically distributed random variables, Lyapunov's theorem, Laplace's theorem.

	- 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 - 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. - 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 σ^2 variance of the normal distribution.Determination of the sample size n. - 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. - 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 and Kolmogorov's agreement criterion - Correlation analysis. Tasks and types of correlation. The main tasks of correlation analysis. The linear correlation coefficient and its properties. - Regression analysis. The equation of paired regression. Types of regression. The least squares method. The average approximation error.. Coefficient of determination - Nonlinear regression equations. Multidimensional regression and correlation. Nonlinear regression equations. OLS for estimating the parameters of multidimensional regression. Regression equation at standardized scales. Average elasticity coefficients. - Analysis of variance. The problem statement and the essence of the analysis of variance. Models of univariate and multifactorial analysis of variance. Schemes of variance analysis.
Literature:	1. Robert Hogg., Elliot Tanis., Dale Zimmerman., Probability and Statistical Inference, 10th edition. Pearson 2019. 2. Pappu Kousalya., Probability, Statistics and Random Processes Pearson 2013. 3. Richard A., Johnson., Probability and Statistics for Engineers 9th edition (Global Edition). Pearson 2017. 4. Morris DeGroot ., Mark Schervish ., Instructor's Solutions, Manual for Probability and Statistics 4th edition. Pearson 2012. 5. Michael Akritas., Probability & Statistics with R for Engineers and Scientists Pearson 2016.

<table>
<tr><td colspan="2">3.6. Discrete Structures</td></tr>
<tr><td>Semester:</td><td>2</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Turgunov Abrorjon Makhamatsolievich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Discrete structures course will encourage you to understand an introduction to discrete structures, sets, subsets, basic operations on sets, ordered sets, Cartesian product of sets, binary relations and relation matrices, types of relations, basic rules of combinatory, permutations without repetition, permutations and placements, Boolean algebra, the concept of reasoning, Boolean functions, generality and accessibility quantifiers, the laws of logic, construction of the truth table of logical functions, methods for minimizing logical networks, Carnot cards, basic concepts of graph theory, Euler and Hamilton graphs, forest, trees, tree properties, oriented graph, adjacency matrix of a directed graph, route, chain, cycle in directed graphs, algorithms for finding the shortest path.</td></tr>
<tr><td>Goal:</td><td>The purpose of mastering the discipline is to give students theoretical knowledge and practical skills in learning Discrete structures.</td></tr>
<tr><td>Objective:</td><td>–understanding the fundamentals of Discrete structures; –studying sets, subsets, basic operations on sets, ordered sets, Cartesian product of sets, binary relations and relation matrices, types of relations; –developing practical skills in basic rules of combinatory, permutations without repetition, permutations and placements; –analyzing Boolean functions, generality and accessibility quantifiers, the laws of logic, construction of the truth table of logical functions, methods for minimizing logical networks, Carnot cards; –studying basic concepts of graph theory, Euler and Hamilton graphs, forest, trees, tree properties, oriented graph; –exploring modern trends adjacency matrix of a directed graph, route, chain, cycle in directed graphs, algorithms for finding the shortest path</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Understand fundamentals of Discrete structures.
LO 2. Understand the sets, subsets, basic operations on sets, ordered sets, Cartesian product of sets, binary relations and relation matrices, types of relations
LO 3. Possess skills in basic rules of combinatory, permutations without repetition, permutations and placements.
LO 4. Use boolean functions, generality and accessibility quantifiers, the laws of logic, construction of the truth table of logical functions, methods for minimizing logical networks, Carnot cards.</td></tr>
</table>

	LO 5. Use basic concepts of graph theory, Euler and Hamilton graphs, forest, trees, tree properties, oriented graph. LO 6. Perform configuration of matrix of a directed graph, route, chain, cycle in directed graphs, algorithms for finding the shortest path.
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations); – game technologies, in which students participate in business, role–playing, simulation games; – information and communication (including distance learning) technologies. 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.
Assessment of the student's knowledge:	

Type of task		**Number of points (max)**		**Total**
Current control	Practical assignment (PA1, PA2, PA3)	20	40	100
	Independent work	10		
	Personal assignment	10		
Mid–term control	Written work	10		
Final control	Exam (Testing)			

Topics of lectures:	- Introductions. Discrete structures and examples - Sets. Operation on sets. Subsets. - Sorted sets. Cartesian products. Properties of Cartesian products. - Relations. Binary relations and their matrix. Types of relations. Equivalent relations. - Mappings and functions. Originality, images and mapping in a limited set. - Combinatory. Basic rules of combinatory. Permutations, placement, combinations. - Boole's algebra. The concept of an utterance. Binary identities of propositional logic. - Boole's functions. Equivalence of formulas. Community and existence quantifiers. - The laws of logic. Building Truth Tables for Logic Functions. Normal forms. Maximum normal forms. Binary logic gates. Application of binary logic gates. - Analysis and synthesis problems in logical circuits. Logical networks. - Minimizing logical networks. Karnaugh map. Application of predicates as a mathematical model of feedback. - Basic concepts of graph theory. Methods for defining graphs. Adjacency and Incident Matrices. Graph isomorphism. - Routes, chains, cycles. Euler and Hamiltonian graphs. Planar graphs. - Euler's formulas for plane graphs. Homeomorphism. - Trees. Forest. Properties of trees. Spanning tree. Minimum spanning tree. Root tree. - Directed graph. Digraph. Adjacency matrix for the digraph. - Routes, chains, and loops for digraphs. Shortest Path Algorithms
Literature:	Literature 1. Mathematical logic and discrete mathematics. T.: "Teacher", Toraev Kh, 2003. 2. Discrete mathematics for programmers, Tekhnosphere, M., Haggarty R., 2003. 3. Discrete mathematics – M.: "Lan", Shevelev Yu.P., 2008. 4. Discrete Math. “Phoenix”, Aseev G.G., Abramov O.M., Sitnikov D.E., 2003 5. Discrete mathematics – Taganrog Radio Engineering University, Taganrog, Kulabukhov S.Yu., 2001. 6. Problems and exercises in discrete mathematics. M.: Nauka., Gavrilov G.P., Sapozhchenko A.A., 2005. 7. Discrete mathematics theory, problems, applications. – M. Erussalimsky Ya.M., 2002.

4. General

<table>
<tr><td colspan="2">4.1. Ecology</td></tr>
<tr><td>Semester:</td><td>5</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Saidova Gulchexra Alisherovna</td></tr>
<tr><td>Component:</td><td>Elective</td></tr>
<tr><td>Cycle:</td><td>Secondary</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>18</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>72</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>The main goal of environmental education is the formation of a conscious attitude to environmental problems among all segments of the population, including students of higher educational institutions.
The course "Ecology", taught in universities, should serve to form the scientific worldview of students and direct them to practical activities.</td></tr>
<tr><td>Goal:</td><td>Requirements for knowledge, skills and abilities of students in teaching this subject:
– 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:
– 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.</td></tr>
<tr><td>Objective:</td><td>Technical competence: understanding and applying the principles of rational environmental management, working with environmental legislation, modeling environmental situations; – Analytical competence: critical analysis and assessment of environmental systems, selection of the optimal resource saving strategy; – Communicative and collaborative competence: teamwork, effective communication and shared decision making in environmental projects.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Anow the basic patterns of functioning of living organisms, ecosystems at various levels of organization, the biosphere as a whole and their.
LO 2. Be able to analyze problems associated with anthropogenic (technogenic) impact on the environment.
LO 3. Have knowledge and skills in the field of environmental protection.
LO 4. Know the concepts, strategies and practical tasks of sustainable development in various countries and the Republic of Uzbekistan.</td></tr>
</table>

<table>
<tr><td></td><td>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.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–10)</td><td>20</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>12</td></tr>
<tr><td>Oral presentation</td><td>8</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Ecology course, goal, task, structure and history
- The doctrine of the biosphere
- Ecology of ecosystems
- Environmental factors and their classification
- Atmosphere and its protection
- Protection of water resources
- Preservation of the lithosphere
- Natural resources and their rational use
- Pollution of the environment with various wastes
- Problems of environmental protection in the Republic of Uzbekistan.
- Pollution of industrial cities and their impact on the environment
- Negative impact of the Aral Sea tragedy on the environment.
- Universal environmental problems. Regional environmental problems.
- The main directions of environmental safety. Environmental assessment.
- The sphere of communication and its impact on the environment. Environmental monitoring.</td></tr>
<tr><td>Literature:</td><td>1. Karimov I.A. Uzbekistan on the threshold of the 21st century: a threat to security. Conditions for stability and guarantees of development. Uzbekistan 1997. 2. Abirkulov K.N., Kurbonniezov R. Fundamentals of ecology. Urgench. UDU, 1999. 3. Rafikov A.A., Abirkulov K.N., Khodzhimatov A.N. Ecology, textbook–T. 2004. 4. Holliev I., Ikromov A. Ecology. Textbook.–T.2001. 5. Tokhtaev A.S. Ecology. Textbook.–T.1998. 6. Yormatova D.Yu. Industrial Ecology – T.2007. 7. Abirkulov K.N., Abdulkosimov A., Khamdamov Sh. Social ecology, textbook–T.2004.. 8. Nigmatov A. Ecological law of the Republic of Uzbekistan. Textbook–T.2004. 9. Environmental protection. Laws and rules. Justice 2002</td></tr>
</table>

<table>
<tr><td colspan="2">4.2. Life safety</td></tr>
<tr><td>Semester:</td><td>6</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Jumamuratov Bexzod Akramjonovich</td></tr>
<tr><td>Component:</td><td>Elective</td></tr>
<tr><td>Cycle:</td><td>Secondary</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of lessons</th><th>Hour</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical work</td><td>18</td></tr>
<tr><td>SAW (Student Autonomous Work)</td><td>72</td></tr>
<tr><td>Final control form</td><td>Exam</td></tr>
<tr><td>Final evaluation method</td><td>Test</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>This course consists of lectures, practical classes and independent work of students aimed at in–depth study of theoretical knowledge with the help of practical skills. Life safety is the creation of normal human life conditions, protection of him and the environment (production, environment, everyday life) from dangerous and harmful factors of a natural and man–made nature.</td></tr>
<tr><td>Goal:</td><td>The course "Life Safety" provides basic concepts and definitions in the production and performance of work in private life. Defines visual concepts in the field of electrical safety, fire safety, electromagnetic safety, and also provides the necessary basis for the application of various types of lighting and noise effects on the human body and the environment.</td></tr>
<tr><td>Objective:</td><td>Distinguish ergonomic features of workplaces (light, noise, vibration, microclimate).</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Have an idea of the harmful effects of radiation on the human body and the environment
LO 2. Distinguish types, means of fire safety systems, as well as classify buildings by fire hazard
LO 3. Distinguish between methods and means of human protection in emergency situations
LO 4. He will get an idea of the main directions of the labor legislation of the Republic of Uzbekistan, protection of employees, current benefits
LO 5. Learns about modern electrical safety systems and the mechanisms of the effect of electricity on the human body</td></tr>
<tr><td>Teaching methods:</td><td>In the conditions of the credit system of education, lessons are mainly conducted in active and creative forms. Among the effective pedagogical methods and technologies that help students actively participate in the search and management of knowledge, it is worth noting the acquisition of independent problem–solving experience:
– problem–based and project–based educational technology;
– educational and scientific activity technologies;
– communication technologies (discussion, press conference, brainstorming, educational debates and other active forms and methods);</td></tr>
</table>

<table>
<tr><td></td><td>– case–study method (situation analysis);
– game technologies in which students participate in business, role–playing, simulation games;
– information and communication (including distance education) technologies.
In order to develop critical thinking among students, methods such as "Prediction with open questions", "Cluster", "Mutual discussion", "Know–I–want–to–learn", "INSERT", practical exercises, etc. gamification and others are actively used during practical training.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–10)</td><td>20</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>–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.
- Negative impact of the production microclimate.</td></tr>
<tr><td>Literature:</td><td>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.</td></tr>
</table>

<table>
<tr><td colspan="2">4.3. Pedagogy. Psychology</td></tr>
<tr><td>Semester:</td><td>5</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Yusupova Zamira Zaripovna, Zakirova Madina Rinatovna</td></tr>
<tr><td>Component:</td><td>Elective</td></tr>
<tr><td>Cycle:</td><td>Secondary</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>120</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>18</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>72</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>This training course is an analysis of the tasks specified in paragraph 14 of the decision of the President of the Republic of Uzbekistan № – 4851 of October 6, 2020 and the analysis and training of reforms being introduced to bring the education system of the Republic of Uzbekistan to the level of world standards. focused on the study of advanced strategic practices.</td></tr>
<tr><td>Goal:</td><td>To be able to apply educational methods in the teaching of technical sciences and in–depth training of individual and psychological characteristics of a person.</td></tr>
<tr><td>Objective:</td><td>– 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 psychology. Motive as a driving force of the cognitive process, individual psychological characteristics of a person are scientifically explained. Purpose and strategy of engineering psychology. The tasks of engineering psychology are covered.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Students will get an idea of the scientific research works of thinkers in Central Asia and Europe.
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.
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.
LO 4. They study the character, abilities and temperament of an IT specialist.
LO 5. They can acquire the qualities of management and leadership in education and production.
LO 6. Students learn the operator's activities in the "Man–machine" system in the educational process.
LO 7. Information–psychological security studies the manifestations and sources of threats.</td></tr>
</table>

<table>
<tr><td>Teaching methods:</td><td>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:
– application of pedagogical technologies in the process of education;
– pedagogical scientific research methods;
– study of personality and psychological methods (questionnaire, interview, observation, experiment, laboratory, test and sociometric methods) ;
– case–study method (analysis of situations);
– through the methods of psychotraining, students try themselves as holders of various professions;
– information and communication (including distance learning) technologies.
In order to develop logical thinking among students, methods such as "Brainstorming", "Cluster", "Problematic education", "Know–I–want–to–learn", "INSERT", practical exercises, gamification and others are actively used during practical training.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–10)</td><td>20</td><td rowspan="3">40</td><td rowspan="5">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- History and theory of pedagogy.
- Person as an object and subject of education.
- Educational methodology and advanced pedagogical technologies.
- Psychology as a science. Tasks and research methods of psychology. Interrelationship and branches of psychology with other sciences.
- Cognitive processes. Activity and its types. The role of psychological knowledge in human activity. Motive and motivation. Motivation of social behavior. Conscious and unconscious motives.
- Individual psychological characteristics of a person (character, ability, temperament). Communication and its types. Psychology of interpersonal relations.
- Engineering psychology as a branch of labor psychology.
- Labor regime and its psychological essence. Quality of labor and psychotechnological issues of its provision.
- Subject of engineering psychology. Purpose and strategy of engineering psychology. Tasks of engineering psychology.
- Research methods and general features in engineering psychology. Psychological methods. Physiological methods. Mathematical methods. Imitation methods.
- Features of classification of "man–machine" system. Operator in the "man–machine" system.
- Human–Machine Collaboration. Sensorimotor requirements in work.
- Psychological information security and social development.
- Manifestations and sources of threats to the information and psychological security of the individual, society and the state.
- Psychological self–protection of a person in the conditions of open mass information systems.</td></tr>
<tr><td>Literature:</td><td>1. B.M. Umarov. Psychology. Textbook – T., 2012. 2. F. Mominov, Sh. Barotov and others. Information psychological security in open information systems. Textbook. – T.: "Science and technology", 2013. 3. S.K. Ganiyev, M.M. Karimov, K.A. Tashev. Information security. Textbook, Tashkent–2017.4. T.A. Fugelova. Engineering psychology. Textbook, 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, Tashkent–2024.</td></tr>
</table>

4.4. Power Supply for Infocommunication Systems	
Semester:	6
Date of last 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 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 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:	The development of students' collaborative critical thinking in the context of power supply of infocommunication systems is ensured through the analysis of electrical power systems and the study of power equipment, which allows students to apply theoretical knowledge to analyze and optimize complex systems, identifying and solving technical problems in practice. Creative design of innovative energy solutions aimed at developing efficient and reliable energy systems and devices requires students to be able to apply engineering and design knowledge to create technically sound and innovative solutions.
Goal:	The acquisition of creative, design and engineering experience by students is achieved through practical work with power equipment, as well as analysis of technical documentation, which contributes to the deepening of their technical competencies and the development of professional skills necessary for effective work in the field of power supply of infocommunication systems.
Objective:	– Technical competence: understanding and application of electrical power systems principles, working with technical documentation and modeling programs; – Analytical Competence: critical analysis and assessment of electrical power systems, selection of optimal technical solutions; – Communicative and collaborative competence: teamwork, effective communication and shared decision making in electrical projects.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Analyze and evaluate the parameters of power supply of infocommunication facilities. LO 2. Design power supply system is taking into account the requirements of reliability and energy efficiency. LO 3. Use and interpret technical documentation and electrical standards. LO 4. Apply methods and technologies to reduce electricity losses in infocommunication systems. LO 5. Develop and implement solutions for integrating renewable energy sources into power supply systems. LO 6. Manage relay protection and automation systems for electrical power systems..

