Faculty of Land Resources and Cadaster

The direction of education: 60722600- Geodesy and geoinformatics

Educational program

Module designation	***GEO1119-Geodesy***
Semester(s) in which the module is taught	*1,2,3,4*
Person responsible for the module	*Associate professor, Islamov O'tkir Pirmetovich* *Senior teacher, Abdiramanov Rashid Dustchanovich* *Assistant professor, Valieva Albina Robertovna*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 570* *Contact hours:* *Lecture – 100 hours* *Practical lessons – 130 hours* *Self-learning – 340 hours*
Credit points	*19*
Required and recommended prerequisites for joining the module	*Geography, mathematics (school program)*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and explains the tasks of plan and height geodetic networks to practical and theoretical knowledge, to be able to visualize acquired geodetic concepts from a geodetic-cartographic and geo-information point of view, analytical networks and density polygonometry and their construction, geodetic research methods;* *-can imagine from a geodetic-cartographic and geo-information point of view;* *- is able to practice the tasks of plan and elevation geodetic networks, analytical networks and density polygonometry and their construction;* *-knows topographical maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-uses of geodetic base networks, geodetic measuring instruments;* *-acquires the skills of applying the solutions in practice, mastering the methods of geodetic works and methods of design and construction;* *-will have the competencies to carry out geodetic surveys using geodetic base networks, geodetic measuring instruments and software, general information about geodesy, topographic maps, determining their graphing and nomenclature, location elements, description of relief on maps and plans.*

Practical training	*After mastering educational practice, the student:* *-Geodetic surveying and cartographic materials will be acquired skills.* *-Knows how to process geodetic measurement results using modern computer programs.* *-Can use topographical materials to solve geodesy problems.*
Content	*Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Triangulation, trilateration and polygonometry, their classes. Accuracy required in their construction. Understanding of card, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *Geographical and magnetic meridians. Right and reverse azimuths. The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Horizontal transfer in analytical and graphical methods. Level of difficulty: 2* *Theodolite gauge and its essence,* *III, IV class and technical leveling networks* *Large-scale (1:5000-1:500) topographic maps elevation grids. Development of level networks in cities and settlements. Level of difficulty: 3* *Design and reconnaissance of class III, IV leveling networks. Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation* *III, IV class and technical leveling. Types of levelers, inspection of level rails and their testing. Class III, IV and III, IV leveling errors. Leveling III, IV class and filling in the leveling log. Level of difficulty: 4* *Equalization work in polygonometry. Equalization of single-level path and single-node network. Mathematical development of density triangulation networks. Angle measuring instruments in density triangulation. Geodetic approximations. Level of difficulty: 4* *Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1.Хамидов М., З.Д.Охунов., А.С.Рўзийев.,Х.Хайитов., Ғ.З.Яқубов Геодезия дарслик. Тошкент: Янги аср авлоди, 2021 йил 512 бет.* *2. Нурматов Э.Х, Ўтанов Ў. Геодезия. Тошкент: Ўзбекистон, 2003. – 224 б.* *3. Гермак О.В., Калачева Н.А., Гугуева О.А. Геодезия. Москва 2020, 316 с.* *4. Киселев М.И., Михелев Д.Ш. Геодезия. Москва 2020, 384 с.* 5. *Zhiping Lu., Yunying Qu., Shubo Qiao, Geodesy. W.Schofield 2014. 534 p.* *6. Мубораков Х., Охунов З.Д., Рузиев А.С., Хайитов Х.Ж., Якубов Г.З. Геодезия. Тошкент 2021, 551 бет.*

Faculty of Land resources and cadaster
The direction of education: 60722800- Cadaster (State Cadaster of Territories),

Educational Program

Module designation	*GTT 2110 Geoinformation system and technologies*
Semester(s) in which the module is taught	*5,6- semester*
Person responsible for the module	*Associate professor, PhD Mukhtorov Uzbekkhan*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 300* *Contact hours:* *Lecture – 40 hours* *Practical lessons – 80 hours* *Self-learning – 180 hours*
Credit points	*10 credits*
Required and recommended prerequisites for joining the module	*Geodesy, Cartography, Information technologies and process modeling*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* *– knows and can explain information systems and technologies, their basic components, software, database,*

	hardware platforms, raster and vector formats; *– knows and can create shape files in GIS software, gnospatial linking of rasters, work with gnographic world coordinate systems;* *– knows and is able to convert text coordinates of points in files of different formats into vector format, vectorization of rasters;* *– can independently perform the tasks of creating thematic layers, placing data in attribute tables, and at the same time combining tables into attributes;* *– knows and can perform geographic database formation, database management and data visualization methods;* *– can perform the tasks of displaying data in the geographic information system, geo-imaging, classification and re-classification, comparing maps, developing a map composition and preparing it for publication, and placing a map.*

Content	*Geoinformatics is a theoretical basis for creating geoinformation systems. Development history of GIS technologies. Ancestors of modern GIS technologies. Classification of GIS technologies. Classification of GIS technologies according to the architectural principle of construction. Classification of GIS technologies by hardware platform. Classification of GIS technologies by territorial coverage. Classification of GIS technologies according to functional capabilities. Implementation scheme of GIS technologies. The structure of universal GIS technologies. Hardware and software of GIS technologies. Level of difficulty: 2* *Land shape and dimensions, used models. Terms used in geoinformation systems. Fields of application of GIS technologies and directions related to it. Level of difficulty: 2* *Basic platforms of GIS. Geographic and attribute data. Geoinformation science is the collection, storage, analysis and synthesis of geographic data / geospatial data through Geographical Information Systems, Display and use. Level of difficulty: 2* *Land shape and dimensions, used models. Coordinate systems used in geodesy and cartography. Cartographic projections. Errors in cartographic projections. Classification of cartographic projections. Gauss-Kruger equiangular cross-cylindrical projection. Graphing of topographic maps and plans and their nomenclature. Level of difficulty: 3* *Data collection methods. Stages of data collection. Basic types of geographic information. Get raster information. Get vector information. Obtaining auxiliary or secondary geographical information. Obtaining information through digital photogrammetry. Obtaining information through a GPS (Global Positioning Systems) device. Getting information from external sources. Geographic information formats. Level of difficulty: 3* *General principles of spatial data visualization. Vector data visualization. Thematic cards. Raster data visualization. The question of generalization. Visualization of geofields. Measurement operations. Analysis of spatial object relations. Spatial queries. Overlay operations. Cutting and shearing operations. Aggregation and disaggregation of object attributes. Buffer zones. Proximity zones. Analysis of engineering fields. Analysis of geofields. Restore geofields. Level of difficulty: 3* *Types of spatial objects in GIS technologies. Understanding of spatial data models. Raster models of data. Regular-cell representation of data. Quadrotomic model of data. Vector models of data. Vector-to-raster and raster-to-vector transformations. Models of surfaces (geofields). Level of difficulty: 4* *Geodata (geodata). Photogrammetric analysis of data. Modeling. Spatial modeling in GIS. Spatial data formats. Geospatial analysis. Methods of geospatial analysis. Database query. Vector data request. Raster data request.*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. O'.Mukhtorov, A. Inamov - "Geoinformation system and technologies". - Tashkent, TIIAME NRU, 2022 year* *2. O'.Mukhtorov, A. Inamov, J. Lapasov. Instructional manual for practical training in "Geoinformation systems and technologies". T. TIIM, 2017.* *3. B.Markus, O'. Mukhtorov, Z. Mamatkulov, Z. Abdurakhmonov, Sh. Sattorov - "Three-dimensional modeling in geoinformation systems". - Tashkent: TIIAME printing, 2021* *4. Muxtorov O'.B., Inamov A.N., Islomov O'.P., Geoaxborot tizim va texnologiyalar. (Ma'ruza uchun) T., TIQXMMI, 2019 yil. 220 bet.*

