TEACHING SUBJECTS IN DEPARTMENT

Teaching subjects in department

№	Item Title	Briefly about the subject
For bachelor’s courses		
1.	Hydrotechnical structures	The main purpose of the subject is to teach students the main directions of scientific and technical development in the field of hydrotechnical structures, all types of hydrotechnical structures used in various fields of water management, their constructions, their operating conditions, the basis of calculation and design, the design of hydrotechnical structures and their application in practice is to create skills.
2.	Reliability of hydraulic structures	In order to ensure the reliability and safety of using hydraulic structures, it is necessary to have knowledge of the professional profile in assessing the reliability of hydraulic structures in operation, determining safety criteria and safety categories, factors determining the safety of hydraulic structures. facilities, as well as organizing the technical condition and safe operation of existing reservoirs and large hydropower networks, developing skills and competencies.
3.	Safety of hydrotechnical installations	The Law of the Republic of Uzbekistan "On the Safety of Hydrotechnical Structures" and other legal documents for the students of the science of safety of hydraulic structures, the assessment of the reliability of the hydraulic structures in operation in ensuring the reliability and safety of the use of hydraulic structures, the determination of safety criteria and safety categories, determining the safety of hydraulic structures factors and organization of control (monitoring) of technical condition and safe operation of existing water reservoirs and large hydroelectric networks. Principles of automation of control-measuring equipment, analysis of service life of hydrotechnical structures and study of factors causing failures. Filtration and turbidity processes occurring in canals and measures against them. Use of water reservoirs, flood reservoirs and floodplains, drawing up schedules for their filling and emptying, as well as composition and sequence of observations in reservoirs, floodwater reservoirs and floodplains. The main problems in the use of water reservoirs and large hydroelectric units. Studying the opening height and water flow capacity of the water outlet in the reservoir. Safety assessment of hydrotechnical facilities in dangerous situations, concept of their safety criteria.

4.	Calculation of hydrotechnical structures	The purpose of teaching science is to teach students the main directions of scientific and technical development in the field of hydrotechnical structures, the types, constructions, their working conditions, calculation and design bases of all hydrotechnical structures used in various fields of water management, and the design of hydrotechnical structures and hydroelectric units, and is to form the skill of applying them in practice.
5.	Hydrotechnical constructions. Technologies and devices of pumping stations	The main purposes of teaching this subject - technical-economic comparison in the selection of hydro-technical structures in agriculture and water economy construction, design and construction of hydro-technical structures, types, and constructions of pumps and pumping stations, principles of operation of pumping devices and stations, pipeline communication, station buildings, types of machine water lifting hydro-technical nodes and to know and be able to use the characteristics and use of hydro-technical structures and hydromechanical and hydro energetic equipment included in them. In addition, they should have the skills to effectively the project of hydrotechnical structures, the method of calculation of construction, modern design, reconstruction, and construction methods of hydro-technical structures, the implementation of water management calculations, the selection of the number of working pumps and the type of pumps, the choice of electric motors, the operation of the devices of pumping stations and their technical and economic evaluation to have the skills to identify indicators, design and build pumping stations, repair and reconstruct pumping station equipment.
6.	Digital technologies in hydrotechnical structures	The purpose of this subject: - the use of digital technologies in water management, the advantages of using them, the purpose of using digital technologies and possible achievements in the future; - application of BIM, integration of BIM programs and programs in the design, construction and operation of hydrotechnical structures; - 2D, 3D, 4D, 5D, 6D dimensions of BIM in the design and construction of hydrotechnical structures. The difference between them. Smart materials, technologies and applications; - digital technologies, water volume and level monitoring sensors, online monitoring, automation of gates in automating operation of HydSts; - Installation and use of automated devices in HydSts, systems for ensuring seismic safety of the dam. In addition, students would have the skills and understanding of digital technologies that can be used in the design, construction and operation of various hydrotechnical structures, the design and development of BIM programs and their integration into BIM, introduction of automated digital technologies using HydSts, online monitoring technologies of water measurement, automatic control of valves, online monitoring of CMIs in the use of various hydrotechnical facilities, analysis of sensor readings.