<table>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–10)</td><td>20</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Organization of power supply in information and communication systems.
- Quantities and parameters characterizing electrical energy. Units. Basic laws. DC and AC power supply systems.
- Primary and secondary sources of power supply. Renewable and non–renewable energy sources.
- Solar energy. Information about solar energy. Types of solar devices. Solar collectors
- Analysis of the development of wind energy devices. Environmental aspect.
- Mechanisms and forms of organization and management of processes in electrical stations and substations of power supply systems of infocommunication facilities.
- The role of devices for transmitting and distributing electrical energy of infocommunication objects.
- Transformation and distribution of electrical energy. Essential elements. Single and three–phase transformers, structure and principle of their operation.
- Rectifiers and converters for power supply of infocommunication facilities.
- Uninterrupted power supply.
- Devices for controlling energy efficiency and resource efficiency in information and communication systems.
- Relay protection and automation of electrical power systems
- Methods and devices for reducing electrical energy losses at facilities and infocommunication devices.
- Accounting and control of production and consumption of electrical energy in infocommunication systems. ASKUE system.
- Climate control devices for infocommunication systems. Security of service and power supply</td></tr>
<tr><td>Literature:</td><td>1. The Essential Guide to Power Supplies. Edited by Gary Bocock. Publisher: XP Power; First Edition (January 1, 2014). Language: English. Paperback: 156 pages. ISBN–10: 1634433432. ISBN–13: 978–1634433433. 2. Paul Scherz, Simon Monk. Practical Electronics for Inventors. Third Edition. p 1120. Copyright © 2013 by The McGraw–Hill Companies. ISBN: 978–0–07–177134–4. MHID: 0–07–177134–4. 3. David Cook. Robot Building for Beginners, Third Edition. Copyright © 2015 by David Cook. ISBN–13 (pbk): 978–1–4842–1360–5. ISBN–13 (electronic): 978–1–4842–1359–9. 4. Batteries in a Portable World – A Handbook on Rechargeable Batteries for Non–Engineers" Isidor Buchmann. Cadex Electronics Inc.; 4th edition (2016). ISBN–10: 0968211844, ISBN–13: 978–0968211847.</td></tr>
</table>

5. Fundamental

<table>
<tr><td colspan="2">5.1. Programming I</td></tr>
<tr><td>Semester:</td><td>1</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Shobdarov Elbek Bekkadir uli</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Calculus</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>42</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Testing</td></tr>
<tr><td>Final assessment method</td><td>Exam</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>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.</td></tr>
<tr><td>Goal:</td><td>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 environments and their application in practice.</td></tr>
<tr><td>Objective:</td><td>– 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.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Understand and use basic programming concepts, linear, branching and iterative structures, functions and properties of arrays, files and strings.
LO 2. Will have the ability to critically analyze and evaluate the achievements of modern science, solve research and practical problems, including creating new ideas in interdisciplinary fields.
LO 3. Must have the skills to develop a software product with a user–friendly interface based on a functional and object–oriented approach to programming using modern syntax of programming languages to solve specific problems.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);</td></tr>
</table>

	– game technologies, in which students participate in business, role–playing, simulation games; – information and communication (including distance learning) technologies. 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.
Assessment of the student's knowledge:	

Type of task		**Number of points (max)**		**Total**
Current control	Practical works (1-10)	30	40	100
	Independent work	10		
Mid–term control	Written work	10		
Final control	Exam (Testing)	50		

Topics of lectures:	-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). -String standard functions and manipulation of strings using them. -Strings and extended characters (in the String category). String standard functions and manipulation of strings using them. -Working with files. Files and streams. Text files, binary files. Special functions for working with files. -Fundamentals of object–oriented programming. Class and object concepts. Constructors. -An array of objects. Relationships between classes. -Encapsulation and inheritance. Management of appeal to members of the basic class. -Polymorphism. Virtual function. Abstract class.
Literature:	1. Mo‘minov B.B. Programming 1. Textbook. – T.: “Nihol print”, 2021. – 280 b. 2. Mo‘minov B.B. Programming 2. Textbook. – T.: “Nihol print”, 2021. – 604 b. 3. Nazirov Sh.A., Qobulov R.V., Bobojanov M.R., Raxmanov Q.S. Language C and C++. – T.: “Successor– publishing house” LLC, 2013. – 488 p. 4. Abdullayeva Z. Sh., Ishniyazov O.O. Programming I and Programming II tutorial, 2022,141 p. 5. Xaydarova M.Y., Mallayev O.U., Abdullayeva Z.SH., Sattarov A. B. Methodological manual for performing laboratory work on the subject “Programming in C++ (1 part) TUIT, Tashkent 2017. 145 p.

<table>
<tr><td colspan="2">5.2. Programming II</td></tr>
<tr><td>Semester:</td><td>2</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Ishniyazov Odil Olimovich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Programming I</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>42</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Testing</td></tr>
<tr><td>Final assessment method</td><td>Exam</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>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.</td></tr>
<tr><td>Goal:</td><td>The purpose of teaching the subject is to teach students the concept of object–oriented programming principles of programming languages and the advanced capabilities of programming languages, user interface capabilities in a modern programming environment, and the ability to solve practical problems related to various fields.</td></tr>
<tr><td>Objective:</td><td>The task of science is to accept technological innovations for student programmers, acquire theoretical knowledge, practical skills, a methodological approach to events and processes related to various fields, as well as form a scientific worldview, solve issues of technical knowledge using modern programming. languages and apply their methods in their professional activities.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Knowledge of concepts of classes and objects, containers, encapsulation, inheritance, polymorphism, abstract concepts, features of programming in a GUI environment and can use them.
LO 2. will have the ability to critically analyze and evaluate the achievements of modern science, solve research and practical problems, including creating new ideas in interdisciplinary fields.
LO 3. Must have the skills to analyze small projects used in industry and develop user–friendly software products based on simple and optimal solutions to complex problems.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);</td></tr>
</table>

<table>
<tr><td></td><td>– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical works (1-10)</td><td>30</td><td rowspan="2">40</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- 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. Components for drawing straight lines and various geometric figures.
- 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.
- User interface in GUI environment. Work with small projects</td></tr>
<tr><td>Literature:</td><td>1. Mo‘minov B.B. Programming 1. Textbook. – T.: “Nihol print”, 2021. – 280 b. 2. Mo‘minov B.B. Programming 2. Textbook. – T.: “Nihol print”, 2021. – 604 b. 3. Nazirov Sh.A., Qobulov R.V., Bobojanov M.R., Raxmanov Q.S. Language C and C++. – T.: “Successor– publishing house” LLC, 2013. – 488 p. 4. Horton I.–Beginning Visual C++ 2012/ I.Horton. Published simultaneously in Canada.–2016. –P. 988. 5. Mallayev O.U., Qurbonov N.M., Xaydarova M.Yu. Creating small projects in Visual C++ // “Communicator”. UzRO and OMTV, 2019, 224 p. 6. Bjarne Stroustrup. Programming: Principles and Practice Using C++ (2nd Edition). Person Education, Inc. 2014. second printing, January 2015. 7. J.Axmadaliev, R.Xoldorboev Methodical guide to learning C++ programming language (2015).</td></tr>
</table>

5.3. Database	
Semester:	3
Date of last modification:	31.08.2023
Teachers:	Kuvnakov Avaz Ergashevich
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 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 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:	Database course will encourage you to understand topics related to the engineering and design of database systems, including: data models; database and schema design; schema normalization and integrity constraints; query processing; query optimization and cost estimation; transactions; recovery; distributed, parallel, NoSQL and heterogeneous databases; triggers, functions and procedures; integrate high–level programming languages and databases and creating interfaces; obtain knowledge and skills in database troubleshooting, transaction management, database administration and security.
Goal:	The goal of the Database course is to provide a thorough understanding of database systems' design and engineering.
Objective:	The objective of the Database course is to develop the ability to design, implement, and manage efficient and secure database systems. Participants will gain practical skills in data modeling, schema design, SQL querying, and database optimization. The course aims to provide hands–on experience with transaction management, recovery techniques, and the use of distributed and parallel databases. Additionally, learners will integrate high–level programming languages with databases, create user interfaces, and troubleshoot database issues effectively.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Understand databases and have knowledge about creating and managing databases. LO 2. Identifying the purpose of the database, know concept of database and creation processes. LO 3. Development of relational databases and development of logical and physical data models for database management systems. LO 4. Demonstrate an understanding of the database model and the relational model. LO 5. Develop conceptual and logical data models and develop a database based on these models. LO 6. Apply knowledge of database normalization and evaluation. LO 7. Write all types of queries using SQL and use high level languages to create queries in database. LO 8. Creating functions, triggers and indexes in SQL. LO 9. Develop skills in database troubleshooting, transaction management, database administration and security.

<table>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical works (1-10)</td><td>30</td><td rowspan="2">40</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to Databases, purpose and basic concepts. Installing and configuring database systems (MySQL Server, Oracle Server, Microsoft SQL Server).
- Architecture of databases and three–tier architecture.
- Database models and entity–relationship model. Database design, creating entity–relationship diagrams. Designing relational databases.
- Relational model and relationships in databases. Creating, updating, and deleting tables in SQL.
- Relational algebra and relational calculus elements. Selecting data and performing operations on them using logical operators like AND, OR, NOR.
- Designing, modeling, and administering databases. Sorting data using the WHERE clause in SQL.
- Normalization of databases and 1NF, 2NF, 3NF, and Boyce–Codd normal forms. Creating queries using GROUP BY and ORDER BY clauses. Creating queries using HAVING clause.
- Writing SQL queries and SQL operators. Using UNION, INTERSECT, and MINUS standard commands.
- Creating simple and complex queries for data manipulation. Working with multiple tables using JOINS.
- Describing data using SQL. Creating queries using standard functions.
- Processes and standard functions in SQL. Using aggregate functions.
- Transaction management. Creating complex queries.
- Distributed databases and data processing. Creating INDEX in SQL.
- Distributed databases and the Internet. Creating and using VIEWS.
- Database administration and security. Creating functions in SQL. Creating triggers in SQL.
- Using ODBC and various software for database access. Creating a simple interface using programming languages and database.
- XML and databases.</td></tr>
<tr><td>Literature:</td><td>Literature 1. Fundamentals of Database Systems Elmasri, R., S. B. Navathe: (5th Ed.)// Addison Wesley, 2015. 2. A Guide to Modern Databases and the NoSQL Movement. Eric Redmond, Jim R. Wilson. USA, 2015. 3. Fundamentals of database systems sixth edition. Ramez Elmasri. Department of Computer Science and Engineering The University of Texas at Arlington. 2011. 4. Database. T.A. Khojakulov. Textbook. T.: TATU, 2022. 5. Database Practice, Methodical instruction. Kuvnakov A.E., Djurayev T.B. Malikova N.T. TATU. 2023.</td></tr>
</table>

<table>
<tr><th colspan="2">5.4. Fundamentals of Cybersecurity</th></tr>
<tr><td>Semester:</td><td>3</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Akhmedova Nozima Farkhod kizi, Khamidov Sherzod Jaloliddin ugli</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>The Cybersecurity fundamentals course introduces students to the fundamentals of cyber security, fundamentals of cryptography, access control, network and computer security, information security threats and effective methods and tools to combat them. The course helps students understand the importance of the process of management and administration in the context of information security, social issues such as personal confidentiality, social engineering problems, cyber ethics, human security, etc.</td></tr>
<tr><td>Goal:</td><td>The purpose of mastering the discipline is to provide students with with knowledge, skills and competence in solving issues related to cyber security of information systems and information resources in professional activities..</td></tr>
<tr><td>Objective:</td><td>Have an idea about the legal, organizational and technical aspects of information security, the principles of information security; Perform simple “tie–butterfly” and rejection tree analysis methods; Possess skills in using threat analysis and prevention tools;</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO.1 Describe the basic concepts of cyber security;
LO.2 Explain the international, national and departmental regulatory framework in the field of cyber security;
LO.3 Demonstrate an understanding of confidentiality, integrity, and usability;
LO.4 Explain the main types of threats to cyber security and the methods and methods of combating them;
LO.5 Analysis of methods of violation of confidentiality, integrity and usability of information;
LO.6 To have the skills to use information protection methods and tools;
LO.7 Implementation of cryptography, access control, network and computer security.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;</td></tr>
</table>

<table>
<tr><td></td><td>– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–10)</td><td>20</td><td rowspan="3">40</td><td rowspan="5">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction, cybercrime, cyber law and cybersecurity.
- Human security, architecture, strategy and policy of cybersecurity.
- Basic concepts of cryptography and it’s history.
- Symmetric cryptosystems, Asymmetric cryptosystems.
- Data Integrity Methods, Disk and file encryption. Methods of secure deletion of data.
- Identification and authentication tools, Logical access control to the data.
- Physical data protection, computer networks and network security issues.
- Network security tools, Wireless network security.
- Risk management, the concept of accessibility. Backup, restore and event logging.
- Software security issues, computer viruses and problems of protection from viruses.
- Account protection, protection against social engineering.
- Learn how to assess risks in cyber security.
- Learning how classic encryption algorithms work, how to encrypt data using the TrueCrypt program.
- Learn how to install and configure a password–based authentication mechanism in an operating system (Windows OS), conduct a reconnaissance attack.
- Building network security using the Network Screen tool, a secure Wi–Fi wireless network.
- Learning to restore data using special software tools, Installing virus protection on personal computers.
- Learn how to manage password usage, how to collect data from social networks.</td></tr>
<tr><td>Literature:</td><td>1. S.K. Ganiyev, A.A. Ganiyev, Z.T. Xudoyqulov. Cybersecurity Fundamentals: methodical handbook, –T.: “Nihol print” OK, 2021. – 224 p. (Uz.) 2. S.K. Ganiyev, Z.T. Xudoyqulov, N.B. Nasrullayev. Cybersecurity Fundamentals: methodical handbook, –T.: «Mahalla va oila nashriyoti», 2021. –240 p. (Ru.) 3. S.K. Ganiyev, M.M. Karimov, K.A. Tashev. Information security. –T.: “FAN va texnologiya”, 2016, 372 p. (Uz.) 4. M.Stamp. Information security. Principles and Practice. Second Edition. ISBN 978–0–470–62639–9. 2011. 5. Shangin V.F. “Integrated information protection in corporate systems”, Tutorial. M.: FORUM – INFRA–M. 2019. 591 p. (Ru.)</td></tr>
</table>

5.5. Data Structures and Algorithms	
Semester:	3
Date of last modification:	31.08.2023
Teachers:	Buriev Yusuf Absamat ugli, 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 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 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:	Data Structures and Algorithms course is a fundamental subject in computer science that focuses on the study of organizing and manipulating data efficiently. Data structures are the way data is organized and stored in a computer's memory, while algorithms are the step–by–step instructions for solving a specific problem.
Goal:	The purpose of "Data Structures and Algorithms" course is to provide a solid foundation in organizing, storing, and manipulating data efficiently in computer programs.
Objective:	–Understanding the fundamental data structures and their properties to effectively store and organize data;–learning various algorithms for searching, sorting, and manipulating data to solve real–world problems;–analyzing the performance of algorithms and data structures to make informed choices for optimizing code efficiency;–developing problem–solving skills by applying data structures and algorithms to solve complex computational problems;–enhancing software development capabilities by writing efficient and scalable code that can handle large datasets and perform tasks quickly.
Learning outcome:	After studying the discipline, students should be able to: LO 1. To be able to use data types correctly, to acquire the skills of using the technology of their creation. LO 2. Understand and apply properties of linear data structures. LO 3. Understand and apply the properties of static data structures. LO 4. Get an idea of List" type data structures. Ability to implement lists statically and dynamically. LO 5. To have an idea about the characteristics of dynamic data structures, to be able to use them LO 6. Be able to explain and apply the properties of non–linear data structure.
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities;

<table>
<tr><td></td><td>– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical works (1–6)</td><td>24</td><td rowspan="2">34</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">16</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Data types and algorithms. Abstract structures of information. Development and analysis of algorithms. Data and stages of their expression. Data structure classification.
- Overview of data structures. Configured data types: arrays, vectors, records, collections, and pointer types.
- Recursion and its application in programming. Recursive algorithms, their analysis. Examples of recursion.
- Data search algorithms. The concept of search and its function. Linear search. Binary search. Efficiency and optimization of search methods.
- Data sorting algorithms. The concept of sorting and its function. Strict sorting methods.
- Linear data structures. Linear containers. Iterators and their types
- Linearly linked lists. Understanding Linked Lists. Logical representation of linearly linked lists
- Stack, Queue and Dec. Represent stack, queue, and declaration using a linearly linked list.
- Priority queues. Dictionaries and their implementation
- Tree data structures. Definitions and properties of tree data structures. Classification of trees. Tree view.
- Binary search tree. Algorithms for adding elements, deleting elements and searching in a binary search tree.
- Balanced Binary Trees. Balancing algorithms: general and specific balancing algorithms. AVL tree.
- Binary trees in heap tree form. Description of heap tree structure. Heap tree execution algorithms. Heap training methods and efficiency
- Algorithms for working with graphs. Graph representation methods: joint matrix and relationship matrix. Adjacency list and arc list
- Graph visualization algorithms. Breadth first search (BFS) algorithm. Depth–first search (DFS) algorithm</td></tr>
<tr><td>Literature:</td><td>Literature 1. Shukla, Rajesh K. Data Structures Using C and C++ : monograph – New Delhi : Wiley India, 2012. – 502 p. [45 ex.] 2. Kruse, Robert L. Data Structures and Program Design in C : monograph. – New Delhi: Dorling Kindersley (India) Pvt. Ltd., 2012. – 607 p. [25 ex.]3. Wirth, Niklaus. Algorithm and structure dannyx. Textbook – 2nd ed., ispr. – M.: DMK Press, 2012. – 272 p. [1 ex.]</td></tr>
</table>