Faculty of Land resources and cadaster
The direction of education: 5313400-Geodesy and Geoinformatics

Educational program

Module designation	*GTT 2109 Geoinformation system and technologies*
Semester(s) in which the module is taught	*6,7- semester*
Person responsible for the module	*Associate professor, PhD Mukhtorov Uzbekkhan*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 270* *Contact hours:* *lecture – 40 hours* *practical lessons – 80 hours* *self-learning – 150 hours*
Credit points	*9 credits*
Required and recommended prerequisites for joining the module	*Geodesy, Cartography, Information technologies and process modeling*

Module objectives/intended learning outcomes	***After mastering the discipline, the student:*** *– knows and can explain information systems and technologies, their basic components, software, database, hardware platforms, raster and vector formats;* *– knows and can create shape files in GIS software, gnospatial linking of rasters, work with gnographic world coordinate systems;* *– knows and is able to convert text coordinates of points in files of different formats into vector format, vectorization of rasters;* *– can independently perform the tasks of creating thematic layers, placing data in attribute tables, and at the same time combining tables into attributes;* *– knows and can perform geographic database formation, database management and data visualization methods;* *– can perform the tasks of displaying data in the geographic information system, geo-imaging, classification and re-classification, comparing maps, developing a map composition and preparing it for publication, and placing a map.*

Content	*Geoinformatics is a theoretical basis for creating geoinformation systems. Development history of GIS technologies. Ancestors of modern GIS technologies. Classification of GIS technologies. Classification of GIS technologies according to the architectural principle of construction. Classification of GIS technologies by hardware platform. Classification of GIS technologies by territorial coverage. Classification of GIS technologies according to functional capabilities. Implementation scheme of GIS technologies. The structure of universal GIS technologies. Hardware and software of GIS technologies. Level of difficulty: 2* *Land shape and dimensions, used models. Terms used in geoinformation systems. Fields of application of GIS technologies and directions related to it. Level of difficulty: 2* *Basic platforms of GIS. Geographic and attribute data. Geoinformation science is the collection, storage, analysis and synthesis of geographic data / geospatial data through Geographical Information Systems, Display and use. Level of difficulty: 2* *Land shape and dimensions, used models. Coordinate systems used in geodesy and cartography. Cartographic projections. Errors in cartographic projections. Classification of cartographic projections. Gauss-Kruger equiangular cross-cylindrical projection. Graphing of topographic maps and plans and their nomenclature. Level of difficulty: 3* *Data collection methods. Stages of data collection. Basic types of geographic information. Get raster information. Get vector information. Obtaining auxiliary or secondary geographical information. Obtaining information through digital photogrammetry. Obtaining information through a GPS (Global Positioning Systems) device. Getting information from external sources. Geographic information formats. Level of difficulty: 3* *General principles of spatial data visualization. Vector data visualization. Thematic cards. Raster data visualization. The question of generalization. Visualization of geofields. Measurement operations. Analysis of spatial object relations. Spatial queries. Overlay operations. Cutting and shearing operations. Aggregation and disaggregation of object attributes. Buffer zones. Proximity zones. Analysis of engineering fields. Analysis of geofields. Restore geofields. Level of difficulty: 3* *Types of spatial objects in GIS technologies. Understanding of spatial data models. Raster models of data. Regular-cell representation of data. Quadrotomic model of data. Vector models of data. Vector-to-raster and raster-to-vector transformations. Models of surfaces (geofields). Level of difficulty: 4* *Geodata (geodata). Photogrammetric analysis of data. Modeling. Spatial modeling in GAT. Spatial data formats. Geospatial analysis. Methods of geospatial analysis. Database query. Vector data request. Raster data request.*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*5. O'.Mukhtorov, A. Inamov - "Geoinformation system and technologies". - Tashkent, TIIAME NRU, 2022 year* *6. O'.Mukhtorov, A. Inamov, J. Lapasov. Instructional manual for practical training in "Geoinformation systems and technologies". T. TIIM, 2017.* *7. B.Markus, O'. Mukhtorov, Z. Mamatkulov, Z. Abdurakhmonov, Sh. Sattorov - "Three-dimensional modeling in geoinformation systems". - Tashkent: TIIAME printing, 2021* *8. Muxtorov O'.B., Inamov A.N., Islomov O'.P., Geoaxborot tizim va texnologiyalar. (Ma'ruza uchun) T., TIQXMMI, 2019 yil. 220 bet.*

Faculty of Land resources and cadastre
The direction of education: 60722600 – Innovative technologies in remote sensing of the earth
Educational program

Module designation	*GTT2111 Geoinformation system and technologies*
Semester(s) in which the module is taught	*6-7*
Person responsible for the module	*Associate professor, PhD, Mukhtorov Uzbekkhan Burkhanovich, Assistant professor, Muslimbekov Bakhodir Mirza o'g'li*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 330* *Contact hours:* *Lecture – 60 hours* *Practical lessons – 80 hours* *Self-learning – 190 hours*
Credit points	*11*
Required and recommended prerequisites for joining the module	*Geodesy, Cartography, Cartographic design*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- knows and can provide information about the history and reasons for the creation of the geoinformation system;* *- understands terms and terms used in geoinformation systems and can use them;* *- can independently find, load, change and store raster and vector geodata;* *- recognizes programs used in GIS, can choose convenient programs based on their advantages and disadvantages;* *- can use and distinguish the structure of electronic and digital maps and use the necessary map based on the content of the map;* *- can create digital maps with a simple structure;* *- acquires theoretical knowledge about the importance of space images in GIS programs and can assess the quality of rasters;* *- knows how to enrich geographic information with data, types of attributive information and can use it in practice;* *- acquires the skills of creating thematic maps using modern geographic information technology programs;* *- knows directions for creating databases, using independent layers.*

Content	*Fundamentals of geoinformation technologies. Introduction to Geoinformation Technologies. Development history of GIS. Basic concepts and terms. Evolution of GIS. Fields of application of GIS. Basic components of GIS. Datums and geospatial binding. Spatial data models. Level of difficulty: 1* *Organization and processing of information in the geographic information system. Special GIS programs. Digitization. Raster. Vector. Generalization of cartographic data. Buffering. Topology. Data collection and input for geographic information systems. Spatial data visualization. Level of difficulty: 2* *Spatial analysis of data in the geographic information system. Measurement operations. Analysis of spatial object relations. Spatial queries. Overlay operations. Cutting and shearing operations. AggreGISion and disaggreGISion of object attributes. Buffer zones. Proximity zones. Analysis of engineering fields. Analysis of geofields. Restore geofields. Digital model of terrain. Database management system. Level of difficulty: 3* *Display of data in the geographic information system. Geodescription. Classify. Compare card. Three-dimensional imaging. Electronic cards. Plotter or graphing device. Technologies for creating vector cards. Management of geographic information system. Requirements for installing GIS programs. Management of GIS. Companies producing GIS programs. Expert systems. Level of difficulty: 4* *Geoinformation systems software. Software of universal vector GISs. Software of universal raster GISs. Internet-GIS systems. Cartographic software modules. GIS applications. Modern development of geographic information systems. Application of GISs. GISs of production significance. Application of GISs in geology and use of underground resources. GISs in state and administrative management bodies. Level of difficulty: 5*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *B.Markus, O‘.Muxtorov, Z.Mamatqulov, Z.Abduraxmonov, Sh.Sattorov Geoaxborot tizimlarida uch o‘lchamli modellashtirish. O‘quv qo‘llanma, Toshkent, TIQXMMI, 2021.* 2. *O‘.Muxtorov, A.Inamov Geoaxborot tizimi va texnologiyalari. O‘quv qo‘llanma Bosma Toshkent, TIQXMMI MTU.* 3. *O‘.Muxtorov, A.Inamov, J.Lapasov. “Geoaxborot tizim va texnologiyalar” fanidan amaliy mashg’ulotlarni bajarish bo‘yicha o‘quv qo‘llanma. T.: TIQXMMI, 2017.* 4. *Mirziyoyev SH.M. Erkin va farovon demokratik O‘zbekiston davlatini birgalikda barpo etamiz. Toshkent, O‘zbekiston, 2016.-56 b.* 5. *Mirziyoyev SH.M. Tanqidiy tahlil, qat’iy tartib - intizom va shaxsiy javobgarlik – har bir rahbar faoliyatining kundalik qoidsi bo‘lishi kerak. Toshkent,O‘zbekiston, 2017.- 104b.*

