

Module Handbook

The MSc: 70812305 – Operation and Maintenance of Hydromeliorative Systems
degree program

Mandatory

Module designation	<i>GMM 5104- Modernization of hydromelioration systems</i>
Semester(s) in which the module is taught	<i>Semester 1, 2</i>
Person responsible for the module	<i>PhD. Urinbaev Sadriddin Komilovich</i>
Language	<i>Uzbek</i>
Relation to curriculum	<i>Mandatory</i>
Teaching methods	<i>lecture, practical lesson.</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 300 hours. Auditorium hours: lecture - 60 hours; Practical training -90 hours; Self-learning -150 hours.</i>
Credit points	<i>10 credits</i>
Required and recommended prerequisites for joining the module	<i>Students must have basic knowledge in Hydraulics, pump and pumping stations, irrigation and land reclamation. Hydrotechnical facilities. Use of hydromelioration systems.</i>
Module objectives/intended learning outcomes	<p>To know and understand:</p> <ul style="list-style-type: none"> - <i>equipping hydromelioration systems with modern technologies and use of hydromelioration systems.</i> - <i>special technologies that allow reducing water wastage, modernizing water distribution processes.</i> - <i>processes of taking water from the source within a specified time and delivering it to consumers without wasting it.</i> <p>To be able to:</p> <ul style="list-style-type: none"> - <i>improvement and modernization of irrigation systems;</i> - <i>modernization of water measuring structures;</i> - <i>using modern channel systems and delivering it to customer;</i> - <i>reconstruction and improvement of irrigation networks;</i> - <i>measuring water discharge in selected areas of hydromeliorative systems.</i> <p>To form competences in:</p> <ul style="list-style-type: none"> - <i>ability to carry out the construction of water supply facilities;</i> - <i>exploitation of hydromelioration systems and their automation;</i> - <i>designing and automation channels for irrigation;</i> - <i>delivering water to consumers through irrigation networks without wasting it, drawing up and implementing water use plans;</i> - <i>cleaning channels of irrigation and drainage networks from waste and weeds;</i> - <i>hydraulic calculation of irrigation networks.</i>

<p>Content: The discipline includes following topics, level of difficulty: (1 – low, 5 high)</p>	<p>- <i>Methods of redevelopment and improvement of irrigation networks and collectors in modern hydromelioration systems.</i> <i>Level of difficulty: 2</i></p> <p>- <i>processes of modernization of hydromelioration systems, requirements for technical devices on hydromelioration systems, providing necessary devices to keep safety of hydromelioration systems.</i> <i>Level of difficulty: 2</i></p> <p>- <i>improvement of irrigation and melioration systems, to study the theories of modernization of hydromelioration systems.</i> <i>Level of difficulty: 4</i></p> <p>- <i>Finding and choosing a water source. Assessment of the quality of natural waters. Requirements for the quality for agriculture water resources. Physical, chemical and bacteriological indicators of water quality. Characteristics of groundwater. Underground water extraction facilities.</i> <i>Level of difficulty: 5</i></p>
<p>Exams and assessment formats</p>	<p>In one midterm control, 3 questions (20 minutes each) and a final exam (40 minutes) will take 60 minutes to complete 30 test questions on the computer.</p>
<p>Study and examination requirements</p>	<p>Requirements for passing the course</p> <p>The total maximum marks for the final exam 40, Midterm exam 20, homework 10 and classroom activity 10. In order to successfully pass the subject, the student must score 60 or more of the allotted points.</p>
<p>Reading list</p>	<ol style="list-style-type: none"> 1. Sherov A., Serikbayev B.S. "Gidromeliorativ tizimlarni modernizatsiyalash". Textbook. Tashkent, TIAME 2018 year, total pages - 380. 2. Sherov A. "Gidromeliorativ tizimlarni modernizatsiyalash" handbook Tashkent, TIAME, 2020 year, total pages 230 p. 3. Sherov A, Gadayev N. Methodological instruction on the science of modernization of hydromelioration systems. Tashkent – 2020, total pages 70. 4. Barayev F.A., Serikbayev B.S., Bazarov R.Kh., "Gidromeliorativ tizimlardan foydalanish", Textbook. "TIIM", 2012 year, total pages - 260; 5. Baraev F.A., Serikbaev B.S. "Gidromeliorativ tizimlardan foydalanish. Textbook. Tashkent. "TIIM", 2013 year, total pages 270. 6. Peter Waller, Muluneh Yitayew, "Irrigation and drainage engineering" Agricultural and Biosystems engineering university of Arizona (Tucson), total pages 496.

Module designation	ITM5102- Scientific Research Methodology
Semester(s) in which the module is taught	1
Responsible teacher of the module/subject, full name, degree and title	<i>Yangiev Asror Abdikhamidovich, doctor of technical sciences, professor</i>
language to be taught	<i>Uzbek, Russian, English</i>
place in the curriculum	<i>Mandatory</i>
Teaching methods	<i>Lecture, practical lesson, self-learning</i>
Study load (by types of classroom hours and independent study hours)	<i>Total load: 60 Auditorium Hours: Lecture - 20 hours; Practical training 10 hours Independent study 30 hours</i>
Number of credits allocated to science	<i>2 credits</i>
list of prerequisite subjects	<i>Soil mechanics, Grounds and foundations, Irrigation and melioration, Use of hydromelioration systems, Water-saving irrigation technologies, Hydrometry, Hydraulics, Construction mechanics, Engineering construction, Hydrotechnical constructions.</i>
Expected Learning Objectives	<p>Knowing and understanding:</p> <ul style="list-style-type: none"> - knowledge such as determining the unique features of the scientific research method and methodology, the proportionality of the scientist's intellectual, capabilities and socio-economic conditions, the creative process of setting a problem in scientific creativity and finding its solution <i>to have insights about.</i> <p>To be able to:</p> <ul style="list-style-type: none"> - to have the ability to scientifically analyze philosophical categories such as scientific research, explanation and understanding, problems and problematic situations, which are the main factors of the methodology of scientific creativity. <p>Formation of competences:</p> <ul style="list-style-type: none"> - to carry out scientific research and research in the field of science and to have an idea about scientific creativity; - to carry out scientific research and research in the field of science and to have and be able to use different conceptual approaches in the field of scientific creativity; - to conduct scientific research and research in the field of science and to have the skills of scientific creativity;

The content of science	<p><i>Subjects and tasks of the science of scientific research methodology. Science and creativity. Science is one of the oldest objects of philosophy. The concept of creativity.</i> <i>Difficulty level: 2</i></p> <p><i>Scientific research methods, Theoretical research methodology, Experimental research methodology, Field research methodology.</i> <i>Difficulty level: 2</i></p> <p><i>Modeling problems in scientific creation. Concept of "modeling". Modeling problems in scientific cognition. The role of modeling and analogy in cognition. Similarity theory. Newton's law of similarity. Geometric similarity. Kitematic and dynamic similarity terms.</i> <i>Difficulty level: 3</i></p> <p><i>Analogy of hydrodynamic processes. From the Nave-Stokes equation to the criteria Fr, Re, Sh, Ei. Dimensional theory: basic concepts and principles, dimensional formulas.</i> <i>Difficulty level: 4</i></p> <p><i>Experiment planning: purpose, factors, types of experiments, randomization. Analysis of experimental data, tasks, differentiation and integration of obtained functions, comparison. finding functional relationships, tables, graphs, interpolation and extrapolation.</i> <i>Difficulty level: 5</i></p>
Exams and assessment format	In one midterm control, 3 questions (20 minutes each) and a final exam (40 minutes) will take 60 minutes to complete 30 test questions on the computer.
Study and exam requirements	<p>Requirements for passing the course:</p> <p>The total maximum marks for the final exam 40, Midterm exam 20, homework 10 and classroom activity 10. In order to successfully pass the subject, the student must score 60 or more of the allotted points.</p>
references	<ol style="list-style-type: none"> 1. <i>Maidanov A.S. "Methodology of scientific creation", TIIM 2008 year.</i> 2. <i>Zimnyaya I.A. "Научно-исследовательская работа": methodology, theory, practical organization and implementation, 2000 year.</i> 3. <i>Rahmatullaev Sh. "Fundamental va ilmiy tadqiqotlar", 2002 year.</i> 4. <i>Sabitov R.A. "Фундаментальные научные исследования". Учебное пособие. - Челябинск, 2002.</i> 5. <i>Bakiev M., Majidov I., Nosirov B., Khojakulov R., Rahmatov M., Yangiev A. Hydrotechnical facilities. Tashkent, Intellect publishing house, 2022. 506 pages.</i>

Module designation	<i>GFA5110- Automation of hydromelioration systems</i>
Semester(s) in which the module is taught	<i>1,2</i>
Person responsible for the module	<i>PhD. Gadaev Nodirjon Nosirovich</i>
Language	<i>Uzbek</i>
Relation to curriculum	<i>Mandatory</i>
Teaching methods	<i>Lecture, practical training, coursework</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 300 hours Auditorium Hours: Lecture - 60 hours; Practical training - 90 hours; self-learning - 150 hours.</i>
Credit points	<i>10 credit</i>
Required and recommended prerequisites for joining the module	<i>Use of hydromelioration systems, design of hydromelioration systems, electronics, physics.</i>

<p>Module objectives/intended learning outcomes</p>	<p><i>To know and understand:</i></p> <ul style="list-style-type: none"> - principles of managing water resources on irrigation networks; - using electronics and arduino technologies; - calculation of hydro structures on water measuring points - calculation and measuring water discharge on different surfaces; - to facilitate the work of operational personnel in distributing water between consumers. <p><i>To be able to:</i></p> <ul style="list-style-type: none"> - Knowledge base in automation of hydromelioration systems, improvement of existing hydromelioration network; - mechanization and automation of water distribution processes; - mechanization of work in production processes; - use the basics of various automatic devices used in the field of water management and land reclamation areas; - calculation channels and their selection areas in in specific conditions, as well as the methods of developing measures to improve the conditions based on the received information; - should have the skills to apply the methods of analysis of technical events and processes in the automation of hydromelioration systems, to accept solutions to technical problems. <p><i>To form competences in:</i></p> <ul style="list-style-type: none"> - Repair and reconstruction of irrigation networks and collector drainages, use of hydromelioration systems, as well as the design and calculation of irrigation equipment and techniques, including the automation of design and calculation work; - modern water-saving innovative techniques and technologies; - professional skills and ability of authority to use nature and its resources economically and efficiently within the framework of social and economic activities, to organize accurate management of water resources and to organize their effective use in various ways, to design irrigation-melioration and other water management systems.
---	--

Content	<p>Introduction of automation of water accounting and water distribution, operation service in irrigation systems.</p> <p><i>Level of difficulty: 2</i></p> <p>Basic knowledge on automation of irrigation networks, choosing specific points to instal automatic water managing systems.</p> <p><i>Level of difficulty: 2</i></p> <p>Coding electronic devices for measuring and managing irrigation systems, adding special devices to send dates to main monitor.</p> <p><i>Level of difficulty: 4</i></p> <p>Collecting dates from all water using departments through rivers, main channel, water distributing structures and consumers. Organizing water using limit for decade, months and year. Adaptation all coding system and measuring devices for limits which was calculated.</p> <p><i>Level of difficulty: 5</i></p>
Exams and assessment formats	<p><i>In one midterm control, 3 questions (20 minutes each) and a final exam (40 minutes) will take 60 minutes to complete 30 test questions on the computer.</i></p>
Study and examination requirements	<p><i>Requirements for passing the course:</i></p> <p><i>The total maximum marks for the final exam 40, Midterm exam 20, homework 10 and classroom activity 10. In order to successfully pass the subject, the student must score 60 or more of the allotted points.</i></p>
Reading list	<ol style="list-style-type: none"> 1. Brian Wahlin, Darell Zimbelman, "Canal Automation for Irrigation Systems" ASCE Publications. USA 2014. 2. Serikbaev B, Dustnazarova S. "Use and automation of irrigation systems" handbook. Tashkent TIQXMMI, 2020. – 258 p; 3. Serikbaev B.S., Sherov A.G., Ibragimova H.R. "Gidromeliorativ tizimlarni moderinizatsiyalash", handbook. Tashkent. "TIQHMMI" 2018 year, total pages 467; 4. Baraev F.A., Serikbaev B.S. Operation and automation of the hydromelioration system. handbook. Tashkent. "TIMI", 2013 year. – total pages 270. 5. Sherov A, "Automation of hydromelioration systems". Methodical instructions for conducting practical training in science. Tashkent-2020, total pages 95. 6. Peter Waller, Muluneh Yitayew, "Irrigation and drainage engoneering" Agricultural and Biosystems engineering university of Arizona (Tucson), total pages 496.