<table>
<tr><td colspan="2">5.6. Electronics and Circuits</td></tr>
<tr><td>Semester:</td><td>3</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Saidov Kamoladdin Nuraddinovich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Physics II</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>The theoretical concepts of the course are mainly learned through exercises and labs of increasing complexity to achieve all the concepts covered. Circuits and Electronics Science consists of Circuit Theory and Basic Topics of Electronics, which are the basic concepts that an ICT major should be familiar with.</td></tr>
<tr><td>Goal:</td><td>Gaining a thorough understanding of the subject will enable students to construct circuits and electronics with systematic academic knowledge and circuit theory and fundamental electronic topics make up practical abilities.</td></tr>
<tr><td>Objective:</td><td>Learning the principles of electronics and semiconductors; studying the foundational subjects of electronics; gaining hands–on experience with circuit and electronics theory; assessing and maximizing ICT performance; and investigating current integrated circuit trends and technologies.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO1. The relationship between an electric current and voltage in passive elements to determine and learning.
LO2. Measuring instruments to learning and use various generators.
LO3. Learns to calculate currents and voltages in passive and active elements in an electric circuit.
LO4. The number of equations needed to analyze and learns to determine the topology of an electrical circuit and determine the minimum.
LO5. Learn to find ways to analyze an electrical circuit.
LO6. An explores the relationship between mathematical terms and understanding the first– and second–order circuit`s.
LO7. Learns transient and steady–state electronic analysis of the Laplace transform.
LO8. Learns to simulate system state in transient and steady state.
LO9. We know how to connect semiconductor devices in electric circuits and how to use them depending on their function.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;</td></tr>
</table>

<table>
<tr><td></td><td>– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–10)</td><td>25</td><td rowspan="3">40</td><td rowspan="5">100</td></tr>
<tr><td>Independent work</td><td>7</td></tr>
<tr><td>Oral presentation</td><td>8</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to Electronics and Circuits 1. The purpose and tasks of science;
- Electronic circuit simulators.
- An analysis of direct current and electric circuits;
- Calculating electric circuits and direct current;
- The main quantities of sinusoidal current and characterizing it;
- Characteristics of electrical circuits under the influence of a sinusoidal signal;
- Mutual induction circuits;
- Quadrupoles and filters;
- Transient processes in the electric circuit;
- The device operation of semiconductor and physical foundations;
- Contact phenomena in semiconductors;
- Semiconductor diodes;
- Bipolar transistors;
- Multilayer semiconductor devices;
- Field transistors (FT);</td></tr>
<tr><td>Literatures:</td><td>1. A.A. Tulyaganov, S.S. Parsiev, V.A. Tulyaganova, U.M. Abdullayev. Theory of electrical circuits. (tutorial), Communicator, 2018, 144 p. 2. X.K.Aripov, A.M. Abdullayev, N.B. Alimova, Electronics and circuit engineering (textbook) Tashkent.: « Communicator», 2017, 376 p. 3. Aripov X.K., Abdullaev A.M., Alimova N.B., “Schematic” (textbook), Tashkent. « The boston of thought», 2013, 447 p. 4. Ron Mancini, Amps For Everyone, 2002, Texas Instruments. 5. X.K. Aripov, A.M. Abdullayev, N.B. Alimova, Electronics (textbook) Tashkent, « Science and technology», 2011, 428 p. 6. Thomas F. Schubert, Jr., Ernest M. Kim. Fundamentals of Electronics Book 1: Electronic Devices and Circuit Applications, 2014,</td></tr>
</table>

<table>
<tr><td colspan="2">5.7. Computer Organization</td></tr>
<tr><td>Semester:</td><td>3</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Rajabov Farkhat Farmanovich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Discrete Structures, Electronics and circuits II</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>An introductory course in computer engineering that teaches the fundamental concepts of digital logic design and computer organization. Lecture topics include binary numbers, Boolean algebra, logic gates and combinational logic, sequential logic, state machines, memories, instruction set architecture, processor organization, caches and virtual memory, input/output, and case studies.</td></tr>
<tr><td>Goal:</td><td>It is to give students knowledge about the specific features of the structure of modern computers, command formats and address modes, memory hierarchy and organization, connection and communication between the processor and external devices, and the organization of calculations in the computer system.</td></tr>
<tr><td>Objective:</td><td>–understanding the fundamentals of computer organization technologies; –studying principles and architectures of computer organization –developing practical skills in computer configuration and management; –analyzing and optimizing computer performance; –troubleshooting computer organization issues; –exploring modern trends and technologies in computer organization</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Understand Boolean logic and state machines as theoretical foundations of digital systems;
LO 2. Conceive, analyze, design, and build combinational and sequential digital logic solutions to everyday problems;
LO 3. Understand the basic structure and functionality of microprocessor, and build a simple one using FPGA hardware;
LO 4. Understand the structure and operation of memory hierarchies and I/O systems</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);</td></tr>
</table>

<table>
<tr><td></td><td>– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–10)</td><td>25</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>7</td></tr>
<tr><td>Oral presentation</td><td>8</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Digital Logic Design
- Boolean algebra and combinational logic
- Sequential logic
- HDL, Verilog design
- State machines
- Timing and clock
- Binary numbers and arithmetic
- Memories
- Computer Organization
- Single–cycle microprocessor
- Pipelined microprocessor
- Caches
- Performance measurement
- Virtual memory
- Input/output
- Advanced topics</td></tr>
<tr><td>Literature:</td><td>1. Computer organization and architecture: designing for performance / William Stallings. — Tenth edition.
pages cm 2016. 2. “Computer organization. Principles, technologies, protocols: A textbook for university students, Fifth Edition” N.A. Olifer, V.G. Olifer, St. Petersburg, Peter, 2016.4, Computer organization and design: the hardware/soft ware interface/David A. Patterson, John L. Hennessy. — 5th ed.p. cm. — (Th e Morgan Kaufmann series in computer architecture and design) 2014. 3 С.А.Орлов, Б.Я.Цилькер. Организация ЭВМ и систем: Учебник для вузов. 3–е изд. — СПб.: Питер, 2015. — 685. 4.F. F. Rajabov, N.S. Atadjanova, N.A.Irmuxamedova. “Raqamli axborotlarni qayta ishlash va yaratish texnologiyasi.” O‘quv qo‘llanma 3.52.01.01 – Raqamli axborotlarni qayta ishlash ustasi kasbi uchun davlat ta’lim standartiga muvofiq yaratilgan – Toshkent, O‘zR FA “Fan” nashriyoti, 2021. 272 b. 5. F.F.Rajabov, J.X.Djumanov, K.T.Abdurashidova, D.E.Eshmuradov. «VLSI tizimini loyihalashtirish» fanidan amaliy ishlarni bajarish bo‘yicha o‘quv qo‘llanma. /TATU. 149 bet. Toshkent, 2022</td></tr>
</table>

5.8. Creating Web Applications	
Semester:	4
Date of last modification:	31.08.2023
Teachers:	Sadikov Rustam Tahirovich
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 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 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:	Science provides students with theoretical and practical knowledge of modern web programming and their creation technologies, HTML, CSS, Javascript, PHP, Bootstrap, JQuery, Bootstrap, AngularJs and PHP programs designed for web programming, basic concepts of web technologies through modern framework platforms, server side programming technologies, MySQL, AJAX technology and working with them, working with MVC framework technologies, building skills and competencies of designing websites in the YII2 framework.
Goal:	The study of this course is based on the knowledge gained in the study of "Programming", "Data base".
Objective:	–understanding the fundamentals of network technologies; –studying network protocols –developing practical skills in network configuration and management; –analyzing and optimizing network performance; –troubleshooting network issues; –exploring modern trends and technologies in networking
Learning outcome:	After studying the discipline, students should be able to: LO1. Understand the concept of static and dynamic sites LO2. Knowing how to create a Frontend and Backend part of a website LO3. To be able to create a structure of a website in HTML used in creating a website, to work with design in CSS LO4. Able to write and search for functions in the programming language for the user interface in Java Script LO5. should have the skills to work with requests and use frameworks in PHP
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations);

	– game technologies, in which students participate in business, role–playing, simulation games; – information and communication (including distance learning) technologies. 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.
Assessment of the student's knowledge:	

Type of task		**Number of points (max)**		**Total**
Current control	Practical works (1–10)	20	40	100
	Independent work	10		
	Oral presentation	10		
Mid–term control	Written work	10		
Final control	Exam (Testing)	50		

Topics of lectures:	- Introduction to WEB programming. Introduction to web technology. Basic concepts. Stages of development of the WWW. Client–server technologies, Internet protocols. Components of a web application. Frontend and backend technologies. - Introduction to HTML. The general structure and main tags and attributes of an HTML document. Tags for working with images, tables, links, lists, and forms. - HTML5 new standards new tags, attributes and their functions. In HTML5. Work with audio, video and graphics. Visual effects. - Introduction to CSS. How to link HTML document with CSS. CSS syntax. Types of selectors. Types of selectors (simple, combination, pseudo–element, pseudo–class, attribute selectors). Units of measurement. - CSS features. CSS pagination. CSS color properties. Border properties in CSS. Background properties in CSS. CSS font properties. Margin features. Padding features. Box model concept. Box model rules. - CSS3 basics. CSS text effects. Two–dimensional and three–dimensional transformation in CSS. CSS animations. CSS preprocessors (sass, less). - JavaScript Basics. Features of the JavaScript scripting language. Link to an HTML document. Variables. Data types. Arrays. - JavaScript functions and objects. Event processing using JavaScript functions. Constant expressions in JavaScript. - Working with JavaScript browser and web document object model. Understanding the Document Object Model (DOM). Working with HTML objects and CSS properties in the object model of the document. JavaScript browser object model (BOM). Date object methods and properties. - Introduction to JQUERY. Basic concepts. Introduction to jQuery. jQuery syntax. Ways to use jQuery. jQuery selectors. jQuery events. jQuery UI. - Bootstrap framework technologies. Link Bootstrap libraries, configure base templates. Working with existing classes in Bootstrap technology. - Introduction to PHP. PHP basics, syntax. PHP versions. Variables, constants, data types. Operators. - PHP functions and objects. Working with arrays, strings and files in PHP. Working with forms. Error handling in PHP - Global variables in PHP. POST, GET, COOKIE, SESSION, SERVER, REQUEST, ENV, FILES. Scopes of variables. Actions on files. - Object–oriented programming in PHP. MVC technology. Classes and objects in PHP. About MVC technology. Model. View. Controller. - Working with MySQL database management system in PHP. - Application of CMS technology in creating websites.
Literature:	1. Nazirova E.Sh., Sadullaeva Sh.A., Abidova Sh.B., Tajiev J.A. Creating web applications / T.: "Alokachi", 2018, 356 p. 2. Zaynidinov H.N., Nazirova E.Sh., Yahshibayev D.S., Makhmudjanov S.U. Creating web applications. textbook / T.: "Alokachi", 2020, 348 p. 3. Dronov V.A. PHP, MySQL, HTML5 and CSS 3. Razrabotka sovremennyx dinamicheskix Web–saytov (pdf+epub) – SPb.: BXB Petersburg 2016. 688p. 4. Martyshin S.A. Bazy dannyx. Prakticheskoe primenenie SUBD SQL –i NoSQL – tipa dlya proektirovaniya informatsionnyx sistem: ucheb. Posobie // – Moscow: ID "FORUM" – INFRA–M, 2019, – 368 p..

6. Core

<table>
<tr><td colspan="2">6.1. Computer Networks</td></tr>
<tr><td>Semester:</td><td>4</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Atadjanova Nozima Sultan-Muratovna, Jabborov Khayitmurod Ishmumin ugli</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Computer organization</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Computer networks course will encourage you to understand an computer network construction principles, technologies and devices, local, network design issues in computer programs, network management methods, basic network protocols, data routing processes, network software and hardware security.</td></tr>
<tr><td>Goal:</td><td>The purpose of mastering the discipline is to give students systematized theoretical knowledge and practical skills in building computer networks.</td></tr>
<tr><td>Objective:</td><td>–understanding the fundamentals of network technologies; –studying network protocols –developing practical skills in network configuration and management; –analyzing and optimizing network performance; –troubleshooting network issues; –exploring modern trends and technologies in networking</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Understand how a computer network works.
LO 2. Understand the process of data transfer in the computer network.
LO 3. Possess skills in network design and organizing interconnection.
LO 4. Use standards when building computer networks (ISO, IEEE).
LO 5. Perform network infrastructure design work with scalability in mind
LO 6. Perform configuration of network equipment in accordance with the tasks</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.</td></tr>
</table>

<table>
<tr><td></td><td>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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–10)</td><td>25</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>7</td></tr>
<tr><td>Oral presentation</td><td>8</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to Computer Networks. History of computer networks.
- Standards of computer networks.
- Network models and network architecture.
- Physical layer. Types of cables and connectors. Physical medium of data transmission.
- Wireless and mobile networks. Wireless sensor networks
- Data link level. MAC addressing. Switching and VLANs
- Network layer. Network protocols. Network layer protocols (IP, ICMP)
- IP addressing and subnets
- Routing (static and dynamic). Routing protocols (RIP, OSPF, BGP)
- Transport layer. Transport layer protocols (TCP, UDP). Congestion control and reliable data transmission
- Application layer protocols (HTTP, FTP, SMTP, DNS).
- Network services and applications. Basics of client–server architecture.
- Network Security. Firewalls and intrusion detection systems (IDS/IPS). Virtual Private Networks (VPN)
- Network Management and Monitoring. Tools and methods for network monitoring
- Modern Technologies and Trends. Cloud computing and virtualization
- Internet of Things (IoT). 5G networks. SDN (Software–Defined Networking)</td></tr>
<tr><td>Literature:</td><td>Literature 1. Computer Networking: This Book Includes: Computer Networking for Beginners and Beginners Guide (All in One). Rassel Scott, 2019. 2. A Top–Down Approach: Computer Networking, James F. Kurose, Keith W. Ross 2017. Pearson Education Limited. 3. Computer Networks, Fourth Edition. Andrew S. Tanenbaum. Publisher; Prentice Hall, 2011. 4. “Computer networks. Principles, technologies, protocols: A textbook for university students, Fifth Edition” N.A. Olifer, V.G. Olifer, St. Petersburg, Peter, 2016.</td></tr>
</table>

6.2. Introduction to Software Engineering	
Semester:	4
Date of last modification:	31.08.2023
Teachers:	Rakhmonova Munisakhon Rashodovna
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 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 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:	During the course "Introduction to Software Engineering" students acquire theoretical knowledge, practical skills, requirements for the development of quality software products, their stages, processes, methods and approaches, testing and monitoring of software products, as well as user experience with software applications.
Goal:	The goal of teaching discipline is to develop knowledge and technical skills in new software systems development, software requirements, architecture, prototyping, test program development, and project management.
Objective:	– understand the software life cycle; – studying the stages of creating software systems; – forming practical skills of software testing; – project management; – software reuse; – studying modern trends and technologies in the field of software engineering.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Know the term "software engineering". LO 2. Understand the current issues and importance in the field. LO 3. Understand the process models for building software systems. LO 4. Know how to define requirements for a software product. LO 5. Create software systems using architectural design patterns LO 6. Recognize the different levels of software testing LO 7. Identify the basic principles of project management and discuss risk analysis techniques.
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations); – game technologies, in which students participate in business, role–playing, simulation games; – information and communication (including distance learning) technologies.