Faculty of Land Resources and Cadaster

The direction of education: 60722600 – Geodesy and geoinformatics

Educational program

Module designation	*GEO2110-Geodesy*
Semester(s) in which the module is taught	*4,5*
Person responsible for the module	*Associate professor, Islamov O'tkir Pirmetovich* *Senior teacher, Abdiramanov Rashid Dustchanovich* *Assistant professor, Valieva Albina Robertovna*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, laboratory, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 300* *Contact hours:* *Lecture – 40 hours* *Practical training – 70 hours* *Laboratory- 10 hours* *Self-learning – 180 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geodesy part 1*
Module objectives/intended learning outcomes	*After mastering the subject, the student:* *-knows and explain the tasks of plan and elevation geodetic networks, to practical and theoretical knowledge, to be able to visualize acquired geodetic concepts, from a geodetic-cartographic and geo-information point of view, analytical networks and density polygonometry and their construction, geodetic research methods;* *-can imagine from a geodetic-cartographic and geo-information point of view;* *-is able to practice the tasks of plan and elevation geodetic networks, analytical networks and density polygonometry and their construction;* *-knows topographic maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-will have the skills to master the methods of geodetic works and methods of implementation in design and construction, and apply their solutions in practice;* *-will have the competencies to carry out geodetic surveys using geodetic base networks, geodetic measuring instruments and software, general information about geodesy, topographic maps, determining their graphing and nomenclature, location elements, depicting relief on maps and plans.*

Practical training	*After mastering educational practice, the student:* *-geodetic surveying and cartographic materials are acquired skills;* *-knows how to process geodetic measurement results using modern computer programs;* *-can use topographical materials to solve geodesy problems.*
Content	*III, IV class and technical leveling networks* *Large-scale (1:5000-1:500) topographic maps elevation grids. Development of level networks in cities and settlements. Level of difficulty: 3* *Design and reconnaissance of class III, IV leveling networks. Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation* *III, IV class and technical leveling. Types of levelers, inspection of level rails and their testing. Class III, IV and III, IV leveling errors. Leveling III, IV class and filling in the leveling log. Level of difficulty: 4* *Connecting level lines to rulers and marks, calculating the height of level marks, equalizing a single level line and a network with one node point, constructing geodetic networks with a densification plan by triangulation method. Level of difficulty: 4* *Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1.Хамидов М., З.Д.Охунов., А.С.Рўзийев.,Х.Хайитов., Ғ.З.Яқубов Геодезия дарслик. Тошкент: Янги аср авлоди, 2021 йил 512 бет.* *2. Нурматов Э.Х, Ўтанов Ў. Геодезия. Тошкент: Ўзбекистон, 2003. – 224 б.* *3. Гермак О.В., Калачева Н.А., Гугуева О.А. Геодезия. Москва 2020, 316 с.* *4. Киселев М.И., Михелев Д.Ш. Геодезия. Москва 2020, 384 с.* *5. Zhiping Lu., Yunying Qu., Shubo Qiao, Geodesy. W.Schofield 2014. 534 p.* *6. Мубораков Х., Охунов З.Д., Рузиев А.С., Хайитов Х.Ж., Якубов Г.З. Геодезия. Тошкент 2021, 551 бет.*

Faculty of Land Resources and Cadaster

The direction of education: 60722600- Geodesy and geoinformatics

Educational program

Module designation	***GEO1119-Geodesy***
Semester(s) in which the module is taught	*1,2,3,4*
Person responsible for the module	*Associate professor, Islamov O'tkir Pirmetovich* *Senior teacher, Abdiramanov Rashid Dustchanovich* *Assistant professor, Valieva Albina Robertovna*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 570* *Contact hours:* *Lecture – 100 hours* *Practical lessons – 130 hours* *Self-learning – 340 hours*
Credit points	*19*
Required and recommended prerequisites for joining the module	*Geography, mathematics (school program)*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and explains the tasks of plan and height geodetic networks to practical and theoretical knowledge, to be able to visualize acquired geodetic concepts from a geodetic-cartographic and geo-information point of view, analytical networks and density polygonometry and their construction, geodetic research methods;* *-can imagine from a geodetic-cartographic and geo-information point of view;* *- is able to practice the tasks of plan and elevation geodetic networks, analytical networks and density polygonometry and their construction;* *-knows topographical maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-uses of geodetic base networks, geodetic measuring instruments;* *-acquires the skills of applying the solutions in practice, mastering the methods of geodetic works and methods of design and construction;* *-will have the competencies to carry out geodetic surveys using geodetic base networks, geodetic measuring instruments and software, general information about geodesy, topographic maps, determining their graphing and nomenclature, location elements, description of relief on maps and plans.*
Practical training	*After mastering educational practice, the student:* *-Geodetic surveying and cartographic materials will be acquired skills.* *-Knows how to process geodetic measurement results using modern computer programs.* *-Can use topographical materials to solve geodesy problems.*

Content	*Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Triangulation, trilateration and polygonometry, their classes. Accuracy required in their construction. Understanding of card, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *Geographical and magnetic meridians. Right and reverse azimuths. The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Horizontal transfer in analytical and graphical methods. Level of difficulty: 2* *Theodolite gauge and its essence,* *III, IV class and technical leveling networks* *Large-scale (1:5000-1:500) topographic maps elevation grids. Development of level networks in cities and settlements. Level of difficulty: 3* *Design and reconnaissance of class III, IV leveling networks. Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation* *III, IV class and technical leveling. Types of levelers, inspection of level rails and their testing. Class III, IV and III, IV leveling errors. Leveling III, IV class and filling in the leveling log. Level of difficulty: 4* *Equalization work in polygonometry. Equalization of single-level path and single-node network. Mathematical development of density triangulation networks. Angle measuring instruments in density triangulation. Geodetic approximations. Level of difficulty: 4* *Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1.Хамидов М., З.Д.Охунов., А.С.Рўзийев.,Х.Хайитов., Ғ.З.Яқубов Геодезия дарслик. Тошкент: Янги аср авлоди, 2021 йил 512 бет.* *2. Нурматов Э.Х, Ўтанов Ў. Геодезия. Тошкент: Ўзбекистон, 2003. – 224 б.* *3. Гермак О.В., Калачева Н.А., Гугуева О.А. Геодезия. Москва 2020, 316 с.* *4. Киселев М.И., Михелев Д.Ш. Геодезия. Москва 2020, 384 с.* 5. *Zhiping Lu., Yunying Qu., Shubo Qiao, Geodesy. W.Schofield 2014. 534 p.* *6. Мубораков Х., Охунов З.Д., Рузиев А.С., Хайитов Х.Ж., Якубов Г.З. Геодезия. Тошкент 2021, 551 бет.*