Name of the module/subject and password in the curriculum	<i>MFO 6102 Methodology of teaching a special subject</i>
Semester in which science is taught	3
Responsible teacher of the module/subject F.I.Sh, degree and title	<i>Ismailova Zukhra Karabaevna - doctor of pedagogic sciences, Mustafaeva Durдона Asilovna - candidate of pedagogical sciences, associate professor.</i>
In which language to be taught	<i>Uzbek, Russian</i>
Its place in the curriculum	<i>Mandatory</i>
Teaching methods	<i>Lecture, practical training,</i>
Study load (by types of classroom hours and independent study hours)	<i>Total load: 60 hours Auditorium Hours: Lecture - 10 hours; Practical training - 20 hours; Independent education - 30 hours;</i>
Number of credits allocated to science	2
This is a list of prerequisite subjects	Vocational education methodology Pedagogical technologies and pedagogical skills
Expected Learning Objectives	<p>To know and understand:</p> <ul style="list-style-type: none"> - to have an idea about the educational normative documents and methodical works of a special subject teacher, their planning, organization, implementation methodology, - the structure, laws and principles of the teaching process of special subjects, the tasks of the professor and the organization of students' educational activities in the process of teaching special subjects, - methods and means of attracting students' attention and increasing the effectiveness of training. <p>To be able to:</p> <ul style="list-style-type: none"> - forms of teaching special subjects (lecture, seminar, practical, know and be able to use methods of laboratory, - independent education, course work, graduation qualification work, educational practice and production efficiency improvement, - to have knowledge and skills in the development of educational and methodological complexes of special subjects, the use of the rating system in the process of teaching special subjects, <p>To form competences in:</p> <ul style="list-style-type: none"> - drawing up the plan and technology of training in the teaching of special subjects, preparing the text of the lecture, the rules for preparing demonstration materials and multimedia, - developing projects and cases related to the specialty, - methods of conducting open trainings and formalizing documents, fully mastering the theoretical and practical concepts of the subject, - accurately reflecting the results of analysis should have the skills of independent thinking about the studied processes.
Content	<i>It is the formation of methodical professional knowledge, skills and qualifications that will help masters to overcome the difficulties that arise in the process of education and upbringing of students during their future activities in the educational system. Level of difficulty: 3</i>

	<p>To conduct general engineering, special technology and production education classes. <i>Level of difficulty: 2</i></p> <p>Formation of basic knowledge necessary for successful mastering of specialized subjects, "Pedagogical technologies and pedagogical skills". <i>Level of difficulty: 1</i></p> <p>"Methodology of professional education", "Methodology of scientific-pedagogical research" and similar subjects, education based on the methodology of teaching subjects related to their field in masters conveying to the recipients. <i>Level of difficulty: 4</i></p> <p>Monitoring and analyzing the pedagogical process, using interactive methods in place, forming the skills of preparing the technological developments of classes, developing the ability to think analytically, work with information and systematize it. <i>Level of difficulty: 2</i></p>
Exams and assessment format	One mid-term control (20 minutes) in the form of an assessment and a final oral exam (40 minutes), a short computerized test is provided
Students who will study and take the exam	Requirements for passing the course: The total maximum marks for the final exam 40, Midterm exam 20, homework 10 and classroom activity 10. In order to successfully pass the subject, the student must score 60 or more of the allotted points.
Reading list	<ol style="list-style-type: none"> 1. Ismailova Z.K., Makhsudov P.M. Ergashev O.K., Matkarimov K.J. Methodology of teaching special subjects. Study guide, T: "Navroz", 2019. 2. Akimova O.B., Ismailova Z.K., Maksudov P.M. Utkina S.N. Методика профессионального обучения. Учебное пособие Т. "Navroz", 2020. 3. Ismailova Z.K., Makhsudov P.M., Ergashev O. Methodology of teaching special subjects. Textbook. "Lesson Press" 2021.228 pages

Module designation	<i>RIT6104- Resource saving irrigation technologies</i>
Semester(s) in which the module is taught	<i>3 - semester</i>
Person responsible for the module	<i>PhD Amanov Boxodir Tukhtasinovich</i>
Language	<i>Uzbek</i>
Relation to curriculum	<i>Mandatory</i>
Teaching methods	<i>Lecture, practical training</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload:120 Auditorium hours: lecture - 30 hour; Practical training - 30 hour; Self-learning - 60 hour.</i>
Credit points	<i>4 credits</i>
Required and recommended prerequisites for joining the module	<i>Design of irrigation systems, hydraulic calculation in pipes, head loss in pipes, basic knowledge of math.</i>

Module objectives/intended learning outcomes

To know and understand:

- Scientific substantiation of the development of irrigation and land reclamation;
- theoretical foundations of resource-saving irrigation technologies, science-based categories, the laws and principles of using new, modern,
- water-saving irrigation technologies in the cultivation of agricultural crops, as well as their detailed scientific design and implementation and the ability to conduct field experiments.

To be able to:

- design and construction of resource-efficient irrigation technologies and their use,
- the development of irrigation procedures for agricultural crops in irrigation through water-saving drip, sprinkler, pulsar (soft pipe) irrigation technologies;
- know and be able to use irrigation technologies and methods, hydraulic calculation of irrigation techniques and the development of irrigation and melioration in their design;
- hydraulic calculation methods of resource-saving irrigation technologies and methods of selecting technical elements and choosing technical and economic options irrigation networks.

To form competences in:

- designing of water-saving innovative techniques and technologies, the rules of construction standards and other normative documents, the selection of modern innovative techniques and technologies, methods and elements of water-saving irrigation, finding technical and economic convenient options for irrigation networks.
- determining the hydromodule layers in irrigation systems, determining the procedure for irrigation agricultur crops, determining the elements of irrigation technology, methods and techniques, rational use of irrigation and reclamation systems, drawing up water use plans and finding economically viable options.
- use of hydromelioration systems, monitoring of hydromelioration systems carried out on the order of farms, and the development of instructions and recommendations for the rational management of irrigation and melioration systems based on scientific research.
- to analyze the state of operation of irrigation and melioration networks, to improve irrigation and melioration networks on a scientific basis, to conduct innovative scientific research in the process of improving the quality of irrigation and melioration networks, to create mathematical models of the processes of using hydromelioration systems.
- creating an idea about the main achievements, problems and prospects of their development in the relevant fields of professional activity in the field of undergraduate education;

Content	<p><i>Theoretical foundations of resource-efficient irrigation technologies, general concepts of scientifically based detailed design and construction of resource-efficient irrigation technologies and their use;</i></p> <p><i>Level of difficulty: 2</i></p> <p><i>new irrigation networks, modern, advanced water-saving irrigation technologies, suitable for each type of crop, development of irrigation procedures for agricultural crops.</i></p> <p><i>Level of difficulty: 2</i></p> <p><i>Scientific justification of irrigation technologies and methods, scientific assessment of the impact of irrigation and melioration on the developing agriculture, hydraulic calculation of irrigation techniques.</i></p> <p><i>Level of difficulty: 3</i></p> <p><i>Technical aspects of placing irrigation networks based on soil, climate, crop type and finding methods of choosing economically favourable options.</i></p> <p><i>Level of difficulty: 5</i></p>
Exams and assessment formats	<p><i>In one midterm control, 3 questions (20 minutes each) and a final exam (40 minutes) will take 60 minutes to complete 30 test questions on the computer.</i></p>
Study and examination requirements	<p><i>Requirements for passing the course:</i></p> <p><i>The total maximum marks for the final exam 40, Midterm exam 20, homework 10 and classroom activity 10. In order to successfully pass the subject, the student must score 60 or more of the allotted points.</i></p>
Reading list	<ol style="list-style-type: none"> <i>1. A. Sherov, B. Amanov. "Resurs tejamkor sug'orish texnologiyalari". Textbook. Tashkent-2022.</i> <i>2. B. Amanov. "Resource-efficient irrigation technologies". Methodical instruction. Tashkent-2022.</i> <i>3. S. Mamatov. "Suv tejamkor sug'orish texnologiyalari". Tashkent 2021 year, total pages 110.</i> <i>4. A. Sherov, B. Amanov. "Resurs tejamkor sug'orish texnologiyalari". Study guide. Tashkent-2022, total pages 120.</i> <i>5. P. Walaer. Irrigation and drainage engineering. Agricultural and Biosystems Engineering University of Arizona Tucson, Arizona, USA. 2016.</i>

Module designation	<i>MR6104- Meliorative regime</i>
Semester(s) in which the module is taught	3
Person responsible for the module	<i>PhD Amanov Bahodir Tukhtasinovich</i>
Language	<i>Uzbek</i>
Relation to curriculum	<i>Elective</i>
Teaching methods	<i>Lecture, practical training</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 120 hours; Contact hours: lecture - 30 hours; Practical training - 30 hours ; Self-learning -60 hours</i>
Credit points	4
Required and recommended prerequisites for joining the module	<i>Land reclamation monitoring in irrigated lands. Irrigation and land reclamation, basic knowledge from math and physics.</i>
Module objectives/intended learning outcomes	<p>To know and understand:</p> <ul style="list-style-type: none"> - <i>Use of hydromeliorative systems;</i> - <i>Design of collector drainage systems;</i> - <i>Calculation of water demand for crops;</i> <p>To be able to:</p> <ul style="list-style-type: none"> - <i>to have an idea about irrigation and drainage networks in man-made-disturbed agrolandscapes;</i> - <i>to know and be able to use water-salt balances and melioration regimes,</i> - <i>to have the skills to determine the productivity of irrigation water in the conditions of automorphic melioration regimes</i> <p>To form competences in:</p> <ul style="list-style-type: none"> - <i>to have the ability to use deep theoretical and practical knowledge in the field of hydromelioration systems,</i> - <i>to have ability to create new ideas and independently conduct scientific and research work, as well as the skills to work in a scientific team.</i>
Content	<p><i>Irrigation and reclamation regimes of cotton. Productivity of irrigation in conditions of semi-hydromorphic melioration regimes.</i></p> <p><i>Level of difficult:2</i></p> <p><i>Evaluation of the reclamation condition of irrigated lands and the technical condition of hydromelioration systems. The method of assessing the ecological - meliorative condition of irrigated lands.</i></p> <p><i>Level of difficult:3</i></p> <p><i>Biological and geological water-salt cycle in irrigated lands. General and private water-salt balances.</i></p> <p><i>Level of difficult:3</i></p>