<table>
<tr><td></td><td>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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–10)</td><td>25</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>7</td></tr>
<tr><td>Oral presentation</td><td>8</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction. Software and software engineering.
- Software development processes. Software development life cycle models.
- "Agile" software development
- Functional and non–functional requirements engineering
- Project planning
- Systematic analysis. System modeling
- Software architecture and architectural design
- Design and implementation
- Configuration management.
- Reliability and social services
- Software testing
- Software evolution.
- Software reuse
- Quality Management
- Project Management and Project Documentation</td></tr>
<tr><td>Literature:</td><td>Literature 1. Ian Sommerville, Software engineering. 10th edition. –London: Pearson Education Limited 2016, Inc., pulishing as Addison–Wesley. –P. 811. 2. Thayer R.H., Dorfman M. Software Engineering Essentials. Carmichael: Software Management Training Press, 2013. 3. Mall R. Fundamentals of software Engeering: monoghaphy. – Delphi:PHI Learning Private Lmited, 2013.</td></tr>
</table>

<table>
<tr><td colspan="2">6.3. Software Testing</td></tr>
<tr><td>Semester:</td><td>5</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Muhamediyeva Dildora Kabilovna</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>8</td></tr>
<tr><td>Pre–requisities</td><td>Introduction to Software Engineering</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>42</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Writing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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 60 minutes</td></tr>
<tr><td>Short content:</td><td>Software testing course will provide you some theoretical and practical concepts of software development, testing the software before deploying, algorithms that used in software development. Moreover, you will be able to have knowledge about testing methodologies, how to automate testing systems for software during the course.</td></tr>
<tr><td>Goal:</td><td>The purpose of mastering the discipline is to give students theoretical knowledge about how automated testing systems work, practical skills in developing software and testing system, theoretical knowledge for working as a testing developer.</td></tr>
<tr><td>Objective:</td><td>–understanding the fundamentals software testing methodologies concepts; –studying components of systems; –studying file systems in automated testing systems; –analyzing and optimizing algorithms used in testing systems; –developing fault tolerance for software; –exploring modern trends and technologies in software testing.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Understand how automated testing systems (ATS) work.
LO 2. Understand the process of testing before deploying.
LO 3. Possess skills in systematic programming of writing general rules.
LO 4. Possess knowledge about basic software requirements.
LO 5. Perform ATS infrastructure design work with scalability in mind
LO 6. Possess skills process of Unit test.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.</td></tr>
</table>

<table>
<tr><td></td><td>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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–10)</td><td>30</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>5</td></tr>
<tr><td>Oral presentation</td><td>5</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- General concepts of testing.
- Modern technologies of software development. Organizing the process of software development.
- Organizing software testing. The challenges of testing.
- The requirements for optimal criteria. Types of criteria. Structural criteria. Mutational criteria.
- Evolution of software development. Methods of Evolution.
- Types of testing. Testing based on module. Testing for OOP.
- Systematically testing.
- Artefacts of testing
- Automating testing concepts. Cost of testing.
- Quality of software. The steps of testing. Scheduling the testing process.
- The approaches of software testing
- Formalization of the designing process.
- The purpose and tasks of regression testing.
- The concepts of analyzing of testing methods.
- The tasks of test–design. Methods of test–design.
- Efficiency of testing process. Bug report.</td></tr>
<tr><td>Literature:</td><td>Literature 1. П. Котляров, Т. В. Коликова «Основы тестирования программного обеспечения: Учебное пособие», Интернет–Университет Инф. Технологий, Москва, 2006. Р.Савин Тестирование Дот Ком, или Пособие по жестокому обращению с багами в интернет–стартапах, Издательство «Дело», Москва, 2007</td></tr>
</table>

<table>
<tr><th colspan="2">6.4. Programming Methods and Paradigms</th></tr>
<tr><td>Semester:</td><td>5</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Mirzayeva Nilufar Sirojidinovna</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Programming II, Introduction to Software Engineering</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>The programming methods and paradigms course introduces you to a variety of programming styles and languages, selecting paradigms, moving systems and applied informatics from low–level programming to high–level hardware interface languages, and the use of languages and special instrumental software tools for solving parallel programming problems. consists of forming skills.</td></tr>
<tr><td>Goal:</td><td>The course introduces students to different programming styles and languages, the choice of paradigms consists in forming skills to use systems and applied informatics from low–level programming to high–level languages in the interface with hardware and languages used to solve parallel programming problems, as well as special instrumental software tools.</td></tr>
<tr><td>Objective:</td><td>Provides theoretical knowledge, practical skills, methods of writing computer programs, approaches to programming, organization of calculations, and the formation of modern methods and tools that determine the structural structure of the work performed by EHM.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Can analyze an overview of the software tools and techniques supported by different languages and programming systems
LO 2. Can demonstrate the evolution of key ideas that support the entire life cycle of programs, demonstrating the relationship between parallel programming concepts in different paradigms.
LO 3. will be able to analyze specific approaches to defining programming languages, focusing on ways to describe the implementation characteristics of parallel programming systems.
LO 4. Can compare the most popular programming paradigms and paradigmatic features of different levels of parallel programming languages.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;</td></tr>
</table>

<table>
<tr><td></td><td>– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical works (1-10)</td><td>30</td><td rowspan="2">40</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- The subject and tasks of the subject "Programming methods and paradigms".
- Support for programming paradigms.
- High and low level programming languages.
- Imperative procedural programming. Imperative programming types.
- Standard Imperative Procedural Programming.
- Structured programming. Specification.
- Functional programming. Higher order functions. Clean features. Recursion.
- Logic programming. Logical programming languages. Predicates.
- Declarative programming.
- Principles of object–oriented programming. Classes, objects, functional model.
- Object–oriented programming
- Multi–paradigm programming languages.
- Parallel programming. An approach to creating parallel programs.
- Parallel programming languages Parallel algorithms. Practical programming systems
- Concurrency models in programming languages.
- Transformational semantics. Abstract complex. A memory.</td></tr>
<tr><td>Literature:</td><td>Literature 1 Gorodnyaya L.V. Programming paradigm. Textbook for universities / L.V.Gorodnyaya. – 2nd ed., St. Petersburg: Lan, 2021. – 232 p.2. Nepeyvoda N.N. Programming styles and methods. M: National Discovery University "INTUIT", 2016 – 376 s.3. Lavrov S.S. Functional programming. Lisp language interpreter / S. S. Lavrov, L. V. Gorodnyaya // Computer tools in education. – St. Petersburg, 2002. No. 5</td></tr>
</table>

6.5. Operating Systems	
Semester:	5
Date of last modification:	31.08.2023
Teacher:	Atoev Sukhrob Gafurovich
Component:	Compulsory
Cycle:	Core
ECTS:	6
Pre–requisities	Computer organization
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 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 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:	The Operating Systems (OS) course provides a comprehensive introduction to the fundamental concepts and principles of OS. It covers the essential components, structures, and functionalities of modern OS, as well as the core algorithms and mechanisms used to manage system resources, handle processes, and facilitate user interactions.
Goal:	The primary goal of this course is to provide students with a comprehensive understanding of the fundamental concepts, principles, and design of modern OS.
Objectives:	– Understand the role and importance of OS in computer systems; – Examine the architectural design and internal organization of OS; – Explore process management, including process scheduling, synchronization, and deadlock; – Learn about memory management techniques, such as virtual memory and paging; – Discuss file system management and I/O operations; – Investigate concurrency control, multi–threading, and parallel processing; – Analyze security and protection mechanisms in OS.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Install, update, and manage OS. LO 2. Understand the OS classes and architectures. LO 3. Understand the network OS services and resources. LO 4. Work in different OS environments and applications. LO 5. Ensure information security in OS.
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations); – game technologies, in which students participate in business, role–playing, simulation games; – information and communication (including distance learning) technologies.

	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.
Assessment of the student's knowledge:	**Type of task** / **Number of points (max)** / **Total** Current control: Practical works (1-10) 30; Independent work 10 — 40 Mid–term control: Written work 10 Final control: Exam (Testing) 50 Total: 100
Topics of lectures:	- Introduction to OS. Basic understanding of OS. History of OS. Classification of OS. - Architecture of OS. Basic principles of construction of OS. Properties of OS. - The role of OS in managing computer devices. The structure of computers, processors, memory devices, buses, etc. - Types of OS. Multiprocessor OS, server OS, client–server model, virtual machine. - Embedded systems. Embedded systems architecture. Embedded systems model. Embedded processors. - Installed software. Device drivers. Embedded OS. Application software. - Command line terminals in OS. Windows command line and PowerShell environment. Terminals of Unix family OS. - Threads in OS. Multithreading in programming. - Management of processes in OS. Management, planning, dispatching and synchronization of processes. Process planning algorithms and parameters. - Memory management in OS. Memory abstraction: concepts of address space, swapping, free memory management. Virtual memory. - File systems in OS. Files. Catalogs. Working with files and directories. Table of file placement in memory. Caching, transaction–based file systems. - OS for cloud computing. Virtualization of devices. Services, data processing centers. Software tools for cloud computing. - Security in OS. Control access to resources. Protection levels. Fundamentals of cryptography. Authentication. Attacks on software systems. - OS in the Unix family. Linux OS and its distributions. Linux kernel. - OS for mobile devices. Android OS. Android architecture. Android applications. Security.
Literature:	1. Modern Operating Systems (4th Edition) 4th Edition. Andrew S. Tanenbaum, Herbert Bos. Pearson, 2014, 1136 pages. 2. Operating Systems. U.R.Khamdamov, Dj.B.Sultonov, S.S.Parsiyev, U.M.Abdullaev. Tashkent, 2021, 436 pages. 3. Linux with Operating System Concepts. Richard Fox. CRC Press, 2015, 688 pages. 4. Operating System Concepts. Binder Ready Version 9th Edition. Abraham Silberschatz, Peter B. Galvin, Greg Gagne. Wiley January 2013, 919 pages.

<table>
<tr><td colspan="2">6.6. Software Systems Design</td></tr>
<tr><td>Semester:</td><td>7</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Rakhmonova Munisa Rashodovna, Ruzibayev Ortiq Baxtiyorovich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Programming II, Introduction to Software Engineering</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Software Systems Design is a discipline focused on the development, creation, and maintenance of complex software systems. It encompasses requirements analysis, architectural and detailed design, modeling, prototyping, implementation, testing, integration, deployment, maintenance, and documentation. The primary goal is to create reliable, scalable, and user–friendly software systems that meet user requirements and expectations</td></tr>
<tr><td>Goal:</td><td>Teaching by listening to a lecture through theoretical concepts and doing practical and experimental work, and the software systems design course consists of providing the basic knowledge that an engineer–programmer needs to know.</td></tr>
<tr><td>Objective:</td><td>–Requirements Gathering and Analysis; –System Architecture Design; –Design and Modeling; –Prototyping; –Coding and Software Development; –Testing and Verification; –Integration and Deployment; –Maintenance and Support; –Documentation; –Project Management;</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Can demonstrate software testing.
LO 2. Can tell about the functions of the operating system to ensure the quality of the software.
LO 3. It will be able to understand the introduction of software and its tracking.
LO 4. Contextual modeling can know and use.
LO 5. Interaction models can discuss.
LO 6. Will acquire the skills of rapid prototyping methods.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);</td></tr>
</table>

<table>
<tr><td></td><td>– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical works (1-10)</td><td>30</td><td rowspan="2">40</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to the process of designing software systems.
- Criteria and models for designing software systems.
- Efficiency and security of software system design.
- Features of software system design.
- Software system design models. The principle of visual modeling and decomposition (modularity).
- Analysis of the branch of science. Data modeling.
- Algorithms and simulation of calculations. Modeling behavior.
- Software development templates. Specification. Architectural patterns.
- Created templates. Structural patterns
- Behavioral patterns. Code generation. The specification is embedded in the code.
- Evaluation of software development solutions. Qualitative attributes of solving the design problem.
- Design metrics.
- Static code analysis and experimental measurements of program execution.</td></tr>
<tr><td>Literature:</td><td>Literature 1. Qian, Kai Fu, Xiang Tao, Lixin Xu, Chong–wei Diaz–Herrera, Jorge L. Software Architecture and Design Illuminated [Text]: монография / K. Qian [et al.]. – Sudbury: Jones & Bartlett Publishers, 2010. – 387 p. 2. Pressman, Ph. D., Roger S. Software Engineering: a Practitioner's Approach [Text]: монография / R. S. Pressman, Ph. D. – 6th. ed. – New Delhi: McGraw Hill Education (India) Private Limited, 2013. – 912 p. 3. Hassan Gomoa, George Mason. Software modelling and design UML UML, Use Cases, Patterns, and Software Architectures. Cambridge University Press, 2011, 547p. 4. Ian Sommerville, Software engineering. 9th ed., Pearson Education, 2021. 790 p. 5. David P. Voorhees. Guide to Efficient Software Design. NY, USA. 2020. 519 p.</td></tr>
</table>

<table>
<tr><th colspan="2">6.7.Software Quality Assurance</th></tr>
<tr><td>Semester:</td><td>6</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Mirzayeva Nilufar Sirojidinovna, Narziyev Nosir Baxshilloyevich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>4</td></tr>
<tr><td>Pre–requisities</td><td>Software Systems Design, Software Testing</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Midterm control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Introduces various methods of software quality assurance. The concept of software quality, the relationship of quality characteristics and quality attributes to requirements. Various methods of software quality control are introduced, and feature testing and validation in models are discussed in more detail.</td></tr>
<tr><td>Goal:</td><td>The concept of quality falls into complex categories due to its multiple interpretations, depending on the purpose of quality management, the stages of the life cycle and the model of the object being evaluated. From the point of view of software engineering, software quality management is based on three pillars: quality principles, management processes and practice</td></tr>
<tr><td>Objective:</td><td>The task of software quality assurance is to evaluate software design tasks, models, templates, and decisions, as well as to improve the quality of software.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. To know the basic concepts and characteristics of software quality, factors affecting software quality, measurement and evaluation features of quality indicators
LO 2. Understand the role of standardization in quality management, types of quality assurance standards and software certification.
LO 3. They learn to analyze the concept of software quality management and the specific features of the modern model of software quality management.
LO 4. Develop skills in software testing, test development, and documentation of test results.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;</td></tr>
</table>

<table>
<tr><td></td><td>– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical works (1-10)</td><td>30</td><td rowspan="2">40</td><td rowspan="3">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- The subject and tasks of the subject "Programming methods and paradigms".
- Support for programming paradigms.
- High and low level programming languages.
- Imperative procedural programming. Imperative programming types.
- Standard Imperative Procedural Programming.
- Structured programming. Specification.
- Functional programming. Higher order functions. Clean features. Recursion.
- Logic programming. Logical programming languages. Predicates.
- Declarative programming.
- Principles of object–oriented programming. Classes, objects, functional model.
- Object–oriented programming
- Multi–paradigm programming languages.
- Parallel programming. An approach to creating parallel programs.
- Parallel programming languages Parallel algorithms. Practical programming systems
- Concurrency models in programming languages.
- Transformational semantics. Abstract complex. A memory.</td></tr>
<tr><td>Literature:</td><td>Literature 1. Chernikov B.V. Software quality management [Electronic resource]: Textbook / B.V. Chernikov. – Moscow: Publishing House "FORUM", 2012. 3. Qian, Kai Fu, Xiang Tao, Lixin Xu, Chong–wei Diaz–Herrera, Jorge L. Software Architecture and Design Illuminated [Text]: monograph / K. Qian [et al.]. – Sudbury: Jones & Bartlett Publishers, 2010. 4. Chernikov B.V. Assessing the quality of software: Workshop [Electronic resource]: textbook. – Moscow: Publishing House "FORUM", 2012. 5. Kirillov V.I. Metrological support of technical systems: Textbook / V.I. Kirillov. – M.: Scientific Research Center INFRA–M; Mn.: New. knowledge, 2013.</td></tr>
</table>

<table>
<tr><th colspan="2">6.8. Mobile Application Development</th></tr>
<tr><td>Semester:</td><td>6</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Nurjabova Dilafruz Shukurullaevna</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Operating Systems, Programming II</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>42</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Testing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>In this course you will master theoretical and practical knowledge of modern mobile programming and technologies for their creation, Java Kotlin, Python Kivy, Dart Flutter, React Native programming languages and technologies for mobile programming; Basic concepts of mobile programming, SQLite technology and working with them are taught through Android Studio, PyCharm, Intellij Idea programs, special attention is paid to developing students' skills and competencies.</td></tr>
<tr><td>Goal:</td><td>The purpose of mastering the discipline is to give the theoretical foundations of mobile programming, their structure and the creation and processing of Android and iOS platforms, the formation of the architecture of mobile applications, the creation of a user interface and environment and their management are taught.</td></tr>
<tr><td>Objective:</td><td>–selection and operation of the programming environment;–knowledge of a framework created on the basis of mobile programming, as well as programming technologies;– the correct choice of the optimal programming language (or its framework) and the design of application tools (frameworks) for project implementation;– the creation of a mobile application based on the developed project concept is of great importance.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Languages and technologies for creating mobile applications: programming for iOS and Android using emulators;
LO 2. Platforms for hosting mobile applications: developing skills in using the Play Market, Apple Store online stores;
LO 3. Principles of mobile application development, studying requirements and creating technical specifications, choosing a platform and working with it;
LO 5. Mobile application design development, implementation and analysis of UI/UX design (Figma);
LO 6. Cross–platform programming technologies: DART => Flutter technology, training in installing and configuring Android Studio;
Flutter: Android Studio interface, writing the first program and using it in the emulator, working with components;
LO 7. Flutter: working with basic components in Android Studio: working with Layout, Table, ListView, Grid, List, etc.;</td></tr>
</table>