Faculty of Land Resources and Cadaster

The direction of education: 60722800-Cadastre (by types of activity)

Educational program

Module designation	***GEO1105-Geodesy***
Semester(s) in which the module is taught	*2*
Person responsible for the module	*Associate professor Islamov O'tkir Pirmetovich*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical lessons – 40 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, Mathematics (school subjects)*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and explain the tasks of plan and height geodetic networks, to practical and theoretical knowledge, to be able to visualize acquired geodetic concepts from a geodetic-cartographic and geo-information point of view, analytical networks and density polygonometry and their construction, geodetic research methods;* *-can imagine from a geodetic-cartographic and geo-information point of view;* *-is able to practice the tasks of plan and elevation geodetic networks, analytical networks and density polygonometry and their construction;* *-know topographical maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-use of geodetic base networks, geodetic measuring instruments;* *-acquires the skills of applying the solutions in practice, mastering the methods of geodetic works and methods of design and construction;* *-will have the competencies to carry out geodetic surveys using geodetic base networks, geodetic measuring instruments and software, general information about geodesy, topographic maps, determining their graphing and nomenclature, location elements, description of relief on maps and plans.*

Practical training	*After mastering educational practice, the student:* *-Geodetic surveying and cartographic materials will be acquired skills;* *-Knows how to process geodetic measurement results using modern computer programs;* *-Can use topographical materials to solve geodesy problems.*
Content	*Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Triangulation, trilateration and polygonometry, their classes. Accuracy required in their construction. Understanding of card, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *Geographical and magnetic meridians. Right and reverse azimuths. The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Analytical and graphic transfer of horizontals, Theodolite survey and its essence. Level of difficulty: 3*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1.Хамидов М., З.Д.Охунов., А.С.Рўзийев.,Х.Хайитов., Г.З.Яқубов Геодезия дарслик. Тошкент: Янги аср авлоди, 2021 йил 512 бет.* *2. Нурматов Э.Х, Ўтанов Ў. Геодезия. Тошкент: Ўзбекистон, 2003. – 224 б.* *3. Гермак О.В., Калачева Н.А., Гугуева О.А. Геодезия. Москва 2020, 316 с.* *4. Киселев М.И., Михелев Д.Ш. Геодезия. Москва 2020, 384 с.* *5. Zhiping Lu., Yunying Qu., Shubo Qiao, Geodesy. W.Schofield 2014. 534 p.* *6. Мубораков Х., Охунов З.Д., Рузиев А.С., Хайитов Х.Ж., Якубов Г.З. Геодезия. Тошкент 2021, 551 бет.*

Faculty of Land resources and cadaster
The direction of education: 60112400– Professional training (Land cadaster and land surveying)
Educational Program

Module designation	***GEO1110-Geodesy***
Semester(s) in which the module is taught	*2, 3*
Person responsible for the module	*Associate professor, PhD, Jumanov Azamat Norbutaevich,* *Assistant professor, Abdirakhmanov Ilkhom Isakovich*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 30 hours* *Practical lessons – 30 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, mathematics (school subjects)*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-to practical and theoretical knowledge, to be able to imagine acquired geodetic concepts from a geodetic-cartographic and geo-informational point of view, to know and explain geodetic research methods about the tasks and construction of plan and elevation geodetic networks, analytical networks and density polygonometry;* *-can imagine from a geodetic-cartographic and geo-information point of view;* *-is able to practice the tasks of plan and elevation geodetic networks, analytical networks and density polygonometry and their construction;* *-knows topographic maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-knows how to use geodetic reference networks, geodetic measuring instruments;* *-acquires the skills of applying the solutions in practice, mastering the methods of geodetic works and methods of design and construction;* *-general information about geodesy, topographic maps, determining their graphing and nomenclature, location elements, description of relief on maps and plans, will have the competencies to carry out geodetic surveys using geodetic base networks, geodetic measuring instruments and software.*

Content	*Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Triangulation, trilateration and polygonometry, their classes. Accuracy required in their construction. Understanding of card, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *Geographical and magnetic meridians. Right and reverse azimuths. The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Horizontal transfer in analytical and graphical methods. Level of difficulty: 2* *Theodolite gauge and its essence,* *III, IV class and technical leveling networks* *Large-scale (1:5000-1:500) topographic maps elevation grids. Development of level networks in cities and settlements. Level of difficulty: 3* *Design and reconnaissance of class III, IV leveling networks. Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation.* *III, IV class and technical leveling. Types of levelers, inspection of level rails and their testing. Class III, IV and III, IV leveling errors. Leveling III, IV class and filling in the leveling log. Level of difficulty: 4* *Tacheometric measurement and its essence, GPS and GPSS measurement and its essence. Application of modern geodetic tools in geodesy. Level of difficulty: 4*
Practical training	*After mastering educational practice, the student:* *-Geodetic surveying and cartographic materials will be acquired skills;* *-Knows how to process geodetic measurement results using modern computer programs;* *-Can use topographical materials to solve geodesy problems.*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1.Хамидов М., З.Д.Охунов., А.С.Рўзийев.,Х.Хайитов., Ғ.З.Яқубов Геодезия дарслик. Тошкент: Янги аср авлоди, 2021 йил 512 бет.* *2. Нурматов Э.Х, Ўтанов Ў. Геодезия. Тошкент: Ўзбекистон, 2003. – 224 б.* *3. Гермак О.В., Калачева Н.А., Гугуева О.А. Геодезия. Москва 2020, 316 с.* *4. Киселев М.И., Михелев Д.Ш. Геодезия. Москва 2020, 384 с.* 5. *Zhiping Lu., Yunying Qu., Shubo Qiao, Geodesy. W.Schofield 2014. 534 p.* *6. Мубораков Х., Охунов З.Д., Рузиев А.С., Хайитов Х.Ж., Якубов Г.З. Геодезия. Тошкент 2021, 551 бет.*

Faculty of Land Resources and Cadaster

The direction of education: 60722700- Innovative technologies in remote sensing of the earth

Educational program

Module designation	*GEO2110- Geodesy (Part 1)*
Semester(s) in which the module is taught	*3,4*
Person responsible for the module	*Associate professo,r Islamov O'tkir Pirmetovich*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 300* *Contact hours:* *Lecture – 50 hours* *Practical lessons – 70 hours* *Self-learning – 180 hours*
Credit points	*10*
Required and recommended prerequisites for joining the module	*Geography, mathematics (school program)*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and explains the tasks of plan and height geodetic networks, to practical and theoretical knowledge, to be able to visualize acquired geodetic concepts from a geodetic-cartographic and geo-information point of view, analytical networks and density polygonometry and their construction, geodetic research methods;* *- can imagine from a geodetic-cartographic and geo-information point of view;* *- is able to practice the tasks of plan and elevation geodetic networks, analytical networks and density polygonometry and their construction;* *- knows topographical maps, location elements, description of terrain on maps and plans, orientation measurement and error theory.* *-use of geodetic base networks, geodetic measuring instruments;* *-acquires the skills of applying the solutions in practice, mastering the methods of geodetic works and methods of design and construction;* *- will have the competencies to carry out geodetic surveys using geodetic base networks, geodetic measuring instruments and software, general information about geodesy, topographic maps, determining their graphing and nomenclature, location elements, description of relief on maps and plans.*