7.	Use of hydrotechnical structures	The main purpose of teaching students of this subject is: - that students have an idea about the operating modes of hydrotechnical structures; - that students have an understanding of the operation of hydrotechnical facilities; - students' knowledge of hydrotechnical structures, their working conditions. - to know the main directions of scientific and technical development of students in the field of operation of hydrotechnical facilities; - students' knowledge and ability to use control and measuring instruments used during the use of hydrotechnical facilities. - students to acquire skills in identifying defects and damages of hydrotechnical structures and their components, repairing them, operating in operation service.
8.	Introduction to hydrotechnical Engineering	The main goal of science is the role of hydrotechnical structures in water management for students; knowledge of the basic principles of assessment of natural conditions (relief, geology, hydrogeology, climatic conditions, availability of local building materials, etc.) is the formation of skills and competences. The task of the subject is to teach students the methods of calculation and design of hydrotechnical constructions; impact of hydrotechnical structures on the environment, technical and economic factors, operation (use), conditions of construction works; introducing the principles of designing joints and individual structures on the river, taking into account the complex use of water resources; the main directions of scientific and technical development in the construction of hydrotechnical structures, the wide production of prefabricated constructions, the principles of unification and industrialization of construction, technical aesthetics, architecture and their role in the design and construction of hydrotechnical structures; is to teach students how to use the acquired knowledge in practice to solve problems arising in the construction of hydrotechnical structures.

9.	Repair of hydraulic facilities	The main purpose of teaching students of this subject is: • Students' knowledge of the types of damage to hydrotechnical structures and their repair features, types of repair and restoration; • to know the procedures for determining the necessary expenses of students according to the types of repair of hydrotechnical structures, their deadlines, their financing, and the procedure for hiring them after repair; • students' knowledge of methods and technologies of repair of ground hydraulic structures and their structural elements; • students' knowledge of repair methods and technologies of concrete hydrotechnical structures and their structural elements; • students should know the types and schemes of reconstruction of hydrotechnical structures according to their type • that students have an understanding of the repair and reconstruction of various hydrotechnical structures; • students' knowledge of repair technology of various hydrotechnical structures; • students know the technicaleconomic justification of whether the hydrotechnical facility is suitable for future use or needs reconstruction; • students should know about the ability to use repair technology of various hydrotechnical structures. • students' knowledge of the methods of repair and reconstruction of various hydrotechnical structures;
10.	Use of geoinformation systems in hydrotechnical structures	The main objective of this subject is to provide students with an understanding of information and data concepts and data sources in GIS (Global Geodatabases) and their use, watershed development methods, technologies and software, in the proposed dam creation. determination and analysis of reservoir parameters, monitoring and calculation of evaporation and infiltration processes in reservoirs on a GIS platform. In addition, they should have the skills to effectively use GIS programs in the construction of flood and water reservoirs and their operation, the measurement of water consumption in rivers and canals and the monitoring of changes in their banks, and other hydrotechnical processes. take Effective use of the Geoinformation System platform in studying, analyzing, developing predictions and making decisions about natural processes related to hydraulic engineering based on remote sensing data and field observation (geodesic measurement and other) data.