<table>
<tr><td></td><td>LO 8. To be able to create simple and complex applications in Android Studio, test it on an emulator and install it on your mobile phone.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
In order to develop critical thinking among students, such methods as "Prediction with open questions", "Case study", "Cross–discussion", "Know–Want to Know–Learned", "INSERT", hands–on activities, gamification and others are actively used during practical classes.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="2">Current control</td><td>Practical works (1–5)</td><td>25</td><td rowspan="2">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>15</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Testing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction: History of mobile application development. Early mobile devices and mobile applications. Modern mobile OS.
- Introduction to the Science of Mobile Application Development The history of mobile application development. Early mobile devices and mobile applications. Getting to know modern mobile operating systems and choosing a more convenient operating system.
- Languages and technologies for creating mobile applications: programming for iOS and Android, emulators.
- Using languages and technologies for mobile application development. Creation of applications for iOS and Android. Learning to work with emulators.
- Platforms for hosting mobile applications: Play Market, Apple Store online stores.
- Selecting platforms for deploying mobile applications. Use in Play Market online stores. Training in using Apple Store online stores.
- Principles of mobile application development, studying requirements and creating technical specifications, choosing a platform.
- Flutter: Working with basic components in Android Studio: Layout, Table, ListView, Grid, List, etc.
- Flutter: Working with its main components in Android Studio.
- Layout, Table Components. Working with ListView, Grid, List, etc.
- Flutter: Create a simple calculator app in Android Studio, test it on an emulator and install it on your mobile phone.
- Flutter: Create a simple calculator app in Android Studio.
- Testing the calculator in the emulator and using it by installing it on a mobile phone.
- Flutter: working with databases in Android Studio, connecting to SQLite, MySQL, MS</td></tr>
<tr><td>Literature:</td><td>Literature 1. Beginning App Development with Flutter: Create Cross–Platform Mobile Apps. Rap Payne. APress. 2019. 321 p.. 2. Google Flutter Mobile Development Quick Start Guide: Get up and running with iOS and Android mobile app development. Prajyot Mainkar, Salvatore Giordano. Packt Publishing. 2019. 256 p. 3. Nazirova E.Sh., Pardayeva G.A. "Mobil ilovalarini ishlab chiqish" Tashkent 2022. 168p.</td></tr>
</table>

<table>
<tr><th colspan="2">6.9. Introduction to Computational Thinking and Programming</th></tr>
<tr><td>Semester:</td><td>4</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Muhamediyeva Dildora Kabilovna, Atoyev Suxrob Gafurovich</td></tr>
<tr><td>Component:</td><td>Elective</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Programming I, Programming II</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>42</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Writing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Midterm control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Introduction to computational thinking and programming is the process of analysing a problem then designing and expressing its solution in such a way that a computer can effectively carry it out. It includes a number of characteristics, such as breaking a problem into small and repetitive ordered steps, logically ordering and analyzing data and creating solutions that can be effectively implemented as programs running on computer.</td></tr>
<tr><td>Goal:</td><td>The goal of this course is hence to take students with no prior experience of thinking in a computational manner to a point where you can derive simple algorithms and code the programs to solve some basic problems in your domain of studies. Student will also learn about basic program construct and simple data structures. In addition, the course will include topics to appreciate the internal operations of a processor.</td></tr>
<tr><td>Objective:</td><td>–understanding the fundamentals methodoligies of computation concepts; –studying components of programming; –studying high level programming languages; –analyzing and optimizing computational algorithms; –developing efficient application using basic techniques ; –exploring modern trends and technologies in computational technique.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Describe the internal operation of a basic processor, how a program is executed by a computer and computing trends.
LO 2. Analyse a problem then design and express its solution in such a way that a computer can effectively carry it out. (i.e. equip you with CT skills).
LO 3. Implement problem solutions as programs using basic control structures (sequence, conditional, iterative).
LO 4. Implement problem solutions as programs using basic data types and aggregate data types.
LO 5. Apply the CT concepts on case studies/problem-based scenarios through hands-on practice of the CT processes.
LO 6. Possess skills process interdependence and compatibility and synchronization of POSIX objects</td></tr>
</table>

<table>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–5)</td><td>20</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>10</td></tr>
<tr><td>Midterm control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>-Course Overview and Concepts of computational Thinking.
-Overview of Programming Languages and Basic Internal Operation of Computer.
-High level programming languages (Python, C, Java) Basic computer organization (Processor, Memory, I/O) and how a computer execute a program (Machine instructions).
-Basic Program Structure: Control Constructs and Data Types
-Concepts of data types, variables. Pseudo-code and flowcharts. Sequences, Selection (if/else), iteration (for/while loop).
-CT Concept - Abstraction. Problem formulation - reducing something to a very simple set of characteristics to only focusing on the most relevant to the problem.
-Concept of functions/libraries and data structure.
-CT Concept - Decomposition
-CT Concept – Pattern recognition
-CT Concept – Algorithm
-Reformulating the problem into series of ordered steps through Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources.
-Basic Programming Constructs in C Language. Intrinsic data types, declarations, operators, assignments, control flow, and simple input/output; Pre-processing.
-Return values, arguments and parameter passing; Scopes of variables; Concept of side effects.
-Built-in Data Structures . Pointers, pointer operations and pass by reference.
-One-dimensional and multi-dimensional arrays, and pointers and arrays.Character strings and arrays of strings. Structures, arrays of structures and type definitions</td></tr>
<tr><td>Literature:</td><td>Literature 1. Wing, J. M. (2006) ‘Computational Thinking’, Communications of the ACM, vol. 49, no. 3, pp. 33–5; also available online at http://www.cs.cmu.edu/ ~wing/ publications/ Wing06.pdf. 2. Wing, J. M. (2009) ‘Computational Thinking and Thinking About Computing’, Evening Lecture Series, 2 September 2009, Florida Institute for Human and Machine Cognition, Florida, US [Online]. Available at http://www.youtube.com/ watch?v=C2Pq4N–iE4I .</td></tr>
</table>

6.10. Introduction to Programming with Python	
Semester:	4
Date of last modification:	31.08.2023
Teachers:	Muhamediyeva Dildora Kabilovna, Atoyev Suxrob G‘afurovich
Component:	Elective
Cycle:	Core
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 / Exam Final assessment method / Writing
Control forms:	Current control, Midterm control, Final control
Assessment 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:	Introduction to programming with python (what it is and how it works), binary computation, problem–solving methods and algorithm development. Includes procedural and data abstractions, program design, debugging, testing, and documentation. Covers data types, control structures, functions, parameter passing, library functions, arrays, inheritance and object oriented design. Laboratory exercises in Python.
Goal:	"Introduction to Programming with Python" aims to teach beginners the fundamentals of programming using Python. The course covers: Python Basics: Syntax, variables, data types, and control structures. Programming Fundamentals: Functions, error handling, and debugging. Problem–Solving Skills: Breaking down and solving complex problems. Data Handling: Using Python’s data structures like lists and dictionaries. Libraries and Modules: Essential libraries for various tasks. Object–Oriented Programming: Basics of OOP, creating and using classes. Practical Applications: Real–world projects and exercises. Software Development Practices: Clean coding, version control, and testing. The goal is to equip students with the skills to write their own Python programs and prepare them for advanced topics in computer science and software development.
Objective:	–understand basic principles of computers; –understand basics of binary computation; –understand the programming basics (operations, control structures, data types, etc.); –readily use the Python programming language; –apply various data types and control structure; –understand class inheritance and polymorphism; –understand the object–oriented program design and development; –understand and begin to implement code
Learning outcome:	After studying the discipline, students should be able to: LO 1. Have knowledge of basic principles of computers. LO 2. Have basic consepts of binary computation LO 3. Have skills of the programming basics (operations, control structures, data types, etc.) LO 4. Readily use the Python programming language. LO 5. Apply various data types and control structure LO 6. Develop apps with class inheritance and polymorphism

<table>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–6)</td><td>30</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>5</td></tr>
<tr><td>Oral presentation</td><td>5</td></tr>
<tr><td>Midterm control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to Python
- Basic Syntax and Data Types
- Control Structures
- Functions
- Data Structures
- Modules and Packages
- File Handling
- Error Handling and Exceptions
- Object–Oriented Programming (OOP)
- Working with Libraries
- Introduction to Debugging
- Basic Algorithms and Data Structures
- Web Scraping
- Data Analysis and Visualization
- Introduction to Databases
- Version Control with Git
- Final Project Preparation</td></tr>
<tr><td>Literature:</td><td>Literature 1. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython 2nd Edition by Wes McKinney ISBN–13: 978–1491957660, (available for free online through the Carnegie Mellon University Library). 2. Automate the Boring Stuff with Python: Practical Programming for Total Beginners (Sweigart, Al) ISBN–13: 978–1593275990, ISBN–10: 1593275994 (available for free on the web). 3. "Starting Out with Python plus MyProgrammingLab with Pearson eText —Access Card Package (3rd Edition) Tony Gaddis ISBN–13: 978–0133862256"</td></tr>
</table>

<table>
<tr><th colspan="2">6.11.Construction of Compilers</th></tr>
<tr><td>Semester:</td><td>5</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Kerimov Komil Fikratovich, Sharipov Baxodir Akilovich</td></tr>
<tr><td>Component:</td><td>Elective</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Programming I, Programming II</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>42</td></tr>
<tr><td>Practical works</td><td>30</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Writing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>The course "Construction of compilers" introduces topics include compiler design, lexical analysis, parsing, symbol tables, declaration and storage management, code generation, and optimization techniques.</td></tr>
<tr><td>Goal:</td><td>The aim of the course "Construction of compilers" to cover the main concepts associated with implementing compilers for programming languages.</td></tr>
<tr><td>Objective:</td><td>At the end of the course students should understand the overall structure of a compiler, and will know significant details of a number of important techniques commonly used. They will be aware of the way in which language features raise challenges for compiler builders.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Use compiler construction tools and describes the Functionality of each stage of compilation process.
LO 2. Construct Grammars for Natural Languages and find the Syntactical Errors
LO 3. Semantic errors during the compilations using parsing techniques.
LO 4. Analyze different representations of intermediate code.
LO 5. Construct new compiler for new languages.
LO 6. Participate in GATE, PGECET and other competitive examinations.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.</td></tr>
</table>

	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.

Assessment of the student's knowledge:

Type of task		**Number of points (max)**		**Total**
Current control	Practical works (1–5)	20	40	100
	Independent work	10		
	Oral presentation	10		
Mid–term control	Written work	10		
Final control	Exam (Writing)	50		

Topics of lectures:

–Introduction to Compilers
–A Simple One–Pass Compiler
–Lexical Analysis: Application of regular expressions in lexical scanners
–Lexical Analysis: formal definition of tokens, implementation of finite state automata.
–Syntax Analysis: Revision of formal definition of grammars, BNF and EBNF; bottom–up vs. top–down parsing
–Syntax–Directed Translation
–Syntax Analysis: tabular vs. recursive–descent parsers, error handling
–Parsers Implementation
–Semantic Analysis
–Intermediate Representation, code generation
–Code generation
–Code optimization
–Error Detection and Recovery
–Error Repair, Compiler Implementation
–Compiler design options and examples.

Literature:

Literature 1.Aho A. V. Compilers: Principles, Technigues, and Tool: монография.– 2th.ed.–Boston: Pearson,2007.– 948p. 2. Fischer, Charles N. Crafting a Compiler: монография. Boston : Addison Wesley, 2009.– 683 p.

6.12. Software Construction and Evolution	
Semester:	5
Date of last modification:	31.08.2023
Teachers:	Mukhsinov Shamil Shavkatovich, Sharipov Bahodir Akilovich
Component:	Elective
Cycle:	Core
ECTS:	6
Pre–requisities	Programming II, Computer Organization
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 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:	The course "Software construction and evolution" aims to equip students with the theoretical knowledge and practical skills needed to design modern software systems effectively. It covers topics such as coding, verification, unit testing, integration testing, and debugging to provide a comprehensive understanding of software development processes.
Goal:	The purpose of the Software Design and Evolution course is to prepare students theoretically and practically in the theoretical foundations of designing modern software systems through a combination of coding, verification, unit testing, integration testing and debugging.
Objective:	Understand theoretical foundations and practical skills in software design; apply coding principles; implement verification techniques; conduct unit testing; perform integration testing;–debug software systems; develop complex, reliable, and maintainable software solutions; meet the needs of users and stakeholders.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Skills in using program design LO 2. Be able to use various design methods LO 3. Know about the stages of software design LO 4. Solve problems related to preparing software design LO 5. Know about software design management techniques LO 6. Have an understanding of software refactoring
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations);

<table>
<tr><td></td><td>– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–6)</td><td>24</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>8</td></tr>
<tr><td>Oral presentation</td><td>8</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to software design.
- Programming as design work.
- Fundamentals of software design.
- Tasks related to software design.
- Analysis of the main directions of software design.
- Minimizing the complexity of software development.
- Difficulty assessment methods
- Practical aspects of program development.
- Software flow complexity metric.
- Data flow complexity metric.
- Software life cycle
- Stages of the software life cycle.
- Standardization in software development.
- Principles of software design.
- Design for testing.
- Preparation for software design.
- Information flow diagram.</td></tr>
<tr><td>Literature:</td><td>Literature 1 McConnell, Steve. Code Complete: A Practical Handbook of Software Construction: учебное пособие. – 2nd. ed. – Washington : Microsoft Press, 2004. – 914 p. – Bibl.: p. 863. 2. Яхшибоев Р. Э., Довлетова С. Б., Хамзаев Ж. Ф. Конструирование программного обеспечения: метод. пособие по выполнению практ. раб. – Т. : Ред.–изд. отдел при ТУИТ, 2023.3 Munch J., Armbrust O., Kowalczyk M., Soto M. Sofware Process Definition and Management: учебное пособие. – Berlin: Springer–Verlag, 2012. 4. Humprhey W. S. Introduction to the Personal Software Process: монография. – Boston: Addison–Wesley , 2007.</td></tr>
</table>

<table>
<tr><th colspan="2">6.13. Introduction to Game Theory</th></tr>
<tr><td>Semestr:</td><td>6</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Narziyev Nosir Baxshilloyevich, Primqulov Oybek Dilmurot ogli</td></tr>
<tr><td>Component:</td><td>Elective</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>42</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Writing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>This course introduces some of the game theory’s main topics and analytic tools, with an emphasis on gaining a practical understanding. Because of the tools–oriented approach, many of the games we analyze will have no obvious economic interpretation. At the end of the course you should be able to formalize a strategic situation as a well–defined game; choose appropriately from a basic kit of analytic tools, called solution concepts, to analyze and solve a wide variety of games and applications.</td></tr>
<tr><td>Goal:</td><td>The purpose of mastering the discipline is to give students systematized theoretical knowledge and practical skills in the analyzing and developing algorithms.</td></tr>
<tr><td>Objective:</td><td>– understanding the basic algorithm of graph theory; – study of optimization in game theory – development of practical skills in creating short game application; –analysis and optimization of algorithms; –solving problems in thinking processing.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Learn the key concepts of Game Theory.
LO 2. Apply concepts to solve (new) problems.
RO 3. Identify real–world situations where Game Theory is applicable and model the situation using Game Theory.
LO 4. Effectively play games: putting theory (and intuition) into practice.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross–discussion", "Know–Want to Know–Learned",</td></tr>
</table>

<table>
<tr><td></td><td>"INSERT", hands–on activities, gamification and others are actively used during practical classes.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–5)</td><td>20</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to strategic reasoning
- Introduction to strategic modelling
- Nash equilibrium in the discrete game
- Nash equilibrium in the continuous game I: Theory
Nash equilibrium in the continuous game II: Applications to public resource management
- Sequential game with perfect information I: Theory
- Sequential game with perfect information II: Applications to firms’ pricing behaviors
- Sequential game with imperfect information I: Theory
Sequential game with imperfect information II: Applications to marriage market and school choice
- Games with private information I: Theory
- Games with private information II: Applications to voting and auction
- Evolutionary game</td></tr>
<tr><td>Literature:</td><td>1. Thomas Ferguson, Game Theory, World Scientific, 2018. 2. Game theory. Cambridge University Press, 2013, Maschler, Michael, Eilon Solan, Shmuel Zamir, (Cambridge University Press, 2013), ISBN–10:1107005485. 3. Games, strategies and decision making (Second Edition), Harrington, Joseph, (Worth Publishers, 2014), ISBN–10:1429239964</td></tr>
</table>

6.14. Digital Image Processing	
Semester:	6
Date of last modification:	31.08.2023
Teachers:	Khudayberdiyev Mirzaakbar Khakkulmirzayevich, Achilov Bakhodir Saydullayevich
Component:	Elective
Cycle:	Core
ECTS:	6
Pre–requisities	Introduction to Software Engineering
Workload:	**Types of classes** / **Hours** Total / 180 Lecture / 30 Practical 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 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:	Digital image processing course provides the fundamentals and different levels of processing of digital images. This course introduces the steps and components of image processing, how digital images are acquired, sampled, quantized and the relationship between pixels. In image enhancement and restoration both spatial and frequency domain techniques are utilized.
Goal:	The purpose of mastering the discipline is to give students theoretical knowledge about what is image processing in computers, practical concepts in filtering, compressing, enahncing images and hardware requirements for IP applications.
Objective:	–understanding the fundamentals of Segmentation techniques explained with edge detection and morphological processing; –studying components of systems; studying the compression techniques and standards for efficient storage; –analyzing and optimizing scheduling algorithms; –exploring echniques to extract features for image representation and recognition.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Discuss digital image fundamentals. LO 2. Articulate image enhancement and restoration techniques. LO 3. Examining image compression Techniques. LO 4. Implementing image segmentation Techniques. LO 5. Representation and recognition of images.
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations); – game technologies, in which students participate in business, role–playing, simulation games;