Practical training	*After mastering educational practice, the student:* *-Geodetic surveying and cartographic materials will be acquired skills;* *-Knows how to process geodetic measurement results using modern computer programs;* *-Can use topographical materials to solve geodesy problems.*
Content	*Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Triangulation, trilateration and polygonometry, their classes. Accuracy required in their construction. Understanding of card, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *Geographical and magnetic meridians. Right and reverse azimuths. The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Horizontal transfer in analytical and graphical methods. Level of difficulty: 2* *Theodolite measurement and its essence, Development of level networks in cities and population centers. Level of difficulty: 3* *Calculation of the surface, the essence and types of leveling. Geometric leveling methods. Effect of earth curvature and refraction on geometric leveling. Types, construction, inspection and correction of levelers and leveling rods. Check and fix N3 levels. Geometric leveling accuracy and leveling errors. Level of difficulty: 3*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1.Хамидов М., З.Д.Охунов., А.С.Рўзийев.,Х.Хайитов., Ғ.З.Якубов Геодезия дарслик. Тошкент: Янги аср авлоди, 2021 йил 512 бет.* *2. Нурматов Э.Х, Ўтанов Ў. Геодезия. Тошкент: Ўзбекистон, 2003. – 224 б.* *3. Гермак О.В., Калачева Н.А., Гугуева О.А. Геодезия. Москва 2020, 316 с.* *4. Киселев М.И., Михелев Д.Ш. Геодезия. Москва 2020, 384 с.* *5. Зҳипинг Лу., Йунйинг Қу., Сҳубо Қиао, Геодесй. W.Ссҳофиелд 2014. 534 п.* *6. Мубораков Х., Охунов З.Д., Рузиев А.С., Хайитов Х.Ж., Якубов Г.З. Геодезия. Тошкент 2021, 551 бет.*

Faculty of Land Resources and Cadaster

The direction of education: 60722700- Innovative technologies in remote sensing of the earth

Educational program

Module designation	*GEO2110-Geodesy 2*
Semester(s) in which the module is taught	*5,6*
Person responsible for the module	*Associate professor, Islamov O'tkir Pirmetovich* *Assistant professor, Valieva Albina Robertovna*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 300* *Contact hours:* *Lecture – 40 hours* *Practical lessons – 80 hours* *Self-learning – 180 hours*
Credit points	*10*
Required and recommended prerequisites for joining the module	*Geodesy part 1*

Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and explain the tasks of plan and height geodetic networks to practical and theoretical knowledge, to be able to visualize acquired geodetic concepts from a geodetic-cartographic and geo-information point of view, analytical networks and density polygonometry and their construction, geodetic research methods;* *-can imagine from a geodetic-cartographic and geo-information point of view;* *-is able to practice the tasks of plan and elevation geodetic networks, analytical networks and density polygonometry and their construction;* *-know topographical maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-use of geodetic base networks, geodetic measuring instruments;* *-acquires the skills of applying the solutions in practice, mastering the methods of geodetic works and methods of design and construction;* *-general information about geodesy, topographic maps, determining their graphing and nomenclature, location elements, description of relief on maps and plans, will have the competencies to carry out geodetic surveys using geodetic base networks, geodetic measuring instruments and software;* *-to practical and theoretical knowledge, to be able to visualize acquired geodetic concepts from a geodetic-cartographic and geo-information point of view, to know and explain the tasks of plan and height geodetic networks, analytical networks and density polygonometry and their construction, geodetic research methods;* *-can imagine from a geodetic-cartographic and geo-information point of view;* *-is able to practice the tasks of plan and elevation geodetic networks, analytical networks and density polygonometry and their construction;* *-know topographical maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-use of geodetic base networks, geodetic measuring instruments;* *-acquires the skills of applying the solutions in practice, mastering the methods of geodetic works and methods of design and construction.* *-will have competencies to carry out geodetic surveys using geodetic base networks, geodetic measuring instruments and software general information about geodesy, topographic maps, determining their graphing and nomenclature, location elements, description of relief on maps and plans.*
Practical training	*After mastering educational practice, the student:* *-geodetic surveying and cartographic materials will be acquired skills;* *-knows how to process geodetic measurement results using modern computer programs;* *-can use topographical materials to solve geodesy problems.*

Content	*III, IV class and technical leveling networks* *Large-scale (1:5000-1:500) topographic maps elevation grids. Development of level networks in cities and settlements. Level of difficulty: 3* *Design and reconnaissance of class III, IV leveling networks. Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation. Level of difficulty: 3* *III, IV class and technical leveling. Types of levelers, inspection of level rails and their testing. Class III, IV and III, IV leveling errors. Leveling III, IV class and filling in the leveling log. Level of difficulty: 4* *Connecting level lines to rulers and marks, calculating the height of level marks, equalizing a single level line and a network with one node point, constructing geodetic networks with a densification plan by triangulation method. Level of difficulty: 4* *Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1.Хамидов М., З.Д.Охунов., А.С.Рўзийев.,Х.Хайитов., Ғ.З.Яқубов Геодезия дарслик. Тошкент: Янги аср авлоди, 2021 йил 512 бет.* *2. Нурматов Э.Х, Ўтанов Ў. Геодезия. Тошкент: Ўзбекистон, 2003. – 224 б.* *3. Гермак О.В., Калачева Н.А., Гугуева О.А. Геодезия. Москва 2020, 316 с.* *4. Киселев М.И., Михелев Д.Ш. Геодезия. Москва 2020, 384 с.* *5. Zhiping Lu., Yunying Qu., Shubo Qiao, Geodesy. W.Schofield 2014. 534 p.* *6. Мубораков Х., Охунов З.Д., Рузиев А.С., Хайитов Х.Ж., Якубов Г.З. Геодезия. Тошкент 2021, 551 бет.*

Faculty of Land Resources and Cadaster

The direction of education: 60722800 - Cadaster (state cadaster of territories)

Educational program

Module designation	***GKA3105 Basics of geoinformation cartography***
Semester(s) in which the module is taught	*9*
Person responsible for the module	*Associate professor, PhD Sarvar Abdurakhmonov*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 30 hours* *Practical lessons – 30 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography (school program), Cartography, Geodesy*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** ***-*** *masteres cartographic concepts in-depth practical and theoretical knowledge of the science program, can imagine confirmations from a geodetic-cartographic and geo-information point of view;* *- acquires an idea and knowledge about the specific important role of geodetic research methods in modern science and technology;* *- the use of remotely acquired materials, automatic and mathematical methods, geographical maps and their types, the principles of creating their legends, the methodology and technology of creating maps, the use of space photographs and mathematical methods, the development of the content of maps, modern GIS in the mapping of remote sensing materials perfectly master the use of software and can use its solutions in practice;* *- General information about geoinformation cartography, the location of events and phenomena on electronic maps and their interrelationship, changes, generalization by means of special symbol models, and using it as a source on the basis of the research method to create maps based on GIS software, including graphics and GIS programs (AsrcGis 10.8, Mapinfo, Surfer, Paint, CorelDRAW Graphics Suite X7), will have the skills to conduct cartographic research using modern geographic information technology programs.*