Exams and assessment formats	<i>One midterm assessment (20 minutes) and one final (40 minutes) Midterm: short computer-based quizzes, Final: oral exam</i>
Study and examination requirements	<i>Requirements for passing the course: The total maximum marks for the final exam 40, Midterm exam 20, homework 10 and classroom activity 10. In order to successfully pass the subject, the student must score 60 or more of the allotted points.</i>
Reading list	<ol style="list-style-type: none"> <li data-bbox="659 492 1441 582">1. Gouri Sankar Bhunia. <i>Land Reclamation and Restoration Strategies for Sustainable Development</i> November 17, 2021 year, total pages 120. <li data-bbox="659 593 1441 660">2. Zeeshan Mustafa Maan (Author) "Reclamation of Soil Salinity By Using Control Drainage", 2010 year. <li data-bbox="659 672 1441 739">3. R.Ikromov. F.Baraev, N.M. "Meliorativ monitoring va kadastr", O'qv qo'llanma. Toshkent "TIMI" 2010 240b. <li data-bbox="659 750 1441 840">4. Sherov A., <i>Meliorativ rejim fanidan amaliy mashg'ulotlarni bajarish bo'yicha uslubiy ko'rsatma.</i> Toshkent-2020. <li data-bbox="659 851 1441 922">5. Sherov A., <i>Melioratsiya rejimi fani bo'yicha majmua.</i> Toshkent-2021.

Name of the module/subject and password in the curriculum	<i>WEIS5104 Water efficient irrigation system design</i>
Semester in which science is taught	<i>1</i>
Responsible teacher of the module/subject F.I.Sh, degree and title	<i>PhD. Amonov Bohodir Tukhtasinovich</i>
In which language to be taught	<i>Uzbek</i>
Its place in the curriculum	<i>Elective</i>
Teaching methods	<i>Lecture, practical training</i>
Study load (by types of classroom hours and independent study hours)	<i>Total workload: 120 hours; Auditorium hours: Lecture - 30 hour; Practical training - 30 hour; Self-learning - 60 hour.</i>
Number of credits allocated to science	<i>4 credits</i>
This is a list of prerequisite subjects	<i>Use of hydromelioration systems, Agricultural hydrotechnical melioration, Organization and management of hydromelioration works</i>
Expected Learning Objectives	<p><i>To know and understand:</i></p> <ul style="list-style-type: none"> - <i>The objects included in the irrigation systems, i.e., the complex of all systems from the water source to the irrigation fields, various types of structures and their elements and constructions are designed,</i> - <i>Knowledge bases in the design of irrigation systems, improvement of existing hydromelioration network,</i> - <i>mechanization and automation of water distribution processes, mechanization of work in production processes,</i> - <i>having a vision of systematically increasing the productivity of sustainable agricultural crops from meliorated areas by implementing complex water management measures.</i> <p><i>To be able to:</i></p> <ul style="list-style-type: none"> - <i>to know and be able to use the methods of arming students with the necessary knowledge to understand the development of the field of irrigation and melioration in the design of irrigation systems,</i> - <i>the service of filtering and reducing evaporation from irrigation networks, and the essence of reform processes based on ecological principles in the elimination of practical and scientific problems in the field.</i> <p><i>To form competences in:</i></p> <ul style="list-style-type: none"> - <i>the student should have the knowledge and skills to design water-saving irrigation systems and apply methods of process analysis, to accept solutions to technical problems,</i> - <i>innovative management and development of production activities in the field of irrigation;</i>

	<p>- calculation and evaluation of efficiency indicators of the use of innovative technology and technical means in water industry production;</p>
content	<p>Scientific analysis and current perspectives of the ongoing work on the introduction of resource-efficient irrigation technology. Level of difficult:3</p> <p>A scientifically based study of the impact of resource-saving irrigation technologies on the development of irrigation and melioration. Level of difficult:4</p> <p>Selection of a resource-efficient irrigation system based on soil, climate, crop type and their analysis. Level of difficult:2</p> <p>Efficiency of water use in drip irrigation. Level of difficult:1</p>
Exams and assessment format	<p>In one midterm control, 3 questions (20 minutes each) and a final exam (40 minutes) will take 60 minutes to complete 30 test questions on the computer.</p>
Students who will study and take the exam	<p>Requirements for passing the course</p> <p>The total maximum marks for the final exam (60%), Midterm exam (20%), homework (10%) and classroom activity (10%). In order to successfully pass the subject, the student must score 60% or more of the allotted points..</p>
Reading list	<ol style="list-style-type: none"> 1. A. Sherov, B. Amanov. "Resource-efficient irrigation technologies". Textbook. Tashkent-2022. 2. B. Amanov. "Resource-efficient irrigation technologies". Methodical instruction. Tashkent-2022. 3. S. Mamatov. Water-saving irrigation technologies. Tutorial. Tashkent-2021. 4. A. Sherov, B. Amanov. "Resource-efficient irrigation technologies". Study guide. Tashkent-2022. 5. P. WALLaer. Irrigation and drainage engineering. Agricultural and Biosystems Engineering University of Arizona Tucson, Arizona, USA. 2016..

Module designation	GTKX5104 Consulting service in the use of hydromelioration systems
Semester(s) in which the module is taught	2 semester
Person responsible for the module	PhD Amanov Bohodir Tukhtasinovich
Language	Uzbek
Relation to curriculum	Elective
Teaching methods	Lecture, practical training
Workload (incl. contact hours, self-study hours)	Total workload: Auditorium hours: lecture - 30 hour; Practical training - 30 hour; Self-learning - 90 hour
Credit points	4 credits
Required and recommended prerequisites for joining the module	Use of hydromelioration systems, Agricultural hydrotechnical melioration, Organization and management of hydromelioration works
Module objectives/intended learning outcomes	<p style="text-align: center;">To know and understand:</p> <ul style="list-style-type: none"> - <i>formation of theoretical and practical knowledge of master's students, knowledge of hydromelioration devices, their types, structure, application, structure and function of consulting services,</i> - <i>to have an idea and knowledge about providing advice and practical assistance in the case of objectively approaching the necessary instructions in solving important issues in the field of irrigation.</i> <p style="text-align: center;">To be able to:</p> <ul style="list-style-type: none"> - <i>to acquire new knowledge and experience in the field of irrigation, as well as the skills of providing consulting services for hydromelioration systems,</i> - <i>elimination of practical shortcomings in irrigation and melioration facilities should have the skills to choose convenient options for connecting the relationship between scientific news and theoretical knowledge of experts in this field.</i> <p style="text-align: center;">To form competences in:</p> <ul style="list-style-type: none"> - <i>scientifically based improvement of irrigation and reclamation networks,</i> - <i>methods of conducting innovative research in the process of improving the quality of irrigation and reclamation networks.</i>
Content	<p style="text-align: center;"><i>Creation of mathematical models of the processes of using hydromelioration systems. Level of difficult:2</i></p> <p style="text-align: center;"><i>To study the processes of improving hydromelioration systems in the field of specialization, to create scientifically based recommendations and to introduce them into</i></p>

	<p><i>production. Level of difficult:2</i></p> <p><i>Providing engineering design and service of hydromeliorating facilities to be repaired, reconstructed and newly built. Level of difficult:2</i></p>
Exams and assessment formats	<p><i>In one midterm control, 3 questions (20 minutes each) and a final exam (40 minutes) will take 60 minutes to complete 30 test questions on the computer.</i></p>
Study and examination requirements	<p><i>Requirements for passing the course</i></p> <p><i>The total maximum marks for the final exam (60%), Midterm exam (20%), homework (10%) and classroom activity (10%). In order to successfully pass the subject, the student must score 60% or more of the allotted points.</i></p>
Reading list	<ol style="list-style-type: none"> <i>1. Б.С.Серикбаев ва бошқалар. Практикум по эксплуатации гидромелиоративных систем, Ташкент, Мехнат, 2016.</i> <i>2. Amanov B.T. Gidromelioratsiya tizimlaridan foydalanishda konsalting xizmati fanidan o'quv qo'llanma // Toshkent TIIAME 2019, 150 bet.</i> <i>3. F. Barayev "Gidromelioratsiya tizimlaridan foydalanishda konsalting xizmati" o'quv qo'llanma. Toshkent - 2014 yil.</i> <i>4. Gidromelioratsiya tizimlaridan foydalanishda konsalting xizmati fani o'quv uslubiy majmuasining elektron versiyasi TIIAME, 2019 y.</i> <i>5. Gidromelioratsiya tizimlaridan foydalanishda konsalting xizmati fanining amaliy mashg'ulotlarini o'tkazish bo'yicha uslubiy qo'llanma, Toshkent, TIIAME, 2018 y.</i>

Module designation	<i>SYMM5104- Reclamation monitoring in irrigated lands</i>
Semester(s) in which the module is taught	<i>2nd semester</i>
Person responsible for the module	<i>PhD Amanov Baxodir Tukhtasinovich</i>
Language	<i>Uzbek</i>
Relation to curriculum	<i>Elective</i>
Teaching methods	<i>Lecture, practical training</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: Auditorium hours: Lecture - 30 hour; Practical training - 30 hour; Self-learning - 60 hour.</i>
Credit points	<i>4 credits</i>
Required and recommended prerequisites for joining the module	<i>Irrigation and land reclamation, Water conservation technologies, Reclamation regime, Engineering service in hydro-reclamation systems.</i>
Module objectives/intended learning outcomes	<p>To know and understand:</p> <ul style="list-style-type: none"> - knowing how to monitor the reclamation condition of irrigated lands in the master's degree, - various specialized equipment, calculations, design, support, basics and training from them, - Must have knowledge of irrigated land reclamation monitoring and cadastre methods. <p>To be able to:</p> <ul style="list-style-type: none"> - should have knowledge about the methods of determining the level of salinity of land and determining the norms of salt washing from this information, - should have knowledge about improvement of irrigation and reclamation systems. <p>To form competences in:</p> <ul style="list-style-type: none"> - development of methods and mechanisms of production process monitoring and quality assessment related to the creation and use of innovative information technology systems, - organizing the implementation of innovations in the field
Content	<p><i>Management of water-salt regimes of irrigated lands and organization of reclamation monitoring. Level of difficult: Methods and principles of water-salt regime monitoring in irrigated lands. Level of difficult:4</i></p> <p><i>Monitoring possibilities in the management of soil water-salt regime for high yield of agricultural products. Level of difficult:3</i></p>
Exams and assessment formats	<i>In one midterm control, 3 questions (20 minutes each) and a final exam (40 minutes) will take 60 minutes to complete 30 test questions on the computer.</i>

<p>Study and examination requirements</p>	<p><i>Requirements for passing the course</i></p> <p><i>The total maximum marks for the final exam (60%), Midterm exam (20%), homework (10%) and classroom activity (10%). In order to successfully pass the subject, the student must score 60% or more of the allotted points.</i></p>
<p>Reading list</p>	<ol style="list-style-type: none"> 1. R.K. Ikramov, G.U. Yusupov, F.A. Baraev, N.M. Karimova. "Melioration monitoring and cadastre of irrigated lands", Textbook. Tashkent "TIIM" 2010 240 p. 2. R.K. Ikramov, G.U. Yusupov, F.A. Baraev, N.M. Karimova. "Meliorative monitoring and cadastre oroshaemykh zemel", Uchebnik. Tashkent "TIIM" 2010. 240 p. 3. Ikramov R.K. Principles of water-salt regime in the Middle East and the deficit of water resources / Tr. NUMBER. - Tashkent: GIDROINGEO, 2001. -191p. 4. Gowri Sankar Bhunia. Land Reclamation and Restoration Strategies for Sustainable Development November 17, 2021. 5. Zeeshan Mustafa Maan (Author) Reclamation of Soil Salinity By Using Control Drainage. 2010.