<table>
<tr><td></td><td>– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–6)</td><td>24</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>8</td></tr>
<tr><td>Oral presentation</td><td>8</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Overview, Computer imaging systems
- Image analysis, preprocessing, CVIPlab
- Human visual system, image model
- Discrete transforms, Fourier
- discrete cosine, Walsh–Hadamard, Haar, PCT, filtering
- filtering, wavelet transform, Intro image enhancement
- Image enhancement, gray scale mods, histogram mod, pseudocolor
- Image enhancement, sharpening, smoothing
- Image restoration, overview, system model, noise removal: order filters
- Image restoration: noise removal: mean & adaptive filters, degradation model, inverse filter
- Freq. filters, geometric transforms
- Image compression: system model, lossless methods</td></tr>
<tr><td>Literature:</td><td>Literature 1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011. 2. Willliam K Pratt, “Digital Image Processing”, John Willey, 2002. 3. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011. 5.Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010. 4. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.</td></tr>
</table>

<table>
<tr><th colspan="2">6.15. Real Time Systems</th></tr>
<tr><td>Semester:</td><td>7</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Rakhimov Nodir Odilovich, Khan Igor Viktorovich</td></tr>
<tr><td>Component:</td><td>Elective</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Programming Methods and Paradigms, Software Systems Design</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>42</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Writing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Real time systems course will provide you some theoritical and practical concepts of real time systems development, scheduling algorithms that used in real time operating systems, hardware and software of real time systems. Moreover, you will be able to learn security of real time systems and fault tolerence methodologies during the course.</td></tr>
<tr><td>Goal:</td><td>The purpose of mastering the discipline is to give students theoretical knowledge about how real time systems work, practical skills in developping real time systems concepts and hardware requirements for real time operating systems.</td></tr>
<tr><td>Objective:</td><td>–understanding the fundamentals real time systems methodoligies concepts; –studying components of systems; –studying file systems in real time operating systems; –analyzing and optimizing scheduling algorithms; –developping fault tolerance for real time systems; –exploring modern trends and technologies in real time systems</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Understand how real time systems work.
LO 2. Understand the process of scheduling in real time operating systems(RTOS).
LO 3. Possess skills in systematic programming of writing general rules.
LO 4. Possess knowledge about basic hardware and software requirements.
LO 5. Perform RTOS infrastructure design work with scalability in mind
LO 6. Possess skills process interdependence and compatibility and synchronization of POSIX objects</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;</td></tr>
</table>

	– information and communication (including distance learning) technologies. 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.

Assessment of the student's knowledge:

Type of task		Number of points (max)		Total
Current control	Practical works (1–5)	20	40	100
	Independent work	10		
	Oral presentation	10		
Mid–term control	Written work	10		
Final control	Exam (Writing)	50		

Topics of lectures:

- General concepts of real–time systems.
- Description of tasks in real–time systems.
- Computing tools for real–time systems.
- Real–time systems and standards.
- Real–time operating systems architecture, main characteristics and features
- Synchronous and technological connections in real–time operating systems
- Communication tools, sensors and executive mechanisms
- Scheduling and management of processes in real–time systems. Use of semaphores for interthread and interprocess synchronization
- Memory management in real–time systems
- Design of real–time systems
- Implementation of real time systems
- Processes on resources.
- Tools for developing real–time systems
- Testing real–time systems
- QNX systems. Resource allocation in QNX. Signal processing in QNX

Literature:

Literature 1. Rajib Mall. Real–Time Systems: Theory and Practice. — IGI Global, 2006. 2. Dimosthenis Kyriazis, Theodora Varvarigou, Kleopatra Konstanteli. Achieving Real–Time in Distributed Computing. — IGI Global, 2011. 3. Гома Х. UML. Проектирование систем реального времени, параллельных и распределенных приложений: Пер. с англ. – М.: ДМК Пресс, 2002. 4. Ю.Г.Древс. Системы реального времени: технические и программные средства. Учебное пособие. М.: МИФИ, 2010.

6.16. Software Architecture	
Semestr:	7
Date of last modification:	31.08.2023
Teachers:	Otakhonova Bahrikhon Ibragimovna, Xan Igor Viktorovich
Component:	Elective
Cycle:	Core
ECTS:	6
Pre–requisities	Programming II, Introduction to Software Engineering
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 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 discipline identifies software components and how they relate to each other, and examines the principles and techniques needed to ensure the reliability, efficiency, and scalability of software systems.
Goal:	The Software Architecture course aims to prepare students to design and develop software systems that are efficient, reliable, and scalable, meeting both current and future needs.
Objective:	The purpose of the Software Architecture course is to provide students with a comprehensive understanding of the principles and practices involved in designing and structuring software systems. This course aims to equip students with the necessary knowledge and skills to create robust, scalable, and maintainable software architectures.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Fundamentals of software architecture. LO 2. Knowledge of modeling methods using a modeling language. LO 3. Having an idea about identifying the main elements and components based on the analysis of the field of science. LO 4. Basic concepts of software architecture design. LO 5. UML 2.0 in software architecture and modeling using a single modeling language.
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations); – game technologies, in which students participate in business, role–playing, simulation games; – information and communication (including distance learning) technologies.

	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.

Assessment of the student's knowledge:

Type of task		Number of points (max)		Total
Current control	Practical works (1–6)	24	40	100
	Independent work	8		
	Oral presentation	8		
Mid–term control	Written work	10		
Final control	Exam (Writing)	50		

Topics of lectures:

- Introduction to Software Architecture Design (DT Architecture Design).
- Software life cycle models and processes.
- Concepts of software design and architecture.
- General concepts of software modeling and design methods.
- Use of modeling types.
- Static modeling.
- Creating objects and classes.
- Design architecture of software subsystems.
- Object–oriented architecture design.
- Designing a client–server architecture.
- Designing a service–oriented architecture.
- Component–based architecture design.
- Simultaneous and real–time architecture design.
- Design of software product architecture.
- Quality attributes of software architecture.
- Limits and scope of application of software architectural design.
- Software architecture documentation approaches.

Literature:

Literature 1. Kai Qian, Xiang Fu, Lixin Tao, Chong–Wei Xu, Jorge L.Diaz–Herrera. Software Architecture and Design Illuminated. 2010 by Jones and Bartlett Publisher. 2. Hassan Gomaa, George Mason. software modeling and design UML, Use Cases, Patterns, and Software Architectures. University, Fairfax, Virginia © 2011, Cambridge university press. 3. Len Bass, Paul Clements, Rick Kazman. Software Architecture in practice. Addison Wesley Second Edition, 2006 4. Partha Kuchana, Software Architecture Design Patterns in Java, 2004 by CRC Press LLC

6.17. Pattern Recognition	
Semestr:	7
Date of last modification:	31.08.2023
Teachers:	Khudayberdiyev Mirzaakbar Khakkulmirzayevich, Achilov Bakhodir Saydullayevich
Component:	Elective
Cycle:	Core
ECTS:	6
Pre–requisities	Programming Methods and Paradigms
Workload:	**Types of classes** / **Hours** Total / 180 Lecture / 30 Practical 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 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 introduces some of the game theory's main topics and analytic tools, with an emphasis on gaining a practical understanding. Because of the tools–oriented approach, many of the games we analyze will have no obvious economic interpretation. At the end of the course you should be able to formalize a strategic situation as a well–defined game; choose appropriately from a basic kit of analytic tools, called solution concepts, to analyze and solve a wide variety of games and applications.
Goal:	The purpose of mastering the discipline is to give students systematized theoretical knowledge and practical skills in the pattern recognition system.
Objective:	– understanding the basics of image recognition; – study of object recognition – development of practical skills in digital data processing; –analysis and optimization of algorithms; –solving problems in bottom processing; –study of modern trends and technologies in the field of technology pattern recognition.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Understand pattern recognition. LO 2. Understand the process of performing data processing and pattern processing. RO 3. Have machine learning and neural network programming skills. LO 4. Use standards when building computer vision algorithms. LO 5. Perform data construction work taking into account scalability. LO 6. Implement neural network architecture.
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations); – game technologies, in which students participate in business, role–playing, simulation games;

<table>
<tr><td></td><td>– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
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<tr><td rowspan="3">Current control</td><td>Practical works (1–6)</td><td>24</td><td rowspan="3">40</td><td rowspan="5">100</td></tr>
<tr><td>Independent work</td><td>8</td></tr>
<tr><td>Oral presentation</td><td>8</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to the science of pattern content. Technical and algorithmic support uses images. The architecture and internal functions of the system are taken from the images. Areas of use.
- Analysis of domain objects in pattern recognition. Concepts of images and class. Training and control sampling. Distance between classes. Pattern recognition problems.
- Formation of sign space. Metric units of measurement signs. Elementary logical classifiers for character spaces of various types. Information content of symbols.
- Methods, algorithms for character recognition and their classification. Statistical methods for identifying patterns. Bayesian classifiers. Criteria.
- Deterministic methods for identifying images. k–nearest neighbors, separating planes, potential functions, etc.
- The neural network method and its application. Learning process. Single–layer and multilayer perceptron. Back propagation algorithm.
- Methods and algorithms for determining patterns based on the principles of precedent and partial precedent. Testing algorithm.
- Algorithms for calculating estimates. Parametric models of algorithms for calculating estimates.
- The clustering problem and methods and algorithms for solving it. "Maksmin" algorithm, "k–means" algorithm, "Izodata" algorithm, "Forel" algorithm.
- Modern recognition technologies: TensorFlow, FaceNet, Apache makout, PyTorch frameworks and libraries.
- Description of images. Stages of identifying classification features for pattern recognition.
- Pattern recognition technologies. Vision systems. OpenCV library Approaches to identifying objects in video data
- Voice and speech recognition technologies. Sphinx Library Assessment and control of recognition quality. Application of pattern recognition systems in solving various practical problems</td></tr>
<tr><td>Literature:</td><td>Musaev M.M., Rakhmatov F.A., Ergashev A.K. Speech recognition algorithms. –Tashkent: Aloqachi, 2019. Duda R., Hart P. Pattern recognition and scene analysis. – Moscow: Mir, 1976. Verhagen K, Duin R, et al. Pattern recognition state and prospects. Per. from English N.G. Gurevich. – M.: Radio and communication, 1985. Vasiliev V.I. Recognition systems. – Kyiv: Naukova Dumka, 1983. Bobkov A.V. Pattern recognition systems. M.: MSTU im. N.E. Bauman, 2018. Suzdaltsev V.A. Pattern recognition systems: textbook / V.A. Suzdaltsev, M.P. Shleimovich, V.V. Mokshin. – Kazan: Editorial and Publishing Center “School”, 2019. Mazurov Vl.D. Mathematical methods for pattern recognition. Tutorial. 2nd ed., add. and processed – Ekaterinburg, 2010. Vapnik V.N. (ed.) Algorithms for training pattern recognition. Moscow: Soviet Radio, 1973. Transplantation V.P. Automatic pattern recognition L.: Energy, 1970.</td></tr>
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<table>
<tr><th colspan="2">6.18. Data Preprocessing Technologies</th></tr>
<tr><td>Semester:</td><td>7</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Khudayberdiyev Mirzaakbar Khakkulmirzayevich, Muhamediyeva Dildor Kabilovna</td></tr>
<tr><td>Component:</td><td>Elective</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>ECTS:</td><td>6</td></tr>
<tr><td>Pre–requisities</td><td>Database, Programming II</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>30</td></tr>
<tr><td>Practical works</td><td>42</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>108</td></tr>
<tr><td>Form of final control</td><td>Exam</td></tr>
<tr><td>Final assessment method</td><td>Writing</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Current control, Mid–term control, Final control</td></tr>
<tr><td>Assessment requirements</td><td>Attendance at classes and 60% of academic progress in total for 2 types of control, to obtain admission to the final control</td></tr>
<tr><td>Final control</td><td>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</td></tr>
<tr><td>Short content:</td><td>Data preprocessing course focus on obtaining knowledge on technologies for developing methods, data preprocessing, based on research and development of domestic and foreign researchers, and also covers soft computing algorithms, which are the main mechanism of data preprocessing systems.</td></tr>
<tr><td>Goal:</td><td>The purpose of mastering the discipline is to give students knowledge about how get ready the data for algorithms, practical skills in transforming the data one form to another form that useful for software.</td></tr>
<tr><td>Objective:</td><td>–understanding the fundamentals data preprocessing methodologies concepts; –studying preprocessing techniques; –studying methodologies data transformation; –analyzing and optimizing data to input algorithms; –studying practical transforming methods; –exploring modern trends and technologies in data preprocessing</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Understand classes of problems solved using a database, programming
LO 2. Understand ways of representing knowledge in intelligent systems
LO 3. Possess knowledge–based inference algorithms
LO 4. Possess knowledge about techniques of transforming dataset.
LO 5. Perform operating principle of intelligent systems based on neural networks
LO 6. Possess knowledge about terminology in the subject area of data analysis skills in solving logical problems using the Python language;</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;</td></tr>
</table>

<table>
<tr><td></td><td>– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–5)</td><td>20</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Basic concepts and definitions.
- Pre–processing data to solve regression problems
- Collecting data about the object
- Formation of a table about data distribution
- Image pre–processing
- Algorithm for linear adaptive increase in image contrast
- Algorithm for nonlinear local contrast enhancement. Image restoration.
- Development of a data distribution graph
- Application of spline methods in digital signal processing
- Approximations of functions and experimental data using cubic basis splines in digital signal processing
- Formation of numerical characteristics of an object
- Bayesian classification
- Data visualization in PYTHON.
- Keras and TensorFlow packages
- Heuristic methods</td></tr>
<tr><td>Literature:</td><td>Literature 1. C.C.Aggarwal. Neural Networks and Deep Learning. A Textbook. Springer International Publishing AG, 2018. DOI 10.1007/978–3–319–94463–0 ISBN 978–3–319–94462–3. S.Haykin. Neural Networks and Learning Machines. 3rd Edition. Pearson, 2018. С.А.Шумский. Машинный интеллект. Очерки по теории машинного обучения иискусственного интеллекта. М., РИОР, 2019. DOI: 10.29039/02011–1</td></tr>
</table>

6.19. Programming in MATLAB	
Semestr:	7
Date of last modification:	31.08.2023
Teachers:	Mukhsinov Shamil Shavkatovich, Rakhmonov Askar Tajibayevich
Component:	Elective
Cycle:	Core
ECTS:	6
Pre–requisities	Programming I, Programming II, Calculus
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 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:	The MATLAB Programming course focuses on comprehensive study of MATLAB, a powerful applied mathematical software package utilized in diverse fields including neural networks, electrical device modeling, complex mathematical problem solving, computer simulation of physical processes, logical thinking, and algorithm development
Goal:	The course " Matlab programming " is aimed at studying MATLAB, a package of applied mathematical software designed for use in many areas, such as neural networks, modeling of electrical devices, solving complex mathematical problems, computer simulation of physical processes, logical thinking, algorithm development.
Objective:	–Utilize MATLAB for various applications;–implement neural networks; –model electrical devices; –solve mathematical problems;–perform computer simulations; –develop logical thinking skills; –create algorithms.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Study of syntax and semantics of programming in Matlab environment. LO 2. Description of the main components of Matlab package (script files, file functions, kernels and libraries). LO 3. Understand and apply the properties of arithmetic and logical operations, mathematical expressions, operations on vectors and matrices in Matlab. LO 4 Categories of files in MATLAB. Scripts and functions of M–files. Understand and apply the structure and properties of script files. LO 5. Be able to perform assignment operator, conditional statements, loop statements.
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);

<table>
<tr><td></td><td>– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
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<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>6</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction. Computer math systems. History of Mercury, Maple, Mathematics, Matcad, Matlab..
- Functions and capabilities of MATLAB system. Extension of the system. Support system.
- Organization and description of data in MATLAB. Basic MATLAB objects.
- System variables and constants. Matrix replacement operations.
- Arithmetic and logical operations. Mathematical functions. Mathematical expressions.
- Actions on vectors and matrices.
- Categories of files in MATLAB. Scripts and functions of M–files. Structure and properties of script files.
- Structure and properties of M–file functions. Local and global variables.
- Functions of numerical argument of a variable.
- Assignment operator. Conditional operators.
- Cycle operators. Programming examples.
- Application layer protocols (HTTP, FTP, SMTP, DNS).
- Object–oriented programming. Creating an object and a class.
- Package Simulink–system of visual modeling of dynamic systems.
- MATLAB functions for statistical processing of data.</td></tr>
<tr><td>Literature:</td><td>Literature 1. Timokhin, A. N., Rumyantsev Yu. D. Modeling of control systems using Matlab:textbook–M.:INFRA–M, 2021.[1 ex]. 2. Usmanov R. N., Xamidov V. S., Abdurashidova K. T., Xabirova D. N. Amaliy dasturiy paketlar: o'quv qo'llanma–T.:Aloqachi, 2019.[67 copies. 3. Akbarova M. X., Tashpulatova N. B., Muxsinov Sh. Sh. Matlabda dasturiy: o'quv–uslubiy qo'llanma.–T.: Muxarrirlik nashr, 2022. . 4. S.G. German–Galkin. Computer modeling of semiconductor systems in Matlab 6.0: monograph. – SPb.: CORONA–print, 2001.</td></tr>
</table>