Content	*The science of geoinformation cartography and its tasks. The purpose of geographic maps and their study, classification of maps. Types of maps. Level of difficulty: 2* *Fundamentals of digital cartography. Land shape and dimensions, used models. Geodetic basis of maps. Cartographic projections and errors. Difficulty level: 3* *Use of geographic maps. Geographic maps, introduction of GIS. Using geographic maps as a research tool. Analysis and assessment of geographic maps and atlases. Level of difficulty: 3* *Methods of cartographic representation. Geographical principles of nature mapping. Cartographic symbols and their importance. Methods of cartographic representation. Illustrate by adding different methods. Methods of depicting relief. Level of difficulty: 3* *Geoinformatics - theoretical foundations for creating geoinformation systems. Development history of GISs. Ancestors of modern GISs. Classification of GISs. Implementation scheme of GISs. The structure of universal GISs. Hardware and software of GISs. Level of difficulty: 3* *Geoinformation cartography. Geoinformatics and GIS - expressions and annotations. Geomatics. A productive approach to geoinformatics. Geoinformation mapping. Quick (operational) getting on a map. Level of difficulty: 4* *Selection of geographic information systems. Short descriptions of foreign GISs. Requirements for GIS. Imagine a digital map. Digital Map Requirements. Level of difficulty: 4* *Technologies for creating vector maps. Getting digital maps over basic paper maps. Obtaining maps based on Earth remote sensing data. Acquisition of maps by data from ground measurements and data from satellite systems. Level of difficulty: 3* *Software of GISs. Software of universal vector GISs. Software of universal raster GISs. Internet-GIS systems. Cartographic software modules. GIS-applications. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *Abduraxmonov S.N., Mirjalolov N.T., Jo‘rayev A.YU. Geoinformatsion kartografiya asoslari. O‘quv qo‘llanma. TIQXMMI – 2020 y.* 2. *Safarov E.Yu., Musayev I. M., Abduraxmonov S.N. “Geoaxborot tizim va texnologiyalar”fanidan amaliy mashg‘ulotlarni o‘tkazish bo‘yicha metodik ko‘rsatma. Toshkent - 2011 yil.* 3. *http: // www.//cartografiya.com.* 4. *Mirziyoyev Sh.M. O‘zbekistonni rivojlantirishning beshta ustuvor yo‘nalishi bo‘yicha Harakatlar strategiyasi. T., O‘zbekiston, 2017. «Gazeta.uz».* 5. *Kraak, M.J., Ormeling, F. [2010], Cartography: Visualization of Spatial Data. Prentice Hall.* 6. *Safarov E.Yu. va boshkalar. Kartografiya va geovizualizatsiya. T. Moliya-iktisod, 2015.-208 b.*

Faculty of Land resources and cadastre
The direction of education: 60722700-Innovative technologies in remote sensing of the Earth
Educational program

Module designation	***GKA3105 Basics of geoinformation cartography***
Semester(s) in which the module is taught	*8*
Person responsible for the module	*Associate professor, PhD Sarvar Abdurakhmonov*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical lessons – 40 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography (school program), Cartography, Geodesy*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** ***-*** *masteres cartographic concepts in-depth practical and theoretical knowledge of the science program, can imagine confirmations from a geodetic-cartographic and geo-information point of view;* *- acquires an idea and knowledge about the specific important role of geodetic research methods in modern science and technology;* *- the use of remotely acquired materials, automatic and mathematical methods, geographical maps and their types, the principles of creating their legends, the methodology and technology of creating maps, the use of space photographs and mathematical methods, the development of the content of maps, modern GIS in the mapping of remote sensing materials perfectly master the use of software and can use its solutions in practice;* *- General information about geoinformation cartography, the location of events and phenomena on electronic maps and their interrelationship, changes, generalization by means of special symbol models, and using it as a source on the basis of the research method to create maps based on GIS software, including graphics and GIS programs (AsrcGis 10.8, Mapinfo, Surfer, Paint, CorelDRAW Graphics Suite X7), will have the skills to conduct cartographic research using modern geographic information technology programs.*

Content	*The science of geoinformation cartography and its tasks. The purpose of geographic maps and their study, classification of maps. Types of maps. Level of difficulty: 2* *Fundamentals of digital cartography. Land shape and dimensions, used models. Geodetic basis of maps. Cartographic projections and errors. Level of difficulty: 3* *Use of geographic maps. Geographic maps, introduction of GIS. Using geographic maps as a research tool. Analysis and assessment of geographic maps and atlases. Level of difficulty: 3* *Methods of cartographic representation. Geographical principles of nature mapping. Cartographic symbols and their importance. Methods of cartographic representation. Illustrate by adding different methods. Methods of depicting relief. Level of difficulty: 3* *Geoinformatics - theoretical foundations for creating geoinformation systems. Development history of GIS technologies. Ancestors of modern GIS technologies. Classification of GIS technologies. Implementation scheme of GIS technologies. The structure of universal GIS technologies. Hardware and software of GIS technologies. Level of difficulty: 3* *Geoinformation cartography. Geoinformatics and GIS - expressions and annotations. Geomatics. A productive approach to geoinformatics. Geoinformation mapping. Quick (operational) getting on a map. Level of difficulty: 4* *Selection of geographic information systems. Short descriptions of foreign GIS technologies. Requirements for GIS. Imagine a digital map. Digital Map Requirements. Level of difficulty: 4* *Technologies for creating vector maps. Getting digital maps over basic paper maps. Obtaining maps based on Earth remote sensing data. Acquisition of maps by data from ground measurements and data from satellite systems. Level of difficulty: 3* *Software of GIS technologies. Software of universal vector GIS technologies. Software of universal raster GIS technologies. Internet-GIS systems. Cartographic software modules. GIS-applications. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *Abduraxmonov S.N., Mirjalolov N.T., Jo‘rayev A.YU. Geoinformatsion kartografiya asoslari. O‘quv qo‘llanma. TIQXMMI – 2020 y.* 2. *Safarov E.Yu., Musayev I. M., Abduraxmonov S.N. “Geoaxborot tizim va texnologiyalar”fanidan amaliy mashg‘ulotlarni o‘tkazish bo‘yicha metodik ko‘rsatma. Toshkent - 2011 yil.* 3. *http: // www.//cartografiya.com.* 4. *Mirziyoyev Sh.M. O‘zbekistonni rivojlantirishning beshta ustuvor yo‘nalishi bo‘yicha Harakatlar strategiyasi. T., O‘zbekiston, 2017. «Gazeta.uz».* 5. *Kraak, M.J., Ormeling, F. [2010], Cartography: Visualization of Spatial Data. Prentice Hall.* 6. *Safarov E.Yu. va boshkalar. Kartografiya va geovizualizatsiya. T. Moliya-iktisod, 2015.-208 b.*

Faculty of Land resources and cadaster
The direction of education: 5313400 – Geodesy and geoinformatics
Educational Program

Module designation	*IG 4104 Engineering surveying*
Semester(s) in which the module is taught	*10*
Person responsible for the module	*Rajapbayev Maqsud, senior teacher* *Ten Yuri, senior teacher.*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 40 hours* *Practical training – 20 hours* *Self-learning – 60 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, Mathematics (school subjects), Higher mathematics, Physic.*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-has an understanding of engineering geodesy and its tasks, plan and elevation engineering geodetic networks;* *-acquires an idea and knowledge about geodetic work, solving engineering geodetic issues topographical-geodetic exploration works, geodetic works performed in the alignment and construction of linear structures, geodetic planning works and relocation of the project, geodetic construction network, geodetic works performed in the search, design and construction of building, transport, industrial and hydrotechnical structures, in the determination of deformation of engineering structures;* *-acquires skills in geodetic work performed in the search, plan and elevation engineering geodetic networks, types of networks and requirements for their accuracy, methods of network accuracy assessment, geodetic network project accuracy assessment, triangulation network project accuracy assessment, geodetic works performed in the alignment and construction of linear structures, geodetic construction network, building, transport, design and construction of industrial and hydrotechnical structures, geodetic work performed in determining the deformation of engineering structures, solving engineering geodetic problems, applying their solutions to practice;* *-plan and elevation engineering geodetic networks, types of networks and requirements for their accuracy, methods of network accuracy assessment, geodetic networks, engineering geodetic issues will be qualified.*