Module designation	BMSF5104- Water use in the context of market relations
Semester(s) in which the module is taught	1st semester
Person responsible for the module	PhD Amanov Baxodir Tukhtasinovich
Language	Uzbek
Relation to curriculum	Optional
Teaching methods	Lecture, practical training
Workload (incl. contact hours, self-study hours)	Total workload: Auditorium hours: Lecture - 10 hour; Practical training - 20 hour; Self-learning - 30 hour.
Credit points	2 credits
Required and recommended prerequisites for joining the module	Hydraulics, organization of hydromelioration systems. Economics of water management, System maintenance.
Module objectives/intended learning outcomes	<p><i>To know and understand:</i></p> <ul style="list-style-type: none"> - The <i>irrigation system at the master's level includes reservoirs, natural or artificial water sources,</i> - <i>irrigation networks, fish installation facilities, sprinklers, pumping stations, irrigation, water collection - disposal,</i> - <i>drainage ditches, structures in various canal networks, irrigation and sprinkler machines,</i> - <i>water consumption management It is to have knowledge on the regulation of contractual relations of farms in the use of tools, automation equipment.</i> <p><i>To be able to:</i></p> <ul style="list-style-type: none"> - <i>To have an idea about the scientific theoretical and practical basis of using water in the conditions of market relations,</i> - <i>Know and be able to use contractual relations in the use of water,</i> - <i>They should have the skills to assess the natural conditions of "water use in the conditions of market relations" objects.</i> <p><i>To form competences in:</i></p> <ul style="list-style-type: none"> - <i>design and implementation of innovative resource-efficient irrigation and reclamation systems and technologies;</i> - <i>development of design and programming documents in the direction of innovative technologies and their use in water management in the field of irrigation and reclamation.</i>

Content	<p>Increasing the efficiency of water use in the conditions of water scarcity using the mathematical economic method. <i>Level of difficult:2</i></p> <p>Water use planning in the field. <i>Level of difficult:2</i></p> <p>Alternate use of water under market conditions. <i>Level of difficult:2</i></p>
Exams and assessment formats	<p><i>To teach graduate students how to improve water use efficiency under water scarcity conditions using mathematical economics for district irrigation departments. Promotion of alternate use of water under market conditions. Theoretical and practical significance of using automated irrigation methods and maximizing crop yields in market conditions.</i></p>
Study and examination requirements	<p><i>In one midterm control, 3 questions (20 minutes each) and a final exam (40 minutes) will take 60 minutes to complete 30 test questions on the computer.</i></p>
Reading list	<ol style="list-style-type: none"> <i>1. Barayev F.A., Serikboev B.S., Bazarov R.X. Bozor munosabatlari sharoitida suvdan foydalanish. O'quv qo'llanma. Toshkent-2012.</i> <i>2. Barayev F.A., Serikboev B.S. Sherov A.G', Shaymanov N.O. Bozor munosabatlari sharoitida suvdan foydalanish. O'quv qo'llanma. Toshkent-2014.</i> <i>3. Bozor munosabatlari sharoitida suvdan foydalanish. Amaliy mashg'ulotlarni o'tkazish bo'yicha uslubiy ko'rsatmalar. Toshkent-2011.</i> <i>4. Hailey Hirst. Water Conservation In The West. 2014.</i> <i>5. Amy Vickers. Water use conservation. 468 p. 2001.</i>

Module designation	GMT5104- Use of hydromelioration systems
Semester(s) in which the module is taught	1- semester
Person responsible for the module	Professor Sherov Anvar G'ulyamovich
Language	Uzbek
Relation to curriculum	optional
Teaching methods	Lecture, practical training
Workload (incl. contact hours, self-study hours)	Total workload: Auditorium hours: lecture - 30 hour; Practical training - 30 hour; Self-learning - 60 hour.
Credit points	4 credits
Required and recommended prerequisites for joining the module	Hydraulics. Use of pumping stations, Hydrotechnical construction and Agricultural hydrotechnical melioration, Organization and management of hydromelioration works
Module objectives/intended learning outcomes	<p style="text-align: center;"><i>To know and understand:</i></p> <ul style="list-style-type: none"> - obtaining the planned amount of water consumption from the irrigation source during the intended period of time with the help of hydrotechnical facilities, - delivering it to consumers through irrigation networks without wasting it, drawing up and implementing water use plans, cleaning the channels of irrigation and drainage networks from waste and weeds, - a special comprehensive measure against water wastage - development of activities in a scientifically based manner and their implementation. <p><i>To be able to:</i></p> <ul style="list-style-type: none"> - management of irrigation networks, implementation of water measurement and distribution, irrigation techniques and their use; - master's students should know and be able to use the methods of implementing irrigation works by choosing the most economical irrigation method based on the preparation of a water use plan for the cultivation of agricultural crops grown on irrigated lands. <p><i>To form competences in:</i></p> <ul style="list-style-type: none"> - should have the skills to determine the hydromodule of irrigation in irrigation systems, determine the procedure for watering agricultural crops, determine the elements of irrigation technology, - techniques, know how to use irrigation and melioration systems rationally, draw up water use plans and find technical and economic options.

Content	<p><i>The requirements include current capital leveling of land surfaces, accounting of water consumption given to water consumers. Level of difficult:2</i></p> <p><i>Installation of water consumption measurement equipment, their use and improvement, introduction of automation. Level of difficult:2</i></p> <p><i>Telemechanization, computerization systems, development of modern irrigation techniques and technologies, and formation of skills for its reconstruction. Level of difficult:2</i></p>
Exams and assessment formats	<p><i>In one midterm control, 3 questions (20 minutes each) and a final exam (40 minutes) will take 60 minutes to complete 30 test questions on the computer.</i></p>
Study and examination requirements	<p><i>Requirements for passing the course</i></p> <p><i>The total maximum marks for the final exam (60%), Midterm exam (20%), homework (10%) and classroom activity (10%). In order to successfully pass the subject, the student must score 60% or more of the allotted points.</i></p>
Reading list	<ol style="list-style-type: none"> <i>1. B.S. Serikboev, A.G.Sherov <i>Gidromelioratsiya tizimlaridan foydalanish</i>, Toshkent, TIIAME, 2018 y.</i> <i>2. A.G.Sherov, B.S. Serikboev va boshqalar. <i>Operatsion gidromelioratsiya tizimi</i>. Toshkent, TIIAME. 2020.</i> <i>3. GMTF fanining o`quv uslubiy majmuasining elektron varianti. 2020.</i> <i>4.Гидромелиоратив тизимларни автоматлаштириш. Фанидан амалий ммашгулотларини бажариш бўйича услубий кўрсатма.Тошкент-2020 йил.</i> <i>5. <i>Gidromelioratsiya tizimlaridan foydalanish bo'yicha amaliy va kurs loyihalarini amalga oshirish bo'yicha o'quv qo'llanma</i>, Toshkent, TIIAME, 2018 y.</i>

Module designation	<i>Engineering hydraulics</i>
Semester(s) in which the module is taught	1
Person responsible for the module	<i>The doctor of philosophy in technical sciences. Otakhanov M. Y.</i>
Language	<i>Uzbek</i>
Relation to curriculum	<i>Elective</i>
Teaching methods	<i>Lecture, practical training</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload:120 hours Auditorium Hours: Lecture – 30 hours; Practical training - 30 hours Self-study – 60 hours</i>
Credit points	<i>4 credits</i>
Required and recommended prerequisites for joining the module	<i>Physics, Mathematics, Hydrometry, Terrestrial Hydrology, Theoretical Mechanics, Hydraulics</i>
Module objectives/intended learning outcomes	<p><i>To know and understand:</i></p> <p><i>-about the theoretical information developed on the laws of water flow hydrotechnical structures, such as irrigation canals, water blocking and damping structures, water distribution structures in canals, culverts, sluices, dams, water connection structures, water hammer extinguishing structures;</i></p> <p><i>To be able to:</i></p> <p><i>- perform hydraulic calculations and justify design parameters in the design of irrigation canals, water blocking and damping structures, water distribution structures in canals, culverts, sluices, dams, water connection structures, water hammer extinguishing structures:</i></p> <p><i>To form competences in:</i></p> <p><i>- the correct assessment and design of hydraulic processes in hydrotechnical structures, to solve the problems encountered, the most important thing, they will have the basic competencies necessary to be competitive in their field, profession.</i></p>
Content	<p><i>The content of the subject is to teach students the theories and hydraulic processes developed on the laws of water flow in hydrotechnical structures such as irrigation canals, water blocking and damping structures, water distribution structures in canals, culverts, sluices, dams, water connection structures, water hammer extinguishing structures, water assessment of the impact of water flow on hydrotechnical structures, performing hydraulic calculations in their design, forming knowledge, skills and abilities in solving the problems of justifying the most optimal hydraulic parameters. Level of difficult:2</i></p>

Exams and assessment formats	One midterm (30 minutes) and final oral exam (60 minutes), short computerized test, written homework and self- study
Study and examination requirements	<p>Requirements for successfully passing the module</p> <p>The total maximum score will be the sum of the points allocated to the final exam (60%), Midterm (24%), homework (24%) and classroom activity (12%). In order to successfully pass the subject, a student must score 60% or more of the allotted points.</p>
Reading list	<p>A.M.Арифжанов. Гидравлика. Тошкент 2022.</p> <p>А.Л. Зуйков. Гидравлика. Том 2. Напорные и открытые потоки. Гидравлика сооружений. Москва 2017.</p> <p>И.В. Качанов. Гидравлика, гидрология, гидрометрия. Минск 2017.</p> <p>Н. В. Васильева. Гидравлика гидравлические расчеты открытых потоков и сооружений. Горки 2022.</p> <p>А.Арифжанов, Қ.Рахимов, А.Ходжиев Гидравлика. Тошкент. ТИМИ 2016й. – 189б.</p> <p>А.Арифжанов, Х.Файзиев, А.Тошхўжаев «Гидравлика», Тошкент, Фан ва технология, 2019й. -366 б.</p> <p>Латипов К.Ш., Арифжанов А.М., Файзиев Х «Гидравлика», Тошкент, ТАҚИ, 2015 й. -459 б.</p> <p>Melvyn Kay “Practical Hydraulics”, Taylor & Francis, 2008y. -253 pages.</p> <p>T.Kaletova, A.Arifjanov “Hydromechanika”, Nitra, 2019y, - 160 pages.</p> <p>А.М.Арифжанов, П.Н.Гурина, Т.У.Апакхужаева “Гидравлика”, Тошкент, ТИҚХММИ, 2018г, -171 с.</p>