6.20. Optimization and Development of Web Applications	
Semestr:	7
Date of last modification:	31.08.2023
Teachers:	Kerimov Komil Fikratovich, Buriyev Yusuf Absamat ugli
Component:	Elective
Cycle:	Core
ECTS	6
Pre–requisities	Create Web Applications, Programming 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 / Writing
Control forms:	Current control, Mid–term control, Final control
Assessment 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:	The purpose of the subject "Optimization and development of web applications" is to provide students with theoretical and practical knowledge on optimization and development of web applications.
Goal:	The task of science is to give students the necessary theoretical and practical knowledge on optimization and development of web applications, to teach them to develop software products, applying them in practice. be able to develop a new database and apply it in the educational and production process, depending on the task.
Objective:	Introduce students to the architecture of the Oracle DBMS; introduce the SQL language; teach students to use the basic database structures in the Oracle DBMS; teach students the basic technical techniques of database administration in the Oracle DBMS.
Learning outcome:	LO1 SERP Research – headlines, snippets, links LO2 Research Google SERP elements LO3 Research Methods for Determining SEO Goals and Objectives LO4 SERP research – evaluation of results LO5 Research Promotion in place in statistics. Advertising in traffic.
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations); – game technologies, in which students participate in business, role–playing, simulation games; – information and communication (including distance learning) technologies. In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross–discussion", "Know–Want to Know–Learned",

<table>
<tr><td></td><td>"INSERT", hands–on activities, gamification and others are actively used during practical classes.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–6)</td><td>24</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>6</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>–Search systems, statistics services
–Common point for the main traffic calculation tool
–Determining the SEO rate
–Website indexing
–Indexing hidden forms and functional elements that affect snippets
–Templates. Vnaliz URL+URN=URI
–Class selectors, CMS types LF, MF, HF, VK, SK, NK.
–Organization of the semantic core and formation of the site structure
–Checking a page that checks location in Google and Yandex
–Leads, types of leads and their use
–Conversions, the relationship between leads and conversions
–Site link rating
–Quality parameters for external links.
–Text, graphics, scripts
–Full and partial copies of the site, page loading speed</td></tr>
<tr><td>Literature:</td><td>1. Gosudarev. I. B. Introduction to web development in JavaScript: a tutorial. – St. Petersburg: M.: Krasnodar: Lan, 2019. 2. Zagumennov. A.P. How to promote a website: monograph. – M.: DMK, 2001. Dronov Vladimir. PHP, MySQL, HTML5 and CSS 3. Development of modern dynamic Web sites: monograph. – St. Petersburg. : BHV–Petersburg, 2016.</td></tr>
</table>

6.21. System programming	
Semestr:	7
Date of last modification:	31.08.2023
Teachers:	Mukhsinov Shamil Shavkatovich, Buriyev Yusuf Absamat ugli
Component:	Elective
Cycle:	Core
ECTS:	6
Pre–requisities	Software Systems Design
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, Midterm control, Final control
Assessment 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:	System programming involves designing and writing computer programs that allow the computer hardware to interface with the programmer and the user, leading to the effective execution of application software on the computer system.
Goal:	The purpose of the “System Programming” course is for students to study the basic theoretical principles of the theory of system programming and practical methods for using these principles..
Objective:	–The purpose of teaching science is to teach students the theoretical and practical knowledge of systematic programming, to use this knowledge in computer networks and systems, and to develop the skills of applying them in practice.
Learning outcome:	After studying the discipline, students should be able to have: LO 1. Knowledge of the composition, functions and basic principles of designing system software for computers, computing systems and networks LO 2. Knowledge of the composition, functions and basic principles of designing system software for computer systems LO 3. Knowledge of the composition, functions and basic principles of network system software design LO 4. Knowledge of the principles of construction, algorithms for the functioning of translators, assemblers, loaders, modern programming systems. LO 5. Skills to use system software LO 6. Knowledge of existing system software created on the basis of modern information technologies
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);

<table>
<tr><td></td><td>– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–6)</td><td>24</td><td rowspan="3">40</td><td rowspan="5">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>6</td></tr>
<tr><td>Midterm control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to the subject "System Programming".
- Basic concepts. Overview of system software.
- Overview of computer systems. Classification of systems.
- Operating systems. Files and file systems
- Software programs and their classification.
- Programming systems. Components of a computer program
- Processor architecture.
- Structure, memory, registers. Addressing
- Compiler. General scheme of program translation.
- Phases of compilation
- Basic concepts of formal language and formal grammar.
- Syntax and semantics. Classification of languages and grammars
- Lexical analysis and syntactic analysis.
- Classes of syntactic analysis
- Finite automaton.
- Non–deterministic and deterministic automaton
- Code generation. Code generation methods.
- General principles of code generation
- Principles of memory allocation.
- Object code optimization
- Assembler programming language basics.
- Assembly language format. Program structure
- Assembler program elements.
- Language constructions and operations
- Assembler directives</td></tr>
<tr><td>Literature:</td><td>Literature 1. Aliyev M.M. System software: textbook for students of universities. – T. : Aloqachi, 2010. 2. Kompaniets R.I. System programming. Fundamentals of building translators: textbook for universities – St. Petersburg: Korona Print, 2000. 3. Yurov, V. I. Assembler: textbook for students of universities. – 2nd ed. – Moscow; St. Petersburg; Nizhny Novgorod: Peter, 2007.4. Gordeev A.V., Molchanov A.Yu. System software: textbook. – SPb : Piter, 2001.</td></tr>
</table>

6.22. SQL Programming	
Semestr:	7
Date of last modification:	31.08.2023
Teachers:	Mukhsinov Shamil Shavkatovich, Shoraimov Khusanboy Uktamboyevich
Component:	Elective
Cycle:	Core
ECTS:	6
Pre–requisities	Database, Programming I, 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 / Writing
Control forms:	Current control, Mid–term control, Final control
Assessment 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:	The curriculum for "SQL Programming" in the industrial and technical field focuses on methods of creating databases, principles of database management, design, and implementing modern automated information systems using SQL, aimed at training undergraduate students in software engineering.
Goal:	Basic concepts of SQL programming, basics of constructing, maintaining and using databases, principles of database design, analysis of implementation tools and basic technologies, basic concepts of SQL programming and mathematical models, data identification, processing languages, procedural extensions, transactions, management system database administration , database tools, design, development and use of database applications.
Objective:	–Understanding the fundamentals of network technologies; –studying network protocols –developing practical skills in network configuration and management; –analyzing and optimizing network performance; –troubleshooting network issues; –exploring modern trends and technologies in networking.
Learning outcome:	L1 Database design L2 Principles of setting up a connection to Microsoft SQL Server and creating databases L3 Development of schedules and constraints L4 Creating tables and constraints in SQL L5 Create selected queries. Select rows by conditions L6 Creating multi–table queries. Contact Inquiries L7 Creating queries for grouping and sorting data. Changing requests. Using built–in functions L8 Create and manage demos L9 Programming Basics with Embedded Transact–SQL on Microsoft SQL Server L10 Create, modify, apply, and delete functions and stored procedures L11 Creating, programming and managing triggers L12 Creating and managing transactions L13 Creating, using and managing cursors L14 SQL Server Security

<table>
<tr><td></td><td>L15 MS SQL Server database management.</td></tr>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–6)</td><td>24</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>6</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to SQL.
- Functions, advantages and forms of using SQL.
- Database management system Oracle Database. Syntax rules
- Data sampling language. Syntax. Queries on one table.
- Multi–table queries. Query optimization.
- Data identification language. Domains.
- Create, modify and delete master database tables.
- Indexes. Temporary tables.
- Comments, designs
- Data manipulation language. Adding new information.
- Update existing data.
- Delete existing data. Speech update.
- Data protection. Access rights management. Data security requirements.
- Access rights and transfer of rights. Revoking privileges.
- Transaction management. Data recovery. Parallelism.rverdata.</td></tr>
<tr><td>Literature:</td><td>1.Batra R. SQL Primer: an Accelerated Introduction to SQL Basics: monograph. –New York: Apress, 2018. (004 – B 30). 2.Martishin S.A., Simonov V.L., Khrapchenko M.V. Database. Practical application of SQL– and NoSQL–type DBMS for the design of information systems: textbook. allowance. – M.: ID FORUM: INFRA–M, 2019. 3.Dunaev, Vadim. Database. SQL language for students: databases and data banks. – 2nd ed., add. and processed – St. Petersburg: BHV–St. Petersburg, 2007. (004 – D 831).</td></tr>
</table>

6.23. Intelligent and Expert Systems	
Semester:	8
Date of last modification:	31.08.2023
Teachers:	Rakhimov Nodir Odilovich, Khasanov Dilmurod
Component:	Elective
Cycle:	Core
ECTS:	6
Pre–requisities	Software Systems Design
Workload:	**Types of classes** / **Hours** Total / 180 Lecture / 30 Practical 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 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:	Intelligent and expert systems course will encourage you to understand an methodologies of intelligent system development, technologies and devices, software and hardware of expert systems, building mathematical model for intelligent systems, basic network protocols, data routing processes, network software and hardware security.
Goal:	The purpose of teaching the subject – the subject of intelligent and expert systems consists of the basic knowledge that an engineer–programmer should know. Science includes such topics as goals and tasks, architecture, methods, algorithms, models and promising intelligent information systems of intelligent and expert systems.
Objective:	–understanding the fundamentals of intelligent systems development; –studying AI algorithms –developing practical skills in making a decision and management in expert systems; –analyzing and optimizing algorithms that use to predict; –collecting data and organize dataset for prediction models; –exploring modern trends and technologies in expert systems
Learning outcome:	After studying the discipline, students should be able to: LO 1. Possess knowledge of intelligent and expert systems, their creation, architecture. LO 2. Possess an understanding of the application areas and types of expert systems; LO 3. Know about the stages and methods of developing intelligent and expert systems, tools for building intelligent and expert systems, knowledge base; LO 4. Work on neural network training algorithms, Genetic algorithms LO 5. Prospects for the development of intelligent information technologies must be able to master theoretical knowledge; LO 6. Soft Computing and Computational Intelligence intellectual information technologies, theory of fuzzy sets: basic concepts and operations, basic information about artificial neural networks: acquisition of theoretical knowledge about basic concepts and types;
Teaching methods:	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: – technology of problem– and project–based learning;

<table>
<tr><td></td><td>– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
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<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–5)</td><td>20</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to intelligent and expert systems
- Architecture of intelligent and expert systems
- Application areas and types of expert systems
- Stages and methods of development of intelligent and expert systems
- Tools for building intelligent and expert systems. Knowledge base.
- Real–time expert systems.
- Methods and models of knowledge representation
- Programming languages of intelligent systems. Methods of forming a logical conclusion.
- Soft Computing and Computational Intelligence intellectual information technologies
- Theory of fuzzy sets: basic concepts and operations
- Basic information about artificial neural networks: basic concepts and types
- Algorithms for learning neural networks
- Genetic algorithms
- Prospects for the development of intelligent information technologies</td></tr>
<tr><td>Literature:</td><td>H.N. Zaynidinov, T.A. Khojaqulova, M.P. Atadjanova. Artificial intelligence. T: "Communicator" 2018. Analyz dannyx i protsesov: ucheb. posobie / A. A. Barseghyan, M. S. Kupriyanov, I. I. Kholod, M. D. Tess, S. I. Elizarov. 3–e izd., pererab. i dop. SPb.: BXV–Peterburg, 2009. Nikolaev A.B., Fominykh I.B. Intellectual analysis and processing Dannyx. Uchebnoe posobie. – M.: MADI (GTU), 2003,</td></tr>
</table>

6.24. Knowledge–based Systems	
Semester:	8
Date of last modification:	31.08.2023
Teachers:	Primqulov Oybek Dilmurot ugli, Atoyev Sukhrob Gafurovich
Component:	Elective
Cycle:	Core
ECTS:	6
Pre–requisities	Database, Introduction to Software Engineering
Workload:	**Types of classes** / **Hours** Total / 180 Lecture / 30 Practical 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 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:	The course seeks to impart an understanding of knowledge based concepts and techniques, translating requirements into knowledge models and then generating these using expert systems. Students will be provided with theoretical foundations and practical techniques to build knowledge based systems. The course is intended for informational purposes and is of interest to students as a basic approach to programming..
Goal:	The purpose of mastering the discipline is to give students theoretical knowledge about how artificial intelligence algorithms work, practical skills in developing knowledge base concepts for intelligent systems and knowledge about inference engine in expert systems.
Objective:	–understanding the fundamentals of knowledge base methodologies; –studying components of inference engine; –studying knowledge base representation methods; –analyzing and optimizing algorithms that use in expert systems; –developing knowledge base for intelligent systems; –exploring modern trends and technologies in artificial intelligence.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Understand knowledge acquisition techniques. LO 2. Understand knowledge representation methods. LO 3. Possess skills in inference techniques to improve prediction and decision support. LO 4. Design and develop expert systems using different programming languages. LO 5. Apply artificial intelligence methods such as fuzzy learning, Baye's method etc., to handle uncertainty LO 6. Use the various search mechanisms to solve a problem
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);

<table>
<tr><td></td><td>– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–5)</td><td>20</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Conceptual models of knowledge–based systems
- Logic models for program design
- Demonstration of knowledge: Wireframes
- Demonstration of knowledge: Logic models
- Demonstration of knowledge: Network models
- Demonstration of knowledge: Production model
- Consolidation of the acquired knowledge
- Neural network architectures
- Convolutional neural network
- Knowledge acquisition techniques
- Uncertainty modeling
- Knowledge systematization
- Methods for intelligent data analysis
- Tools for intelligent data analysis
- Semantic data model</td></tr>
<tr><td>Literature:</td><td>Literature 1. Russell, S. and Norvig, P. Artificial Intelligence: A Modern Approach. Third edition. Prentice Hall. 2010. Barsegyan A.A., Kupriyanov M.S., Stepanenko V.V., Holod I.I., Methods and models of data analysis: OLAP and DataMining. SPb .: BHV–Petersburg, 2004. Puppe, F. Systematic Introduction to Expert Systems: Knowledge Representations and Problem–Solving Methods. Springer. 2011. S.Haykin. Neural Networks and Learning Machines. 3rd Edition. Pearson, 2018</td></tr>
</table>

6.25. Fundamentals of action research	
Semestr:	8
Date of last modification:	31.08.2023
Teachers:	Akbarova Marguba Xamidovna, Rakhmonov Askar Tajibayevich
Component:	Elective
Cycle:	Core
ECTS:	4
Pre–requisities	Software Testing
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 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:	The course " Fundamentals of action research " focuses on a comprehensive study of the development and application of optimization methods based on mathematical modeling and various heuristic approaches.
Goal:	The purpose of the course "Fundamentals of action research " is to familiarize students with the theoretical foundations of operations research, the main types of operations research problems and methods for solving them for practical application..
Objective:	Familiarization with the main types of operations research problems and training in methods for solving them; familiarization with trends in the application of modern information systems for solving optimization problems
Learning outcome:	After studying the discipline, students should be able to: LO 1. Principles of mathematical modeling of decision–making situations. LO 2. Main classes of mathematical models and methods for making optimal decisions. LO 3. Models and methods of solving operations research problems. LO 4. Apply methods and algorithms to solve optimization problems. LO 5. Types of operations research problems, their features and properties. LO 6. Methodology of formalization and solution of operations research problems.
Teaching methods:	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: – technology of problem– and project–based learning; – technologies of educational and research activities; – communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods); – case–study method (analysis of situations); – game technologies, in which students participate in business, role–playing, simulation games; – information and communication (including distance learning) technologies. In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross–discussion", "Know–Want to Know–Learned",

<table>
<tr><td></td><td>"INSERT", hands–on activities, gamification and others are actively used during practical classes.</td></tr>
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<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>10</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>–Introduction to the Fundamentals of Action Research.
–Decision making process.
–Linear programming.
–Polygonal solution.
–Basic linear programming problem.
–Solving the problem by the simplex method.
–Transportation problems of linear programming.
–Solving the transport problem by the method of potentials.
–Introduction to Dynamic Programming.
–A general problem of dynamic programming.
–Posing the problem of resource allocation by means of dynamic programming.
–Modeling operations by Markov random processes.
–Kolmogorov equation for the continuous Markov chain probability condition.
–Game theory in decision making.
–Minimax principle.</td></tr>
<tr><td>Literature:</td><td>Literature 1. Ventcel E.C. Issledovanie operatsiy: zadachi, printsipi, metodologiya: textbook. M.:KNORUS. 2010.
2. Xodjayev T. Issledovanie operatsiy: Textbook. – T. : Aloqachi, 2007.</td></tr>
</table>

6.26. Software Requirements Analysis	
Semestr:	8
Date of last modification:	31.08.2023
Teachers:	Muhsinov Shamil Shavkatovich, Shoraimov Khusanboy Uktamboyevich
Component:	Elective
Cycle:	Core
ECTS:	4
Pre–requisities	Software Testing, Software Quality Assurance
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 / Wtiting
Control forms:	Current control, Mid–term control, Final control
Assessment 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:	Software requirements analysis course is a critical phase in the software development lifecycle that focuses on understanding and documenting the needs and expectations of stakeholders for a new or existing software system. This process aims to ensure that the final product satisfies user requirements and meets business objectives.
Goal:	The goal of the Software Requirements Analysis course is to equip students with the knowledge and practical skills necessary to effectively elicit, document, and analyze stakeholder requirements for software systems
Objective:	Study techniques for eliciting requirements, languages and models for representing requirements;– explore analysis and validation techniques, including need, goal and use–case analysis;– explain specifying and analyzing requirements for various types of systems;– study requirements documentation standards;– examine requirements in the context agile processes;– learn requirements management.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Demonstrate understanding different types of requirements, and how to properly adapt to changes in product requirements. LO 2. Effectively document and analyze clear requirements in order to drive effective software development. LO 3. Demonstrate basic skills for visualizing client requirements using low–fidelity prototypes such as wireframes and storyboards LO 4 Express requirements with the help of tools such as user stories, acceptance tests, product backlog, and story maps. LO 5. Effectively work in teams that involve skills such as organization, planning, time management and within group organization.