11.	Soil mechanics and foundation.	The purpose of teaching the subject is to teach students the types, structures, mechanical, water and physical properties of soils, calculation of subsidence and displacement of soils under the influence of loads falling from above, types of surfaces, deep and pile foundations, their calculation and design, in accordance with the profile of the direction is the formation of knowledge, skills and competence. In addition, students are taught the nature and types of soils, the solid particles and granularity of soils, the structure of soils, the determination of soil moisture at the upper plasticity limit and moisture at the lower plasticity limit, the main physical, mechanical, and water properties of soil, the design of floors and foundations, and their requirements. Checking the priority of individual foundations to displacement and overturning. Design of shallow foundations. Determining the dimensions of the foundation. Classification of piles and pile foundations, calculation methods. Calculating the bearing capacity of piled foundations and determining the number of piles. Foundations to be built on highly permeable loess soils. Deep foundations. Artificial grounds. Methods of soil replacement, compaction and hardening.
12.	Engineering construction	The task of science is to teach students to analyze their constructive solutions in the construction, repair and reconstruction of water management and building structures, as well as to independently and rationally solve technical and economic problems that arise. It is the formation of knowledge, skills and abilities suitable for the profile of the course on teaching students the basics of designing and calculating the constructions of buildings and structures in the water management and reclamation system based on modern requirements and advanced technologies.
13.	Engineering constructions and nature protection structures	The science of calculation methods of engineering constructions, the main requirements for them in the design of engineering constructions, the rational use of current regulatory documents in their construction and use, various types of engineering constructions and their fields of application, physical and mechanical properties of the main materials used in the construction of engineering constructions and structural elements teach them stress states under the influence of external loads. In addition, students will be able to form the ability to design water management buildings and structures, use progressive design methods in the design of water management buildings and structures and improve their constructive solutions, use modern building materials in the construction and reconstruction of water management buildings and structures.

14.	Use of hydrotechnical structures in canals	the structure of the service for the use of hydrotechnical facilities in the channel; - to have an idea about the working modes of hydrotechnical structures in the canal; - to have an understanding of the operation of hydrotechnical facilities; - knowledge of hydrotechnical structures, their working conditions. - To know the main directions of scientific and technical development in the field of operation of hydrotechnical facilities in the channel; - To know and be able to use the control and measuring instruments used during the use of hydrotechnical facilities in the channel. - must have the skills to identify defects and damages of hydrotechnical structures in the channel and their elements, repair them, and operate in the service of operation.
15.	Architecture	The purpose of teaching the subject is to form students' knowledge, skills and competence in the field of architectural design basics, design principles and methods, in accordance with the profile of the direction. Estimating creativity as a human creative activity in building perfect and beautiful structures and complexes. In addition, its role in the training of bachelors and masters in this direction. Decisions of the government on the development of republican architecture and water management.
16.	Dynamics of flood in channel. Regulation of channel.	The main goal of teaching science is to teach students about the natural processes in the riverbed, the discharges in it, their types, movement, determining their quantity in field conditions, the order of the flow in the rivers, the construction of the flow plan, the curves and straight sections of the river. study of flow movement Classification of rivers (S.T.Altunin, E.Danelia, Velikanov) hydromorphological expressions, forces affecting the solid particles lying at the bottom, distribution of discharges along the river section. Covering the upper reaches of hydroelectric dams and reservoirs with discharges, riverbed processes in the lower reaches and their calculation, information about floods and flood flows, determining the basic parameters of floods. Drainage structures, their classification, constructions: longitudinal dams, transverse dams, permeable, impermeable, combined dams: methods of their calculation, determination of the depth of local washing at the head of the dam, silting of structures located in the foothills and calculation, mastering the spacing of dams and its effect on the flow, designing symmetrically located structures, studying the operation of flow-directing systems, the schemes of adjustment of the river: using longitudinal, transverse and mixed dams , strengthening the banks of rivers, fighting against floods, protecting the banks from washing, the design of constructions of structures to divert the flow in the desired direction, based on modern requirements and advanced technologies.

17.	Calculation of hydrotechnical structures	The purpose of teaching science is to teach students the main directions of scientific and technical development in the field of hydrotechnical structures, the types, constructions, their working conditions, calculation and design bases of all hydrotechnical structures used in various fields of water management, and the design of hydrotechnical structures and hydroelectric units, and is to form the skill of applying them in practice.

List of subjects taught by master's majors

1	Scientific research in hydrotechnical structures	The main goal of scientific research in hydraulic engineering is to teach undergraduates to analyze various problems encountered in the field of hydraulic engineering, to think independently, to model hydraulic engineering structures, to plan, to conduct research, to randomize experiments, to analyze the obtained results and to be able to use them in their professional activities.