Module designation	<i>GTT-3205, Geoinformation Systems and Technologies</i>
Semester(s) in which the module is taught	<i>1 semester</i>
Person responsible for the module	<i>Professor Pulatov A.S.</i>
Language	<i>English</i>
Relation to curriculum	<i>Selective</i> <i>This module is shared with other study programme</i>
Teaching methods	<i>Lectures and seminars</i>
Workload (incl. contact hours, self-study hours)	<i>(Estimated) Total workload: 150 hours</i> <i>Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 20 hours lectures and 40 seminars</i> <i>Private study including examination preparation, specified in hours¹: 90 hours</i>
Credit points	<i>5 credit points</i>
Required and recommended prerequisites for joining the module	<i>Geography, Cartography</i>

<p>Module objectives/intended learning outcomes</p>	<p>To know and understand:</p> <ul style="list-style-type: none"> - The main object of this module is to enable the geoinformation system in the field of water management to analyze data, - study problems, solve and assess situations, and to form appropriate knowledge and skills in geographic information systems. <p>To be able to:</p> <ul style="list-style-type: none"> - Geoinformation Systems and Technologies are to organize the data of the geo-information system of water management, - to collect, store, manage, process, analyze and describe spatial-geographical data, and based on them to prepare a database necessary in all areas of the national economy, - to determine the most effective ways to improve land use, to improve card evaluation and economic justification methods and to identify ways to increase their efficiency. <p>To form competences in:</p> <ul style="list-style-type: none"> - to gain an understanding of map projection and georeferencing, geographic data visualization, global positioning systems, and spatial data infrastructure, - knowledge and ability to use ArcCatalog and ArcMap computer programs, - should have the skills to perform geometric correction and geolinking of images, vector and raster operations.
<p>Content</p>	<p>Introduction to GIS, concepts and tasks of GIS. Data models. Datums and Georeferencing. Level of difficulty:2 Map projections. Visualization of geographic data. Geovisualization and map types. Level of difficulty:3</p>
<p>Exams and assessment formats</p>	<p>Two Midterm assessments (80 minutes each) and one final exam (80 minutes), take-home written assignments</p>
<p>Study and examination requirements</p>	<p>Requirements for successfully passing the module The final grade in the module is composed of 60% performance on exams, 20% take-home assignments, 20% in-class participation. Students must have a final grade of 60% or higher to pass</p>
<p>Reading list</p>	<p>Chang K.T., 2011. Introduction to Geographic Information Systems. Fourth Edition. McGRAW – HILL International Edition.</p>

Module designation	<i>Water cadastre. Integrated water resources management</i>
Semester(s) in which the module is taught	1
Person responsible for the module	<i>Senior Teacher, Mamatov Sobitjon</i>
Language	<i>Uzbek, Russian</i>
Relation to curriculum	<i>Selection</i>
Teaching methods	<i>Lecture, practical lesson, self-learning</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 60 Contact hours: lecture - 10, practical lessons – 20, self-learning – 30, hours</i>
Credit points	2
Required and recommended prerequisites for joining the module	<i>Hydrology; Hydrogeology; Irrigated agriculture; water saving technologies;</i>

<p>Module objectives/intended learning outcomes</p>	<p>To know and understand:</p> <ul style="list-style-type: none"> - <i>water resource accounting systems,</i> - <i>distribution of water structures - rivers, lakes, reservoirs and glaciers in the world and Central Asia,</i> - <i>surface and groundwater reserves and resources, operational water resources,</i> - <i>Hydrometric network designed to account for River Water Resources, use of local streams and protection of water facilities,</i> - <i>fundamentals of Integrated Water Resource Management, international problems in cross-border Water Resource Management.</i> <p>To be able to:</p> <ul style="list-style-type: none"> - <i>forecasts for the return of juicy and low periods in water sources,</i> - <i>Short-and long-term predictions of river flow,</i> - <i>monthly data on the amount of precipitation in the winter period and an assessment of the wateriness of its rivers for the growing season,</i> - <i>images of the study of winter precipitation, snow reserves, methodological foundations public participation for the assessment of annual renewable aquaculture resources.</i> <p>To form competences in:</p> <ul style="list-style-type: none"> - <i>calculation of the water balance in natural and artificial water bodies,</i> - <i>hydrological - quality assessment of collected river waters by hydrochemical indicators,</i> - <i>assessment of potential exploitation resources of groundwater by Trunk river basins,</i> - <i>predicting river flow changes due to people's economic activities,</i> - <i>drawing up a water use plan.</i>
---	---

Content	<p><i>Understanding of the water cadastre, goals and tasks. Main goals and objections, working with legal documents about water cadastre Uzbekistan. Level of difficulty: 4;</i></p> <p><i>Surface water resources. Allocation of water bodies in Central Asia - rivers, lakes, reservoirs and glaciers. Level of difficulty: 5;</i></p> <p><i>Underground water resources. Exploitable and potentially exploitable underground water reserves. Level of difficulty: 5;</i></p> <p><i>River water resource accounting is a hydrometric network that accounts for river water resources. Level of difficulty: 5;</i></p> <p><i>The catchment area of the river. Level of difficulty: 4</i></p> <p><i>The natural hydrological regime of rivers. Level of difficulty: 4</i></p> <p><i>Hydrometric information, annual flow of rivers, flow rates, return of wet and dry periods. Level of difficulty: 4</i></p> <p><i>Short and long-term river flow forecasts. Level of difficulty: 3</i></p> <p><i>Measurements, winter precipitation, snow storage images, methodology for estimating annual renewable water resources. Level of difficulty: 4</i></p> <p><i>Assessment of long-term variability of water resources. Level of difficulty: 5;</i></p> <p><i>Statistical descriptions of surface water quality, river water quality. Level of difficulty: 5;</i></p> <p><i>Methodological basis of the evaluation of the operational reserve of underground water, assessment of the potential operational reserve of underground water in the main river basins. Artificial supply or establishment of underground water. Level of difficulty: 5;</i></p> <p><i>Use of water resources, general information about water management facilities, use of surface and underground water. Level of difficulty: 5;</i></p> <p><i>Water resources and their future use. Predicting changes in river flow due to human economic activities. Level of difficulty: 4;</i></p> <p><i>Hydrological annals. Hydrological prediction. Level of difficulty: 4;</i></p> <p><i>Modern sources of hydrological and hydrogeological information. Conditions for organizing monitoring of hydrological studies, water resources cadastre - a collection of hydrological data on surface and underground waters. Level of difficulty: 5;</i></p> <p><i>Introduction to integrated water resources management. Important issues of integrated management of water resources. Level of difficulty: 4;</i></p> <p><i>Implementation of integrated management of water resources. Development of a strategic vision in the integrated management of water resources. Level of difficulty: 5;</i></p> <p><i>Water resources management planning. Water resources management planning cycle. Level of difficulty: 4;</i></p> <p><i>Activating the water resources management planning process. Development of a work plan for integrated management of water resources. Level of difficulty: 5;</i></p> <p><i>Participation of interested parties in the development of the work plan for integrated management of water resources. Level of difficulty: 4;</i></p> <p><i>Situation analysis in the process of planning water resources management. Analysis of the state of water resources in the process of water resources management planning. Level of difficulty: 5;</i></p> <p><i>Water resources management strategy and options.</i></p>
---------	---

Exams and assessment formats	<p><i>During one semester, MSc students answered two oral questions (midterm assessments), with each question lasting 5 minutes. They collected a total of 60 points, evenly distributed with 30 points for the first set of questions and 30 points for the second set.</i></p> <p><i>Additionally, there was a final exam for MSc students, which lasted 40 minutes. There were short computer-based quizzes, and MSc students could collect up to 40 points.</i></p>
Study and examination requirements	<p><i>During one semester, MSc students answered two oral questions (midterm assessments), with each question lasting 5 minutes. They collected a total of 60 points, evenly distributed with 30 points for the first set of questions and 30 points for the second set.</i></p> <p><i>Additionally, there was a final exam for MSc students, which lasted 40 minutes. There were short computer-based quizzes, and MSc students could collect up to 40 points.</i></p>
Reading list	<ol style="list-style-type: none"> <i>1. R. Quentin Grafton, Karen Hussey Water Resources Planning and Management Cambridge University Press Cambridge, UK, 2011. 249 r.</i> <i>2. Salokhiddinov A.T., Ikromov R.K., Temirova M.N. Water resources management. Handbook. Tashkent, 2015 - 246 p.</i> <i>3. Saloxiddinov A.T., Raximov N.R. Fundamentals of integrated water resources management. 2018 y. 136 b.</i> <i>4. Water is a critical resource for Uzbekistan UN Uzbekistan 2005-102p.</i>

Module designation	The impact on the environment evaluation
Semester(s) in which the module is taught	3
Person responsible for the module	<i>Phd, Razzakov Ruslan, Shipilova Kamila.</i>
Language	<i>Uzbek, Russian</i>
Relation to curriculum	<i>Selection</i>
Teaching methods	<i>Lecture, practical lesson, self-learning</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 120 Contact hours: lecture - 30, practical lessons – 30, self-learning – 60, hours</i>
Credit points	4
Required and recommended prerequisites for joining the module	<i>To master the course, Bachelor Students must have basic knowledge in chemistry, physics, ecology and environmental protection, engineering geodesy, geology and hydrogeology."</i>
Module objectives/intended learning outcomes	<p>To know and understand:</p> <ul style="list-style-type: none"> - <i>To know the natural conditions and properties of environmental components, changes in the environment's state, the nature, scope, and significance of impacts, the scheme for determining the importance of impacts;</i> - <i>To evaluate and make decisions about the impact on the environment with role of assessment in the decision-making system</i> <p>To be able to:</p> <ul style="list-style-type: none"> - <i>Knows the natural conditions and properties of environmental components, changes in the state of the environment, the nature, scale and significance of impacts, the scheme for determining the significance of impacts;</i> - <i>Make decisions about the environmental impact using the assessment in the decision-making system.</i> <p>To form competences in:</p> <ul style="list-style-type: none"> - <i>analyzes the compliance of pre-project stages and post-project stages with the general principles of EIA;</i> - <i>conducts monitoring and environmental audit using regulations and results of strategic environmental assessment and strategic assessment;</i> - <i>applies the norms of national legislation in the field of villages</i>