<table>
<tr><td>Teaching methods:</td><td>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:
– technology of problem– and project–based learning;
– technologies of educational and research activities;
– communication technologies (discussion, press–conference, brainstorming, educational debates and other active forms and methods);
– case–study method (analysis of situations);
– game technologies, in which students participate in business, role–playing, simulation games;
– information and communication (including distance learning) technologies.
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.</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th colspan="2">Type of task</th><th colspan="2">Number of points (max)</th><th>Total</th></tr>
<tr><td rowspan="3">Current control</td><td>Practical works (1–6)</td><td>24</td><td rowspan="3">40</td><td rowspan="4">100</td></tr>
<tr><td>Independent work</td><td>10</td></tr>
<tr><td>Oral presentation</td><td>6</td></tr>
<tr><td>Mid–term control</td><td>Written work</td><td colspan="2">10</td></tr>
<tr><td>Final control</td><td>Exam (Writing)</td><td colspan="2">50</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>- Introduction to the course
- Introduction to Requirements Engineering
- Requirements from the customer's perspective, Good practices for requirements engineering.
- The business analyst; Pitching the project
- Finding the voice of a user
- Requirements elicitation
- Understanding user requirements
- Documenting requirements.
- Writing excellent requiremens.
- Setting requirement priorities
- Using models to clarify requirement.
- Risk reduction through prototyping.
- Validating the requirements
- Requirements management
- Requirements for specifc project classes: agile projects, enhancement and replacemnt projects, packaged solution projects an outsources projects.</td></tr>
<tr><td>Literature:</td><td>Literature 1. Applying UML and Patterns, 3rd/Edition, Graig Larman,, Pearson. 2 Requirements Engineering: Fundamentals, Principles, and Techniques" (2nd Edition) by Klaus Pohl – 2020 3. "Challenges in Requirements Engineering: A Systematic Mapping Study" by various authors – 2021. 4. "Software Requirements 4th Edition" by Karl Wiegers and Joy Beatty – 2022</td></tr>
</table>

6.27. Individual project

Semestr:	5
Teachers:	Kerimov Komil Fikratovich
Component:	Compulsory
Cycle:	Core
Credit point:	4
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 commission, and each member of the commission evaluates the work.
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 outcome:	After studying the discipline, students should be able to: LO 1. Understand the problematic topic in the field of computer engineering. LO 2. To develop students' ability to set a specific problem and solve it. LO 3. Development of proposals and recommendations aimed at the implementation of a problematic topic. LO 4. Increase the potential of students to effectively use scientific literature, practical analytical-statistical data and other materials in scientific-practical activities.
Teaching methods:	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: - technology of problem- and project-based learning; - technologies of educational and research activities; - communication technologies (discussion, press-conference, brainstorming, educational debates and other active forms and methods); - case-study method (analysis of situations); - game technologies, in which students participate in business, role-playing, simulation games; - information and communication (including distance learning) technologies. In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross-discussion", "INSERT", "Fishbone" method, "I know, I found out, I want to know" hands-on activities, gamification and others are actively used during practical classes.
Assessment of the student's knowledge:	

Type of task	Number of points (max)	Total
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 lectures:	- Introduction to Computer Engineering - Concept of "Individual project, project activity, project culture". Goals, design tasks, problems in the modern world. 2 - Methodology and technology of project activity. Design thinking methods. - Designing the topic and problems of the project. Design concept. Relevance - evidence, validity. - Methods of determining the goal and dividing it into tasks, originality, compliance with the topic. Review of key materials on the topic. - Logic of actions and sequence of steps in personal project planning. Calculate the calendar schedule of your activity. - Information search and systematization. Information culture. Types of information sources. Information processing tools - methods, techniques, technologies. - Use of information technologies in research and project activities. Working on the Internet. Organization of work with scientific literature. Introduction to catalogs. - Communication barriers in public defense of project results. Use of information technology in research and project. Methods and forms of data submission. - Presentation of the results of the educational project. Analysis of information, implementation of the project, formation of conclusions. Prepare possible forms for presenting results. A basis for the design process. Explanation of the obtained results. - Recommendations and analysis of reported errors. Correction of defects. Search, compare, identify strengths and weaknesses of similar projects. - Initial public presentation: topic, working hypothesis, relevance, research plan, expected results, project plan.
Literature:	1. Andrew S. Tanenbaum. Computer Networks, Fourth Edition. Publisher; Prentice Hall, 2011. 2. James F. Kurose, Keith W. Ross "A Top-Down Approach: Computer Networking", 2017. Pearson Education Limited 3. Musaev M.M. "Computer systems and networks". Tashkent.: "Alokachi" publishing house, 2013. Chapter 8. 394 pages. - Guide for higher educational institutions. 4. Miryusupov Z. Z., Djumanov J. Kh. Computer networks: study guide, Muhammad Al-Khorazmi name. TATTOO. - T.: Alokachi, 2020. - 144 p.

6.28. Qualification Practice 1 (Practical Training)	
Semestr:	6
Teachers:	Kerimov Komil Fikratovich
Component:	Compulsory
Cycle:	Core
Credit point:	6
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 report on the subject of the graduation qualification work.
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 and technical staff of these enterprises. The head of the enterprise assigns the responsibility for the organization of the operation to the chief specialist or his deputy.
Learning outcome:	After studying the discipline, students should be able to: LO 1. Understand the problematic topic in the field of computer engineering. LO 2. Search for information, critically analyze and synthesize, apply a systematic approach to solving given problems. LO 3. Development of proposals and recommendations aimed at the implementation of a problematic topic. 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.
Teaching methods:	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: - technology of problem- and project-based learning; - technologies of educational and research activities; - communication technologies (discussion, press-conference, brainstorming, educational debates and other active forms and methods); - case-study method (analysis of situations); - game technologies, in which students participate in business, role-playing, simulation games; - information and communication (including distance learning) technologies. In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross-discussion", "INSERT", "Fishbone" method, "I know, I found out, I want to know" hands-on activities, gamification and others are actively used during practical classes.

<table>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th>Type of task</th><th>Number of points (max)</th><th>Total</th></tr>
<tr><td>Complete and accurate completion of the task</td><td>0-50</td><td rowspan="3">0-100</td></tr>
<tr><td>Being able to demonstrate the ability to think independently within the framework of pre-graduate work practice</td><td>0-20</td></tr>
<tr><td>To answer the given questions clearly and succinctly</td><td>0-30</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>
- The direct management of practice in enterprises is carried out by the engineering and technical staff of these enterprises. The head of the enterprise assigns the responsibility for the organization of the operation to the chief specialist or his deputy.
- Study of normative and technical literature on the topic of practice.
- Get technical safety instructions.
- Get the topics of the graduation thesis. Identifying problematic situations for graduate work. Forming a group.
- Determining the main goals and tasks of the graduate work.
- Standards for the development of a technical assignment for a graduate qualification work. Development of requirements for graduate work
- Projecting. Search and systematization of information on the topic of graduate work.
- Projecting. Creating a model on the subject of a graduate thesis.
- Analysis of information, implementation of graduation qualification work, formation of conclusions. Prepare possible forms for presenting results. Explanation of the obtained results.
- Recommendations and analysis of reported errors. Correction of defects. Search, compare, and identify strengths and weaknesses of similar graduate qualifications. Preparation of reports.
- Initial public presentation: topic, working hypothesis, relevance, research plan, expected results, thesis plan.
- Final presentation. Presentation of work carried out within the framework of pre-graduation qualification work
</td></tr>
<tr><td>Literature:</td><td>1. Project Solving Basic Technique Third edition, Fujitsu Learning Media Ltd. – 2011, 2013. –62 p. 2. Andrew S. Tanenbaum. Computer Networks, Fourth Edition. Publisher; Prentice Hall, 2011. 3. James F. Kurose, Keith W. Ross "A Top-Down Approach: Computer Networking", 2017. Pearson Education Limited 4. Musaev M.M. "Computer systems and networks". Tashkent.: "Alokachi" publishing house, 2013. Chapter 8. 394 pages. - Guide for higher educational institutions. 5. Miryusupov Z. Z., Djumanov J. Kh. Computer networks: a study guide, named after Muhammad Al-Khorazmi. TATTOO. - T.: Alokachi, 2020. - 144 p.</td></tr>
</table>

<table>
<tr><th colspan="2">6.29. Qualification Practice 2 (Pre-Graduation Work Practice)</th></tr>
<tr><td>Semestr:</td><td>8</td></tr>
<tr><td>Teachers:</td><td>Kerimov Komil Fikratovich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>Credit point:</td><td>6</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>180</td></tr>
<tr><td>Lecture</td><td>-</td></tr>
<tr><td>Practical works</td><td>-</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>180</td></tr>
<tr><td>Final assessment method</td><td>Practice Report</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>Practice Report</td></tr>
<tr><td>Final control</td><td>The report is the individual work of the student in the form of a report on the subject of the graduation qualification work.</td></tr>
<tr><td>Short content:</td><td>In modern conditions, mastering the necessary skills and experience of practical work in one's specialty and preparing for graduation work.</td></tr>
<tr><td>Goal:</td><td>The goal of pre-graduation practice is comprehensive development of all types of professional activities of students in their fields.</td></tr>
<tr><td>Objective:</td><td>The direct management of practice in enterprises is carried out by the engineering and technical staff of these enterprises. The head of the enterprise assigns the responsibility for the organization of the operation to the chief specialist or his deputy.</td></tr>
<tr><td>Learning outcome:</td><td>After studying the discipline, students should be able to:
LO 1. Understand the problematic topic in the field of computer engineering.
LO 2. Search for information, critically analyze and synthesize, apply a systematic approach to solving given problems.
LO 3. Development of proposals and recommendations aimed at the implementation of a problematic topic.
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.</td></tr>
<tr><td>Teaching methods:</td><td>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:
- technology of problem- and project-based learning;
- technologies of educational and research activities;
- communication technologies (discussion, press-conference, brainstorming, educational debates and other active forms and methods);
- case-study method (analysis of situations);
- game technologies, in which students participate in business, role-playing, simulation games;
- information and communication (including distance learning) technologies.
In order to develop critical thinking among students, such methods as "Prediction with open questions", "Cluster", "Cross-discussion", "INSERT", "Fishbone" method, "I know, I found out, I want to know" hands-on activities, gamification and others are actively used during practical classes.</td></tr>
</table>

<table>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th>Type of task</th><th>Number of points (max)</th><th>Total</th></tr>
<tr><td>Complete and accurate completion of the task</td><td>0-50</td><td rowspan="3">0-100</td></tr>
<tr><td>Being able to demonstrate the ability to think independently within the framework of pre-graduate work practice</td><td>0-20</td></tr>
<tr><td>To answer the given questions clearly and succinctly</td><td>0-30</td></tr>
</table>
</td></tr>
<tr><td>Topics of lectures:</td><td>
- The direct management of practice in enterprises is carried out by the engineering and technical staff of these enterprises. The head of the enterprise assigns the responsibility for the organization of the operation to the chief specialist or his deputy.
- Study of normative and technical literature on the topic of practice.
- Get technical safety instructions.
- Get the topics of the graduation thesis. Identifying problematic situations for graduate work. Forming a group.
- Determining the main goals and tasks of the graduate work.
- Standards for the development of a technical assignment for a graduate qualification work. Development of requirements for graduate work
- Projecting. Search and systematization of information on the topic of graduate work.
- Projecting. Creating a model on the subject of a graduate thesis.
- Analysis of information, implementation of graduation qualification work, formation of conclusions. Prepare possible forms for presenting results. Explanation of the obtained results.
- Recommendations and analysis of reported errors. Correction of defects. Search, compare, and identify strengths and weaknesses of similar graduate qualifications. Preparation of reports.
- Initial public presentation: topic, working hypothesis, relevance, research plan, expected results, thesis plan.
- Final presentation. Presentation of work carried out within the framework of pre-graduation qualification work
</td></tr>
<tr><td>Literature:</td><td>1. Project Solving Basic Technique Third edition, Fujitsu Learning Media Ltd. – 2011, 2013. –62 p. 2. Andrew S. Tanenbaum. Computer Networks, Fourth Edition. Publisher; Prentice Hall, 2011. 3. James F. Kurose, Keith W. Ross "A Top-Down Approach: Computer Networking", 2017. Pearson Education Limited 4. Musaev M.M. "Computer systems and networks". Tashkent.: "Alokachi" publishing house, 2013. Chapter 8. 394 pages. - Guide for higher educational institutions. 5. Miryusupov Z. Z., Djumanov J. Kh. Computer networks: a study guide, named after Muhammad Al-Khorazmi. TATTOO. - T.: Alokachi, 2020. - 144 p.</td></tr>
</table>

<table>
<tr><th colspan="2">6.30. Graduation qualification work</th></tr>
<tr><td>Semestr:</td><td>8</td></tr>
<tr><td>Date of last modification:</td><td>31.08.2023</td></tr>
<tr><td>Teachers:</td><td>Kerimov Komil Fikratovich</td></tr>
<tr><td>Component:</td><td>Compulsory</td></tr>
<tr><td>Cycle:</td><td>Core</td></tr>
<tr><td>Credit point:</td><td>14</td></tr>
<tr><td>Pre-requisites</td><td>–</td></tr>
<tr><td>Workload:</td><td>
<table>
<tr><th>Types of classes</th><th>Hours</th></tr>
<tr><td>Total</td><td>420</td></tr>
<tr><td>Lecture</td><td>-</td></tr>
<tr><td>Practical works</td><td>-</td></tr>
<tr><td>SAW (Student autonomous work)</td><td>420</td></tr>
<tr><td>Form of final control</td><td>State Attestation</td></tr>
</table>
</td></tr>
<tr><td>Control forms:</td><td>State Attestation</td></tr>
<tr><td>Final control:</td><td>The defense is conducted through a presentation of the completed work. The presenter is given 10 minutes, followed by time for questions from the commission members.</td></tr>
<tr><td>Short content:</td><td>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.</td></tr>
<tr><td>Goal:</td><td>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.</td></tr>
<tr><td>Objective:</td><td>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.</td></tr>
<tr><td>Learning outcome:</td><td>LO 1. 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.
LO 2. To develop and implement a research plan, including data collection, analysis, and interpretation, demonstrating the student's ability to conduct independent research.
LO 3. To identify and analyze a specific problem or question relevant to the field, proposing viable solutions or approaches.
LO 4. To enhance the student's ability to critically evaluate existing literature, theories, and practices related to the chosen topic.
LO 5. To encourage the exploration of new ideas, techniques, or approaches within the field, contributing to the advancement of knowledge or practice.
LO 6. To effectively communicate research findings and arguments in a clear, concise, and well-structured manner, both in written and oral forms.</td></tr>
<tr><td>Teaching methods:</td><td>–</td></tr>
<tr><td>Assessment of the student's knowledge:</td><td>
<table>
<tr><th>Type of task</th><th>Number of points (max)</th><th>Total</th></tr>
<tr><td>Completeness of theoretical material</td><td>0-20</td><td rowspan="3">0-100</td></tr>
<tr><td>Implementation of the practical part of the project</td><td>0-30</td></tr>
<tr><td>To answer the given questions clearly and succinctly</td><td>0-50</td></tr>
</table>
</td></tr>
</table>

Topics of lectures:	- Choosing a topic: Selecting and agreeing on a thesis topic that should be relevant, significant, and aligned with the field of study. - 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. - 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. - Preparation for defense: Preparing a presentation, thesis summary, and speech for the defense of the thesis before the committee. - 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:	1. 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., & Waters, S. (2018). Doing Your Research Project: A Guide for First-time Researchers. McGraw-Hill Education. 5. Robson, C., & 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 Integrity: A Guide for Students. University of Queensland Press.