2	Hydrotechnical structures against floods	in-depth knowledge of flood flow types, impact, laws of movement; - to know the hydrotechnical constructions, their constructions, calculations and design of anti-erosion, flood-stopping, flood-transferring dams; - knowledge of hydrotechnical structures that protect objects and floodplains from floods, their constructions, characteristics, requirements for them; - floodplains and cisterns, dams blocking floods and water flow, their constructions, characteristics, knowledge; - knowledge of the safety of reservoirs and life activities, their place in the life of society; - knowledge of hydrotechnical structures that discharge water, their types, hydrotechnical structures that empty the water reservoir and their constructions according to the type; - he should know the calculations of hydrotechnical structures that transfer flood waters and the ability to use them - to have an idea about the types of floods, their movement, characteristics, sources of floods, their causes, theoretical bases for calculating flood flows, measures to prevent floods, and formed hydrotechnical structures against floods and riverbed straightening structures; - to know the theoretical bases of design, construction and calculation of modern constructions of hydrotechnical structures against floods and water leveling structures; - to know the theoretical bases of design, construction and calculation of modern constructions of hydrotechnical structures against floods and water leveling structures; - to know and be able to use the types of filtration in the body and foundation of selkhona and selsuvombori dams, the resistance of the structure to filtration, the methods of calculating the effect of filtration water; - should know how to design various hydrotechnical structures against floods and flood control structures. - to have an idea about the types of floods, their characteristics, the foci of floods, their causes, the theoretical basis for calculating flood flows, measures to prevent floods, and the formed hydrotechnical structures against floods; - in-depth knowledge of anti-erosion hydrotechnical structures, anti-flood and flood control hydrotechnical structures, and structures of floodplains and reservoirs and their design, - should have skills in the design of various anti-flood hydrotechnical structures.
3	Design of hydrotechnical structures	The main goal of the course "Design of hydrotechnical structures " is to provide in-depth knowledge about the operation of hydraulic structures and increase the level of knowledge about the design, construction and operation of large hydroelectric units built on rivers.

4	Control and measurement equipment in hydrotechnical facilities	Formation of the worldview of the student of the subject "Control and measurement equipment in hydraulic engineering structures"; formation of masters as specialists, development of their logical and algorithmic thinking, increasing their intelligence; training of knowledge and skills necessary for modeling natural processes, phenomena and devices, conducting reasonable analysis, searching for optimal solutions to technical and economic issues, choosing the best ways of their implementation, as well as installed in operational hydrotechnical facilities controls and measuring equipment, their construction, installation procedure, their management, processing of observation results, performs the tasks of imparting basic knowledge necessary for mastering the compulsory and optional subjects of general professional and specialization in the curricula.
5	Operation hydrotechnical facilities, their repair and reconstruction	The fundamentals of using, repairing, and recreating hydraulic infrastructure are thoroughly covered. In addition, the basics of using, repairing, and reconstructing hydraulic structures are taught in depth. In addition, to know the procedures for determining the necessary expenses of students for the types of repair of hydrotechnical structures, the terms of their completion, their financing and the procedure for hiring after repair, the students' knowledge of the methods and technologies of repairing underground hydrotechnical structures and their structural elements knowledge, students' knowledge of methods and technologies of repair of concrete hydraulic structures and their structural elements are taught to students.
6	Reliability and safety in the use of hydrotechnical facilities	The purpose of the course on reliability and safety in the use of hydraulic structures is to provide students with reliability and safety in the use of hydraulic structures, to ensure the safety of hydraulic structures in emergency situations.
7	Monitoring the reliability of hydrotechnical facilities	The science of monitoring the reliability of hydraulic structures is one of the main subjects, and it is the formation of knowledge, skills and qualifications in accordance with the professional profile of safety monitoring of hydrotechnical structures.