<p>Content: The discipline includes the following topics. The level of difficulty: (1 – low, 5 high):</p>	<p><i>Basics of Environmental impact assesment. The purpose, objectives and main directions of the science of Environmental impact assesment. Level of difficulty: 4</i></p> <p><i>Basic concepts and principles of environmental impact assessment basic principles of environmental impact assessment: primacy, complexity, democracy. Level of difficulty: 5</i></p> <p><i>General outline of the environmental impact assessment process. Elements of the environmental impact assessment process. Community involvement and consideration of alternatives. Level of difficulty: 5</i></p> <p><i>The initial stages of the environmental impact assessment process. Methods and procedures for selecting projects for impact assessment definition of impact assessment tasks. Methods for determining significant effects. Level of difficulty: 3</i></p> <p><i>Forecasting and assessment of the significance of environmental impact characteristics of the state of the environment: description of natural conditions and environmental components Level of difficulty: 3</i></p> <p><i>Consultations and public participation in the environmental impact assessment process. The concept of public participation. The concept of "public" refers to public groups. Level of difficulty: 5</i></p> <p><i>Consideration of alternative options for the project (activity) in the process of environmental impact assessment Level of difficulty: 2</i></p> <p><i>Documentation of environmental impact assessment and quality control. Level of difficulty: 4</i></p> <p><i>Environmental impact assessment and decision-making Level of difficulty: 5</i></p> <p><i>Post-project stages of environmental impact assessment Level of difficulty: 2</i></p> <p><i>Strategic environmental impact assessment. Purpose and subject of strategic environmental impact assessment Level of difficulty: 3</i></p> <p><i>Environmental impacts resulting from agricultural activities and ways to reduce them Level of difficulty: 3</i></p> <p><i>Environmental impact as a result of water management activities and ways to reduce them Level of difficulty: 5</i></p> <p><i>Ecosystem services. Stimulation of ecosystem services (EXR): principles, types of schemes, international experience</i></p> <p><i>Environmental audit. Principles, procedure, methodology of environmental audit (EA), international experience Level of difficulty: 3</i></p>
<p>Exams and assessment formats</p>	<p><i>Two written midterm assessments (30 minutes each), take-home written assignments and one final oral exam (40 minutes).</i></p>
<p>Study and examination requirements</p>	<p><i>Requirements for successfully passing the module:</i></p> <p><i>The final grade in the module is composed of 60% performance on exams, 20% take-home assignments, 20% in-class participation. Students must have a final grade of 60% or higher to pass</i></p>

Reading list

1. Saloxiddinov A.T. va b. *Atrof muhitga bo'ladigan ta'sirni baholash.* – Toshkent: Chinor ENK, 2013.
2. Ветошкин А.Г. *Инженерная защита атмосферы от вредных выбросов. Учебно-практическая пособия.* Инфра-инженерия Москва-Вологда 2016 й.
3. Кудрящева О.В., Ледащева Т.Н. «*Методика и практика оценки воздействия на окружающую среду*» М-2014.
4. Anji Reddy Mareddy. *Environmental impact assesment Theory and Practice Book-2018*
<https://www.sciencedirect.com/book/9780128111390/environmental-impact-assessment#book-description>
5. John Glasson, Riki Therivel and Andrew Chadwick *Introduction to Environmental Impact Assessment Third Edition* Taylor & Francis e-Library ISBN 0-415-33837-9. USA, 2005 289 r. *Ecological Hazards.* Wessex Institute of Technology UK, 2015. 277 r.

Module designation	<i>SRF-4204 Multi purposes water resources use</i>
Semester(s) in which the module is taught	2
Person responsible for the module	<i>Docent Ravshan Boyirov Senior lecturer Sobit Mamatov</i>
Language	<i>Uzbek, Russian</i>
Relation to curriculum	<i>Selection</i>
Teaching methods	<i>Lecture, practical lesson, self-learning</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 120 Contact hours: lecture - 30, practical lessons – 30, self-learning – 60, hours</i>
Credit points	4
Required and recommended prerequisites for joining the module	<i>To master the course, Bachelor Students must have basic knowledge in chemistry, physics, ecology and environment muchithic muchophase, engineering Geodesy, geology and hydrogeology.</i>
Module objectives/intended learning outcomes	<p>To know and understand:</p> <ul style="list-style-type: none"> - <i>general principles of develop schemes of multipurpose water use,</i> - <i>calculate total water resources of river basins;</i> - <i>estimate water demand of different water users,</i> - <i>calculate water use budget;</i> <p>To be able to:</p> <ul style="list-style-type: none"> - <i>predict future water demand of different water users;</i> - <i>estimate water resources of different probability;</i> - <i>estimate effective water resources;</i> - <i>estimate return flow of agriculture, rural settlements, industry and power stations</i> - <i>develop water saving and return water reuse measures</i> <p>To form competences in:</p> <ul style="list-style-type: none"> - <i>ability to collect and analyze historical data on a river flow, groundwater flow, and precipitation,</i> - <i>ability to collect and analyze demographic data</i> - <i>ability to collect and analyze statistical data on industrial product</i> - <i>ability to collect data on crop types, sown area and yields and water requirements, power generation</i> - <i>ability to analyze water use budgets and develop recommendations how to meet demand with limited existing water resources</i> - <i>ability to select proper water saving and water conservation measures to be able to meet future needs of different water users</i> - <i>ability to allocate water between different water uses</i> - <i>ability to develop water use plans for different water uses</i> - <i>ability to predict impact of river flow regulation on downstream</i>

<p>Content: The discipline includes the following topics. The <i>level of difficulty</i>: (1 – low, 5 high):</p>	<p><i>Hydrosphere, its components. The movement of water in it, water reserves and resources. Level of difficulty: 3</i></p> <p><i>The water resources of the globe, their distribution by continent. Quantitative descriptions of water. Level of difficulty: 2</i></p> <p><i>The water requirements of the participants of the aquatic complex and the turn of their water supply. Level of difficulty: 4</i></p> <p><i>Municipal, industrial enterprises, energy, agricultural and livestock water farm complex: Level of difficulty: 1</i></p> <p><i>Measures for the effective use of Water Resources in irrigated agriculture and their implementation: Level of difficulty: 4</i></p> <p><i>Water economy balance. Drawing up and analyzing the balance of the water economy of the river basin: Level of difficulty: 4</i></p> <p><i>The current basis for the management and use of Water Resources. Water Resources Management and use system in Uzbekistan: Level of difficulty: 5</i></p> <p><i>Global climate change. Impact of climate change on water resources and water use: Level of difficulty: 5</i></p> <p><i>Water resources of Uzbekistan - their current use and problems. Water Resources Planning: Level of difficulty: 3</i></p> <p><i>Basin water management. Basin institutions and their responsibilities. Basin water organizations (BVOs). Examples: Level of difficulty: 4</i></p> <p><i>Water in 2050, 2100. Water resources in 2050, 2100. Water demand in 2050, 2100. Roadmap: Level of difficulty: 5</i></p>
<p>Exams and assessment formats</p>	<p><i>During one semester, MSc students answered two oral questions (midterm assessments), with each question lasting 5 minutes. They collected a total of 60 points, evenly distributed with 30 points for the first set of questions and 30 points for the second set.</i></p> <p><i>Additionally, there was a final exam for MSc students, which lasted 40 minutes. There were short computer-based quizzes, and MSc students could collect up to 40 points.</i></p>
<p>Study and examination requirements</p>	<p><i>MSc Students must have a final grade of 60% or higher to pass</i></p>
<p>Reading list</p>	<ol style="list-style-type: none"> <i>1. Valiev X.I., Murodov Sh.O., Xolboev B. “Suv resurslaridan mukammal foydalanish va muxofaza qilish”, Darslik. T. Fan va texnologiya, 2010. - 167 b.</i> <i>2. Mamatov S.A. va boshqalar. Kichik daryolar suv resurslarini mukammal boshqarish va ulardan oqilona foydalanish. Toshkent, 2014 - 76 b.</i> <i>3. R.Quentin Grafton, Karen Hussey “Water resources planning and management”, London 2011, Cambridge University Press p. 423</i> <i>4. Diane Arjoon, Amory Tillmant and Markus Herrmann. Sharing water and benefits in transboundary river basins. hydrol. Earth Syst. Nauk, 20, 2135–2150, 2016.</i> <i>5. Grafton R.K., Hussey K. Planning and management of water resources. The Cambridge University Express. 2011.</i>

Module designation	<i>Improve Water Quality</i>
Semester(s) in which the module is taught	<i>1</i>
Person responsible for the module	<i>Ashirova Olga Aleksandrovna, Associate Professor, PhD</i>
Language	<i>Uzbek, Russian</i>
Relation to curriculum	<i>Elective</i>
Teaching methods	<i>Lecture, practical exercise, additional training</i>
Workload (incl. contact hours, self-study hours)	<i>Total load: 60 Audience hours: Lecture-10 hours; Practical training 20 hours Independent Education 30 hours</i>
Credit points	<i>2 credits</i>
Required and recommended prerequisites for joining the module	<i>Engineering Geodesy, fundamentals of Geology and hydrogeology, pumping and pumping stations, hydraulics.</i>

<p>Module objectives/intended learning outcomes</p>	<p>To know and understand:</p> <ul style="list-style-type: none"> - methods for assessing and analyzing the quality of natural water and the basic methods of its preparation for domestic drinking water supply, technological and livestock needs; - the essence of the processes of clarification and discoloration of water, the types and designs of structures used, the basis for their calculation; - methods of water disinfection, removal of odors and tastes; - basic requirements and principles for the layout of water clarification, decolorization and disinfection stations; - the main directions of scientific research work on the development and modernization of natural and wastewater treatment systems; <p>To be able to:</p> <ul style="list-style-type: none"> - assess the quality of natural waters, determine the required degree of purification, select the optimal treatment technology and consist of facilities; - evaluate the efficiency of the water treatment plant as a whole and its individual facilities; - use regulatory, reference, scientific and technical literature and relevant computer software; - analyze the economic efficiency of engineering projects and enterprise activities. <p>To form competences in:</p> <ul style="list-style-type: none"> - basic modern methods of calculation and design of structures, carry out technical drawings using modern computer programs; - skills in performing verification calculations of existing structures; - modern requirements and methods of carrying out necessary water protection measures; - methods for calculating economic indicators of environmental management and water use projects; - the main tools for quality management at all stages of the product life cycle.
<p>Content: The discipline includes the following topics. The <i>level of difficulty</i>: (1 – low, 5 high):</p>	<p>Introduction to the Science of Water quality Improvement. Concepts of improving the natural waters quality and special water treatment. Water filtration and disinfection. <i>Level of difficulty</i>: 2</p> <p>Special water treatment. Waste water treatment. Determining the concentration and level of purification of waste water. Waste water treatment methods. <i>Level of difficulty</i>: 4</p> <p>Method of mechanical treatment of wastewater. Biological and Physico-chemical methods of wastewater treatment. Disinfection of waste water. <i>Level of difficulty</i>: 2</p>
<p>Exams and assessment formats</p>	<p><i>To fully master the theoretical and methodological concepts related to science, be able to correctly reflect the results of the analysis, independently observe about the processes being studied and carry out tasks and tasks assigned in intermediate forms of control, submit a written work on final control.</i></p>

Study and examination requirements	<p><i>Students of successful transition from science</i></p> <p><i>The maximum points to be summed will consist of the final exam (40%), the interval control (60%), the sum of the points to be separated. To successfully pass the subject, the student must score 60% of the allocated points and a higher one in it.</i></p>
Reading list	<ol style="list-style-type: none"> 1. <i>Djalilova A. Y., Khamidov A. O., Abdukodirova M. N. textbook on the subject" Sewage and wastewater treatment". Tashkent - 2012 y -200 pages.</i> 2. <i>Makhmudova I. M., Akhmedova T. A. "Fundamentals of assessing and correcting the quality of natural and wastewater." textbook, TIIM 2008.- 1616.</i> 3. <i>Abukadirova M. N., Radkevich M. V., Shipilova K. B. textbook "sewage and wastewater treatment", T.2021-240 s</i> 4. <i>Mackenzie L. Davis. Water and Wastewater Engineering: Design Principles and Practice. McGraw-Hill Education: New York,2010-356p.</i>

Module designation	DTU-5104 Methods of Field Research
Semester(s) in which the module is taught	2

Person responsible for the module	Khamidov Muhammadkhan Khamidovich professor
Language	Uzbek
Relation to curriculum	Compulsory
Teaching methods	lecture, practical training and seminar
Workload (incl. contact hours, self-study hours)	Total workload: 120 Contact Hours: Lecture - 30 hours; Exercise - 30 hours Self-learning - 60 hours
Credit points	4
Required and recommended prerequisites for joining the module	Methodology of scientific research, Reconstruction of hydromelioration systems, Automation of hydromelioration systems, Water-saving irrigation technologies
Module objectives/intended learning outcomes	<p>To know and understand:</p> <ul style="list-style-type: none"> - <i>in the conditions of global climate change, increasing water scarcity, limited irrigated land and water resources, rational management of water resources, their effective use,</i> - <i>effective use of hydromelioration systems, and improvement of the melioration conditions of irrigated land, modern GIS uses computer technologies and mathematical methods to predict the duration of wind erosion,</i> - <i>should have skills such as high-precision digital laboratory equipment in field research, mathematical modeling of the research process.</i> <p>To be able to:</p> <ul style="list-style-type: none"> - <i>general rules for field experiments, selection of pilot plots for field experiments, hydromelioration systems and their reliability,</i> - <i>methods and technologies of crop irrigation, saline soils and their washing technologies,</i> - <i>melioration activities on soils prone to salinity and erosion.</i> <p>To form competences in:</p> <ul style="list-style-type: none"> - <i>to have the skills to take into account the type of soil, water-physical properties, meliorative condition during the experiment, to increase the COP of hydromeliorating systems,</i> - <i>knowledge of scientific irrigation methods of crops, water-saving irrigation technologies, conducting field experiments on saline and eroded lands; coefficient of use of water resources.</i>

Content	<p><i>Introduction to the methodology of conducting field experiments. Subject, purpose and tasks of science. General rules for field experience. Lysimetric experiments. Level of difficulty: 3</i></p> <p><i>Studying the order of Groundwater. Conducting field experiments and research in salty lands. Experiments on irrigation procedures. Level of difficulty: 4</i></p> <p><i>Experiments on irrigation technologies. Phenological observations and various calculations in field experiments. Methods of determining and calculating crop yields. Level of difficulty: 2</i></p> <p><i>Determination of COP and reliability of irrigation systems. Features of conducting field experiments on soils prone to erosion. Level of difficulty: 2</i></p>
Exams and assessment formats	<p><i>Two midterm assessments (20 minutes each) and one final (40 minutes) Midterms: short computer-based quizzes, Final: oral exam</i></p>
Study and examination requirements	<p><i>Requirements for successfully passing the module</i></p> <p><i>the final grade in the module is composed of 40%, Midterm in the module is composed 50%, 10% take-home assignments</i></p> <p><i>Students must have a final grade of 60% or higher to pass</i></p>
Reading list	<ol style="list-style-type: none"> <i>1. Khamidov M.Kh., Soliev B.K., Mukhamedov A.K. «Scientific research works in melioration and irrigated agriculture ». Handbook. Tashkent, TIMI. 2011-176 pages.</i> <i>2. Nurmatov Sh.N, Mirzajonov Q.M. and others. – "Methods of conducting field experiments ». Methodological handbook. Tashkent 2007, 147 pages</i> <i>3. Isabaev A. Fundamentals of scientific research. Methodological instruction. Tashkent, TIAME 2010</i> <i>4. Khamidov M.Kh., Begmatov I.A., Isaev S.Kh., Mamatov S.A. "Water-saving irrigation technologies" Handbook. Tashkent, TIMI, 2015. 243 page.</i>

Module designation	SENS5104 Moisture conservation technologies in irrigated lands
Semester(s) in which the module is taught	2
Person responsible for the module	PhD. Bekmirzaev Gulom Toshpulatovich
Language	Uzbek
Relation to curriculum	Optional
Teaching methods	Lecture, practical training
Workload (incl. contact hours, self-study hours)	Total workload: Auditorium hours: Lecture - 30 hour; practical training - 30 hour; self-learning - 60 hour.
Credit points	4
Required and recommended prerequisites for joining the module	Landscape irrigation, Water-saving irrigation technologies.
Module objectives/intended learning outcomes	<p>To know and understand:</p> <ul style="list-style-type: none"> - To have an idea about the full and effective use of land, the regular increase of soil fertility, - productivity and the yield of agricultural crops through irrigation, - the implementation of land reclamation in connection with high-yield agrotechnical measures. <p>To be able to:</p> <ul style="list-style-type: none"> - know and be able to use the design of hydromelioration systems, the construction of irrigation networks, - the design of hydraulic calculations and cuts of irrigation equipment. <p>To form competences in:</p> <ul style="list-style-type: none"> - should have the skills to improve the health of the lands in saline areas, develop new lands, design, build, operate and repair hydromelioration systems, - manage irrigation networks, find technical and economic options for carrying out water measurement and distribution works in them.
Content	<p><i>The subject, tasks and directions of the science "Moisture conservation technologies in irrigated lands" and the requirements for it. Level of difficulty: 3</i></p> <p><i>Basic information about irrigation. The essence, forms and types of irrigation. Level of difficulty: 2</i></p> <p><i>The impact of irrigation on the external environment. Irrigation systems, their elements and functions. Level of difficulty: 1</i></p> <p><i>Components of irrigation networks and their functions. Soils of Uzbekistan. Level of difficulty: 5</i></p>

	<p><i>Soil types and water-physical properties. Soil-ameliorative conditions of Uzbekistan and demand for irrigation. Methods of maintaining moisture in the soil. Level of difficulty: 2</i></p> <p><i>Importance of moisture preservation technologies in Uzbekistan. Application of moisture conservation technologies in the cultivation of agricultural crops. Level of difficulty: 3</i></p>
Exams and assessment formats	<p><i>In one midterm control, 3 questions (20 minutes each) and a final exam (40 minutes) will take 60 minutes to complete 30 test questions on the computer.</i></p>
Study and examination requirements	<p><i>Requirements for passing the course</i></p> <p><i>The total maximum marks for the final exam (60%), Midterm exam (20%), homework (10%) and classroom activity (10%). In order to successfully pass the subject, the student must score 60% or more of the allotted points.</i></p>
Reading list	<ol style="list-style-type: none"> <i>1. Khamidov M.Kh., Mamataliyev A.B. Irrigation and reclamation. Study guide. Tashkent. 2019. 210 p.</i> <i>2. Mamataliyev A.B. Land reclamation, recultivation and protection. Textbook. -Tashkent: "ILM-ZIYO-ZAKOVAT" publishing house, 2019. -230 pages.</i> <i>3. Khamidov M.Kh., Shukurlaev K.I., Lapasov K.O. Instruction manual on practical training in "Agricultural hydrotechnical melioration". -Tashkent: TIMI, 2014. -320 pages.</i>

Module designation	<i>MYR-5104 Reclamation and land reclamation</i>
Semester(s) in which the module is taught	2
Person responsible for the module	<i>Professor Khamidov Mukhammadxon Khamidovich</i>
Language	<i>Uzbek</i>
Relation to curriculum	<i>Optional</i>
Teaching methods	<i>Lecture, practical training, seminar and course project</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 240 Auditorium Hours: Lecture - 60 hours; Practical training - 60 hours Self-education - 120 hours</i>
Credit points	4
Required and recommended prerequisites for joining the module	<i>Scientific Research Methodology, Reclamation Soil Science, Hydromelioration Systems Research, Geoinformation Systems in Irrigation and Reclamation.</i>
Module objectives/intended learning outcomes	<p><i>To know and understand:</i></p> <ul style="list-style-type: none"> - <i>to have an idea of the work to be done in the implementation of the system of recultivation of lands damaged by anthropogenic and natural influences,</i> - <i>improvement of land reclamation conditions of different categories.</i> <p><i>To be able to:</i></p> <ul style="list-style-type: none"> - <i>knowledge of water management measures, methods of water resources and soil protection, preservation and restoration of soil fertility in land reclamation and recultivation.</i> <p><i>To form competences in:</i></p> <ul style="list-style-type: none"> - <i>types of reclamation and recultivation, their design, construction and use,</i> - <i>repair-restoration and reconstruction,</i> - <i>scientific knowledge in the field of reclamation and recultivation - Must have research skills.</i>

<p>Content</p>	<p><i>General concepts of melioration and land recultivation. Types of agricultural land. Level of difficulty: 3</i></p> <p><i>Soil monitoring and reclamation of agricultural lands. Salinity of irrigated lands in the republic. Water-physical properties of soils of irrigated lands. Level of difficulty: 2</i></p> <p><i>Tasks of reclamation depending on natural and climatic conditions. Irrigation melioration. Irrigation systems. Watering methods. Conditions, advantages and disadvantages of using surface, sprinkler, drip, subsurface and aerosol irrigation. . Level of difficulty: 2</i></p> <p><i>Elements of irrigation technology. Irrigation networks. Their water consumption. Control of land reclamation conditions. Ameliorative cadastre. Water and salt balance equations of irrigated lands and their elements. . Level of difficulty: 5</i></p> <p><i>Salt wash. Reclamation regimes of irrigated lands and methods of their management. Innovative solutions to the problems of land reclamation. . Level of difficulty: 3</i></p> <p><i>Integrated management of water resources. General concepts about land reclamation. Objects of reclamation, natural state. Classification of disturbed lands. Stages of reclamation. Agrosystems. . Level of difficulty: 1</i></p> <p><i>Issues to be solved in land recultivation. Objects and directions of reclamation. The content of works performed depending on the directions of recultivation and the requirements for the technical stage of recultivation. . Level of difficulty: 4</i></p> <p><i>Activities of the biological stage of reclamation. Activities of the biological stage of recultivation for agricultural purposes. Level of difficulty: 2</i></p>
<p>Exams and assessment formats</p>	<p><i>Assessment consists of two mid-term tests (20 minutes) and a final test (40 minutes) per semester.</i></p> <p><i>Mid-term tests are short computerized tests, and the final test is an oral exam.</i></p>
<p>Study and examination requirements</p>	<p><i>Requirements for passing the course. Total maximum points for the final exam (40%), Mid-term tests (50%), homework-presentations (10%) in each semester. To pass the subject successfully, the student must score 60% or more of the allotted points.</i></p>
<p>Reading list</p>	<ol style="list-style-type: none"> <i>1. Khamidov M., Botirov Sh., Hamidov A. "Melioration and land recultivation" Textbook. T.: 2021, 299 p.</i> <i>2. Khamidov M., Isabaev K. Hamidov A. "Land reclamation and land reclamation" Instructional manual. T.: 2022, 256 p</i> <i>3. Golovanov, A.I. Reclamation narushennix zemel [Electronic resource], Moscow, 2008.</i> <i>4. Stekolnikov K.E., Gasanova E.S. "Melioration and recultivation of land". Uchebnoe posobie. Voronezh, 2015.</i> <i>5. S.A. Kasimbetova, A.I. Dolidudko, G.T. Akhmedjanova, Land recultivation and protection. Methodological instruction. Tashkent. 2014.</i>

Module designation	<i>STST 5104 Water economical technologies</i>
Semester(s) in which the module is taught	1
Person responsible for the module	<i>Professor Matyakubov Baxtiyor Shamuratovich</i>
Language	<i>Uzbek</i>
Relation to curriculum	<i>Optional</i>
Teaching methods	<i>Lectures and practical exercises</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 120 hours. Auditorium Hours: Lecture - 30 hours; Practical training - 30 hours; Self-learning - 60 hours.</i>
Credit points	4
Required and recommended prerequisites for joining the module	<i>Introduction to mathematics, physics, water management and reclamation science, soil science, geology and hydrogeology, mathematical modeling, hydraulics, ecology, GTI, organization of hydroreclamation works, improvement of natural conditions, agricultural hydrotechnical reclamation, irrigation and reclamation, irrigation reclamation, etc.</i>
Module objectives/intended learning outcomes	<p>To know and understand:</p> <ul style="list-style-type: none"> - <i>in the design of water-saving innovative techniques and technologies, the rules of construction standards and other normative documents,</i> - <i>the selection of modern innovative techniques and technologies, methods and elements of water-saving irrigation,</i> - <i>finding technical and economic convenient options for the placement of irrigation networks.</i> <p>To be able to:</p> <ul style="list-style-type: none"> - <i>knowledge of the basics of "Water-saving irrigation technologies (STST)" at a high level,</i> - <i>know how to apply the theoretical and practical knowledge gained in the field in practice,</i> - <i>formation of a methodological approach to the field and a scientific outlook.</i> <p>To form competences in:</p> <ul style="list-style-type: none"> - <i>determining the hydromodule of irrigation in irrigation systems, determining the procedure for watering agricultural crops, irrigation technology,</i> - <i>determining the elements of methods and techniques, rational use of irrigation and melioration systems,</i> - <i>drawing up water use plans and finding technical and economic favorable options</i>

Content	<p><i>In the use of hydromelioration systems, the monitoring of hydromelioration systems carried out on the order of farms and the development of instructions and recommendations for the rational management of irrigation and melioration systems based on scientific research Level of difficulty: 2</i></p> <p><i>Analysis of irrigation and land reclamation networks, scientifically based improvement of irrigation and land reclamation networks Level of difficulty: 4</i></p>
Exams and assessment formats	<p><i>Since there are two semesters, there are four midterms (30 minutes each) and a final oral exam (60 minutes), computerized or written.</i></p>
Study and examination requirements	<p><i>Students who successfully pass the subject (in both semesters):</i></p> <p><i>The total maximum score will be the sum of the points allocated to the final exam (60%), the Midterm (20%) and the classroom activity (20%). In order to successfully pass the subject, a student must score 60% or more of the allotted points.</i></p>
Reading list	<ol style="list-style-type: none"> <i>1. Mamatov S.A., Khamrayev Sh.R., Karshiyev R.J., Zaks I.A., Burkhonjonov B.Sh. "Fundamentals of water-saving irrigation technologies". Tashkent-2022, Info Capital Books. 382 p.</i> <i>2. Khamidov M.Kh., Begmatov I.A., Isaev S.Kh., Mamatov S.A. "Water-saving irrigation technologies" Instructional manual. T.: TIMI, 2015, 232 p.</i> <i>3. Khamidov M.Kh., Begmatov I.A., Isaev S.Kh., Mamatov S.A. "Water-saving irrigation technologies", Study guide. T., TIIM printing house, 2015. 243 pages.</i> <i>4. Khamidov M.Kh., Shukurlaev X.I., Mamataliev A.B. "Agricultural hydrotechnical melioration". Textbook. T. East, 2009, 379 pages.</i> <i>5. Mamatov S.A. "Drip irrigation system". Manual. T. "Mehridarya", 2012, 80 pages.</i>

Module designation	<i>MYR-5104 Reclamation and land reclamation</i>
Semester(s) in which the module is taught	2
Person responsible for the module	<i>Professor Khamidov Mukhammadxon Khamidovich</i>
Language	<i>Uzbek</i>
Relation to curriculum	<i>Optional</i>
Teaching methods	<i>Lecture, practical training, seminar and course project</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 240 Auditorium Hours: Lecture - 60 hours; Practical training - 60 hours Self-education - 120 hours</i>
Credit points	4
Required and recommended prerequisites for joining the module	<i>Scientific Research Methodology, Reclamation Soil Science, Hydromelioration Systems Research, Geoinformation Systems in Irrigation and Reclamation.</i>
Module objectives/intended learning outcomes	<p><i>To know and understand:</i></p> <ul style="list-style-type: none"> - <i>to have an idea of the work to be done in the implementation of the system of recultivation of lands damaged by anthropogenic and natural influences,</i> - <i>improvement of land reclamation conditions of different categories.</i> <p><i>To be able to:</i></p> <ul style="list-style-type: none"> - <i>knowledge of water management measures, methods of water resources and soil protection, preservation and restoration of soil fertility in land reclamation and recultivation.</i> <p><i>To form competences in:</i></p> <ul style="list-style-type: none"> - <i>types of reclamation and recultivation, their design, construction and use,</i> - <i>repair-restoration and reconstruction,</i> - <i>scientific knowledge in the field of reclamation and recultivation - Must have research skills.</i>

<p>Content</p>	<p><i>General concepts of melioration and land recultivation. Types of agricultural land. Level of difficulty: 3</i></p> <p><i>Soil monitoring and reclamation of agricultural lands. Salinity of irrigated lands in the republic. Water-physical properties of soils of irrigated lands. Level of difficulty: 2</i></p> <p><i>Tasks of reclamation depending on natural and climatic conditions. Irrigation melioration. Irrigation systems. Watering methods. Conditions, advantages and disadvantages of using surface, sprinkler, drip, subsurface and aerosol irrigation. . Level of difficulty: 2</i></p> <p><i>Elements of irrigation technology. Irrigation networks. Their water consumption. Control of land reclamation conditions. Ameliorative cadastre. Water and salt balance equations of irrigated lands and their elements. . Level of difficulty: 5</i></p> <p><i>Salt wash. Reclamation regimes of irrigated lands and methods of their management. Innovative solutions to the problems of land reclamation. . Level of difficulty: 3</i></p> <p><i>Integrated management of water resources. General concepts about land reclamation. Objects of reclamation, natural state. Classification of disturbed lands. Stages of reclamation. Agrosystems. . Level of difficulty: 1</i></p> <p><i>Issues to be solved in land recultivation. Objects and directions of reclamation. The content of works performed depending on the directions of recultivation and the requirements for the technical stage of recultivation. . Level of difficulty: 4</i></p> <p><i>Activities of the biological stage of reclamation. Activities of the biological stage of recultivation for agricultural purposes. Level of difficulty: 2</i></p>
<p>Exams and assessment formats</p>	<p><i>Assessment consists of two mid-term tests (20 minutes) and a final test (40 minutes) per semester.</i></p> <p><i>Mid-term tests are short computerized tests, and the final test is an oral exam.</i></p>
<p>Study and examination requirements</p>	<p><i>Requirements for passing the course. Total maximum points for the final exam (40%), Mid-term tests (50%), homework-presentations (10%) in each semester. To pass the subject successfully, the student must score 60% or more of the allotted points.</i></p>
<p>Reading list</p>	<ol style="list-style-type: none"> <i>1. Khamidov M., Botirov Sh., Hamidov A. "Melioration and land recultivation" Textbook. T.: 2021, 299 p.</i> <i>2. Khamidov M., Isabaev K. Hamidov A. "Land reclamation and land reclamation" Instructional manual. T.: 2022, 256 p</i> <i>3. Golovanov, A.I. Reclamation narushennix zemel [Electronic resource], Moscow, 2008.</i> <i>4. Stekolnikov K.E., Gasanova E.S. "Melioration and recultivation of land". Uchebnoe posobie. Voronezh, 2015.</i> <i>5. S.A. Kasimbetova, A.I. Dolidudko, G.T. Akhmedjanova, Land recultivation and protection. Methodological instruction. Tashkent. 2014.</i>

Module designation	<i>STST 5104 Water economical technologies</i>
Semester(s) in which the module is taught	1
Person responsible for the module	<i>Professor Matyakubov Baxtiyor Shamuratovich</i>
Language	<i>Uzbek</i>
Relation to curriculum	<i>Optional</i>
Teaching methods	<i>Lectures and practical exercises</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 120 hours. Auditorium Hours: Lecture - 30 hours; Practical training - 30 hours; Self-learning - 60 hours.</i>
Credit points	4
Required and recommended prerequisites for joining the module	<i>Introduction to mathematics, physics, water management and reclamation science, soil science, geology and hydrogeology, mathematical modeling, hydraulics, ecology, GTI, organization of hydroreclamation works, improvement of natural conditions, agricultural hydrotechnical reclamation, irrigation and reclamation, irrigation reclamation, etc.</i>
Module objectives/intended learning outcomes	<p>To know and understand:</p> <ul style="list-style-type: none"> - <i>in the design of water-saving innovative techniques and technologies, the rules of construction standards and other normative documents,</i> - <i>the selection of modern innovative techniques and technologies, methods and elements of water-saving irrigation,</i> - <i>finding technical and economic convenient options for the placement of irrigation networks.</i> <p>To be able to:</p> <ul style="list-style-type: none"> - <i>knowledge of the basics of "Water-saving irrigation technologies (STST)" at a high level,</i> - <i>know how to apply the theoretical and practical knowledge gained in the field in practice,</i> - <i>formation of a methodological approach to the field and a scientific outlook.</i> <p>To form competences in:</p> <ul style="list-style-type: none"> - <i>determining the hydromodule of irrigation in irrigation systems, determining the procedure for watering agricultural crops, irrigation technology,</i> - <i>determining the elements of methods and techniques, rational use of irrigation and melioration systems,</i> - <i>drawing up water use plans and finding technical and economic favorable options</i>

Content	<p><i>In the use of hydromelioration systems, the monitoring of hydromelioration systems carried out on the order of farms and the development of instructions and recommendations for the rational management of irrigation and melioration systems based on scientific research Level of difficulty: 2</i></p> <p><i>Analysis of irrigation and land reclamation networks, scientifically based improvement of irrigation and land reclamation networks Level of difficulty: 4</i></p>
Exams and assessment formats	<p><i>Since there are two semesters, there are four midterms (30 minutes each) and a final oral exam (60 minutes), computerized or written.</i></p>
Study and examination requirements	<p><i>Students who successfully pass the subject (in both semesters):</i></p> <p><i>The total maximum score will be the sum of the points allocated to the final exam (60%), the Midterm (20%) and the classroom activity (20%). In order to successfully pass the subject, a student must score 60% or more of the allotted points.</i></p>
Reading list	<ol style="list-style-type: none"> <i>1. Mamatov S.A., Khamrayev Sh.R., Karshiyev R.J., Zaks I.A., Burkhonjonov B.Sh. "Fundamentals of water-saving irrigation technologies". Tashkent-2022, Info Capital Books. 382 p.</i> <i>2. Khamidov M.Kh., Begmatov I.A., Isaev S.Kh., Mamatov S.A. "Water-saving irrigation technologies" Instructional manual. T.: TIMI, 2015, 232 p.</i> <i>3. Khamidov M.Kh., Begmatov I.A., Isaev S.Kh., Mamatov S.A. "Water-saving irrigation technologies", Study guide. T., TIIM printing house, 2015. 243 pages.</i> <i>4. Khamidov M.Kh., Shukurlaev X.I., Mamataliev A.B. "Agricultural hydrotechnical melioration". Textbook. T. East, 2009, 379 pages.</i> <i>5. Mamatov S.A. "Drip irrigation system". Manual. T. "Mehridarya", 2012, 80 pages.</i>