Content	*Goals and tasks of engineering geodesy. The science of engineering geodesy and its tasks. Engineering is the content of geodetic works. Connection of "Engineering Geodesy" with other disciplines. The significance of engineering geodetic works in land preparation, land reclamation and construction. Level of difficulty: 2* *Planned engineering - geodetic networks. Types of grids and their accuracy requirements, grid accuracy calculation methods and their construction, triangulation grid design accuracy assessment, polygonometry grid design accuracy assessment, Level of difficulty: 3* *Altitude engineering - geodetic networks. The function of the height base and requirements for its accuracy, assessment of the accuracy of the design of height grids. Level of difficulty: 3* *Topographic - geodetic search. General description of large-scale plans, accuracy of measurement in plans, underground communications planning. Level of difficulty: 3* *Routing of linear structures. General understanding of route and routeing, camera routeing, location routeing, perfect pitch planning. Level of difficulty: 3* *Geodetic planning works. General information about planning work, accuracy of planning work, elements of planning work, methods of planning main axes. Level of difficulty: 4* *Geodetic installation and inspection of construction structures and technological equipment. Methods of geodetic preparation for assembly works, planned installation and inspection of construction structures. Level of difficulty: 4* *Preparation of executive plans and executive plans. Obtaining an executive plan, creating executive master plans. Level of difficulty: 3* *Geodetic methods of determining the subsidence of structures. General information about the deformation of structures, determining the dimensions of the pit bottom bulge and sinkhole, placing signs to monitor subsidence, determining the subsidence of structures. Level of difficulty: 3.* *Measurement of horizontal movement of structures. Placement of signs to measure movement, determination of horizontal movement by wall measurement method, observation of vertical deviation and cracking of buildings and structures, observation of collapse. Level of difficulty: 4* *Geodetic work in the design and construction of roads and railways. Road exploration, road rehabilitation, road elevation planning, highway bends, serpentines, highway junctions and intersections. Level of difficulty: 5* *Planned engineering - evaluation of the project of geodetic networks. Evaluation of the polygon network project. Evaluation of the accuracy of the triangulation project. Evaluation of the leveling network project by approximation method. Level of difficulty: 3* *Accuracy of modern geodetic tools in the construction of engineering structures. Digital levels. Optical levels. Laser levels. Electronic theodolites. Level of difficulty: 3* *Accuracy of modern geodetic tools in the construction of engineering structures. Tools used in GPS surveying. Use of GPS in the construction of high-altitude networks. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. Хайитов Х.Ж., А.Н.Инамов. Инженерлик геодезияси. «ТИҚХММИ» Миллий тадқиқот унверситети, 2022. 495 б* *2. Суюнов А. Инженерлик геодезияси. Тошкент. 2021.-359 б.* *3. Абдуллаев Т.М., Инамов А. Н., Лапасов Ж.О. Инженерлик геодезияси гидротехника ншоотларини қуришда геодезик ишлар. ТИҚХММИ, 2019. 152 б.* *4. Авчиев Ш.К. Амалий геодезия. Ворис нашриёти, 2010. 350 б.* *5. Поклада Г.Г. Практикум по геодезии. Академический проект, Москва, 2015 г., 486 стр.*

Faculty of Land resources and cadastre
The direction of education: 60710800 – Hydropower

Educational program

Module designation	*IG1105 Engineering Surveying*
Semester(s) in which the module is taught	*2*
Person responsible for the module	*Associate professor, PhD Jumanov Azamat Norbutaevich*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geographyб, Informatics (school subjectк), Higher mathematics.*

Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-to be able to visualize acquired geodetic concepts from a geodetic-cartographic and geo-information point of view, to practical and theoretical knowledge, to know and explain the tasks of plan and height geodetic networks, analytical networks and density polygonometry and their construction, geodetic research methods;* *-able to imagine topographical-geodesic search works, geodetic planning works, from geodetic-cartographic and geoinformational point of view;* *-geodetic works performed in the alignment and construction of linear constructions, geodetic construction network, building, industrial, plan and height geodetic networks, analytical networks and compaction polygonometry tasks and can apply their construction in practice;* *-knows topographic maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-knows how to solve geodetic works performed in the search, design and construction of hydromeliorating and hydrotechnical structures, geodetic works performed in determining the deformation of engineering structures, and engineering geodetic problems;* *-can define scales, conventional signs, topographic maps, their graphing and nomenclature;* *- learns to carry out measurements of the elements of the place using geodetic measuring instruments, geodetic equipment, methods of measurement and processing of results;* *-draws up the project of the construction object, carrying out topographic surveying, moving the designed buildings and structures to the place, carrying out geodetic control and measurement works during their construction;* *-monitors the deformation of structures during their use by geodetic methods; geodetic work performed in the design and construction, mastering the methods of implementation of the methods, will have the skills to apply the solutions in practice.* *- to acquire the skills of making topographical plans and profiles of the place, to have the competences to carry out geodetic surveys using geodetic measuring instruments and software.*
Practical training	*After completing the internship, the student will:* *-strengthens theoretical knowledge obtained from "Engineering Geodesy";* *-studies methods of geodetic measurement in field conditions;* *-gains experience in performing the main types of geodetic measurements and observations;* *-will be qualified to use modern geodetic tools and technical equipment;* *-constitutes geodetic measurements and observations;* *-learns to process and analyze the obtained results;* *-prepares a practical report on the basis of scientific and research work carried out in the field.*

Content	*Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Understanding of map, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Level of difficulty: 2* *Horizontal transfer in analytical and graphical methods. Level of difficulty: 2* *Theodolite measurement and its essence, Level of difficulty: 3* *Grids of technical leveling Large-scale (1:5000-1:500) topographic maps height grids. Development of level networks in cities and settlements. Level of difficulty: 3* *Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation. Level of difficulty: 4* *Types of levelers, inspection and testing of leveling rods, leveling errors. Level of difficulty: 4* *Perform leveling and fill in the leveling log. Level of difficulty: 4* *Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty : 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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 collect a high score in it.*
Reading list	*1.Х.Ж.Хайитов, А.Н.Инамов. Инженерлик геодезияси. «ТИҚХММИ» Миллий тадқиқот унверситети, 2022. 495 б* *2. А.Суюнов Инженерлик геодезияси. Тошкент.2021.-359 б.* *3. Абдуллаев Т.М., Инамов А. Н., Лапасов Ж.О. Инженерлик геодезияси гидротехника ншоотларини қуришда геодезик ишлар. ТИҚХММИ, 2019. 152 б.* *4.Ш.К.Авчиев. Амалий геодезия. Ворис нашриёт 2010. 350 б.* *5.Г.Г.Поклада. Практикум по геодезии. Академический проект, Москва, 2015 г., 486 стр.,*

Hydraulic construction (HC)

The direction of education: 60812500-Use of hydraulic facilities and pumping stations

Educational Program

Module designation	*IG 1105 Engineering surveying*
Semester(s) in which the module is taught	*2*
Person responsible for the module	*Associate professor, Ph.D Xayitov Xolmurod Jamardovich* *Senior teacher, Abdiramanov Rashid Duschanovich* *Assistant professor, Shovazov Temur Karimjonovich*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, Mathematics (school subjects), Higher mathematics, Physics.*

Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- acquires an understanding of conducting water-technical exploration works (dam, dam, channel, river, water cadastre, stream, stream, hydrousele, etc.);* *-knows the tasks of engineering geodesy and applies it in the field of HC: search, design, construction and use, knows and can explain the tasks of plan and height geodetic networks, analytical networks and density polygonometry and their construction, geodetic research methods;* *-topographical-geodesic exploration works, geodetic planning works, - acquires geodetic-cartographic concepts, uses them in the construction of hydroelectric power plants;* *-geodetic works performed in the alignment and construction of linear structures, geodetic construction network, building, industrial, plan and height geodetic networks, analytical networks and density polygonometry tasks and can apply their construction in practice;* *-knows the theory of topographical maps, location elements, description of relief on maps and plans, coordinates, orientation, measurement and errors;* *-able to solve geodetic works performed in the search, design and construction of hydrotechnical structures, geodetic works performed in determining the deformation of engineering structures, and engineering geodetic issues;* *-determines of scales, conventional signs, topographic maps, their graphing and nomenclature, carries out geodetic works in reservoirs;* *-carries out measurements of the elements of the place using geodetic measuring devices (theodolite, level, electronic tachymeter, etc.), studies geodetic equipment, measurement methods and results processing;* *-is able to draw up a project of a construction object, carry out topographical surveying, move designed buildings and structures to their place, carry out geodetic control and measurement works during their construction;* *-during the period of use of structures, they will have the skills to observe their deformation by geodetic methods, geodetic works performed during design and construction, methods of implementation, and to apply their solutions in practice.;* *- has the skills to make topographical plans and profiles of the place, have the skills to conduct geodetic surveys using geodetic measuring instruments and software.*
Practical training	***After completing the internship, the student will:*** *-practically applies and strengthens the theoretical knowledge obtained from the science of "Engineering Geodesy".* *-learns and can apply geodetic measurement methods in field conditions;* *-will have experience in carrying out the main types of geodetic measurements and observations;* *- has the ability to use modern geodetic tools and technical equipment;* *- can organize geodetic measurements and observations;* *- knows how to process and analyze the obtained results;* *- will have the ability to draw up a practical report on the basis of the scientific-research works carried out and carried out in the field.*

Content	*Application of engineering geodesy in the field of geotechnical engineering (dam, dam, canal, river, water cadastre, stream, stream, hydrousele, etc.), connection of the science with other sciences, stages of development. Water-technical exploration works. Level of difficulty: 1* *General understanding of engineering geodesy. Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Understanding of card, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Level of difficulty: 2* *Geodetic calculations and measurements in the HC area. Horizontal transfer in analytical and graphical methods. Level of difficulty: 2* *Geodetic works in water reservoirs and hydroelectric site. Theodolite measurement and its essence, Level of difficulty: 3* *Geodetic works, technical leveling grids, large-scale (1:5000-1:500) topographic maps, height grids for moving the project of hydrotechnical construction axes. Development of level networks in cities and settlements. Level of difficulty: 3* *Observation of subsidence and deformation of large hydrotechnical structures. Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation. Level of difficulty: 4* *Geodetic work in the design of channels. Types of levelers, inspection and testing of leveling rods, leveling errors. Level of difficulty: 4* *Geodetic works in the design and construction of melioration systems. Perform leveling and fill in the leveling log. Level of difficulty: 4* *Application of modern geodetic instruments in the field of GTQ. Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Хайитов Х.Ж., А.Н.Инамов. Инженерлик геодезияси. «ТИҚХММИ» Миллий тадқиқот унверситети, 2022. 495 б* *2. Суюнов А. Инженерлик геодезияси. Тошкент. 2021.-359 б.* *3. Абдуллаев Т.М., Инамов А. Н., Лапасов Ж.О. Инженерлик геодезияси гидротехника ншоотларини қуришда геодезик ишлар. ТИҚХММИ, 2019. 152 б.* *4. Авчиев Ш.К. Амалий геодезия. Ворис нашриёти, 2010. 350 б.* *5. Поклада Г.Г. Практикум по геодезии. Академический проект, Москва, 2015 г., 486 стр.*

Hydraulic construction (HC)

The direction of education: 60730900 Hydraulic construction (in water management)

Educational Program

Module designation	*IG 1105 Engineering surveying*
Semester(s) in which the module is taught	*2*
Person responsible for the module	*Associate professor, Ph.D Rozikulova Aykhumor Shermamatovna,* *Senior teacher, Abdiramanov Rashid Duschanovich* *Assistant professor, Shovazov Temur Karimjonovich*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, Mathematics (school subjects), Higher mathematics, Physics.*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- acquires an understanding of conducting water-technical exploration works (dam, dam, channel, river, water cadastre, stream, stream, hydrousele, etc.);* *-knows the tasks of engineering geodesy and applies it in the field of HC: search, design, construction and use, knows and can explain the tasks of plan and height geodetic networks, analytical networks and density polygonometry and their construction, geodetic research methods;* *-topographical-geodesic exploration works, geodetic planning works, - acquires geodetic-cartographic concepts, uses them in the construction of hydroelectric power plants;* *- geodetic works performed in the alignment and construction of linear structures, geodetic construction network, building, industrial, plan and height geodetic networks, analytical networks and density polygonometry tasks and can apply their construction in practice;* *-knows the theory of topographical maps, location elements, description of relief on maps and plans, coordinates, orientation, measurement and errors;* *-able to solve geodetic works performed in the search, design and construction of hydrotechnical structures, geodetic works performed in determining the deformation of engineering structures, and engineering geodetic issues;* *-determines of scales, conventional signs, topographic maps, their graphing and nomenclature, carries out geodetic works in reservoirs;* *-carries out measurements of the elements of the place using geodetic measuring devices (theodolite, level, electronic tachymeter, etc.), studies geodetic equipment, measurement methods and results processing;* *- is able to draw up a project of a construction object, carry out topographical surveying, move designed buildings and structures to their place, carry out geodetic control and measurement works during their construction;* *- during the period of use of structures, they will have the skills to observe their deformation by geodetic methods, geodetic works performed during design and construction, methods of implementation, and to apply their solutions in practice.;* *- has the skills to make topographical plans and profiles of the place, have the skills to conduct geodetic surveys using geodetic measuring instruments and software.*

Practical training	***After completing the internship, the student will:*** *-practically applies and strengthens the theoretical knowledge obtained from the science of "Engineering Geodesy".* *-learns and can apply geodetic measurement methods in field conditions;* *-will have experience in carrying out the main types of geodetic measurements and observations;* *- has the ability to use modern geodetic tools and technical equipment;* *- can organize geodetic measurements and observations;* *- knows how to process and analyze the obtained results;* *- will have the ability to draw up a practical report on the basis of the scientific-research works carried out and carried out in the field.*
Content	*Application of engineering geodesy in the field of geotechnical engineering (dam, dam, canal, river, water cadastre, stream, stream, hydrousele, etc.), connection of the science with other sciences, stages of development. Water-technical exploration works. Level of difficulty: 1* *General understanding of engineering geodesy. Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Understanding of card, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Level of difficulty: 2* *Geodetic calculations and measurements in the HC area. Horizontal transfer in analytical and graphical methods. Level of difficulty: 2* *Geodetic works in water reservoirs and hydroelectric site. Theodolite measurement and its essence, Level of difficulty: 3* *Geodetic works, technical leveling grids, large-scale (1:5000-1:500) topographic maps, height grids for moving the project of hydrotechnical construction axes. Development of level networks in cities and settlements. Level of difficulty: 3* *Observation of subsidence and deformation of large hydrotechnical structures. Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation. Level of difficulty: 4* *Geodetic work in the design of channels. Types of levelers, inspection and testing of leveling rods, leveling errors. Level of difficulty: 4* *Geodetic works in the design and construction of melioration systems. Perform leveling and fill in the leveling log. Level of difficulty: 4* *Application of modern geodetic instruments in the field of GTQ. Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. Хайитов Х.Ж., А.Н.Инамов. Инженерлик геодезияси. «ТИҚХММИ» Миллий тадқиқот унверситети, 2022. 495 б* *2. Суюнов А. Инженерлик геодезияси. Тошкент. 2021.-359 б.* *3. Абдуллаев Т.М., Инамов А. Н., Лапасов Ж.О. Инженерлик геодезияси гидротехника ншоотларини қуришда геодезик ишлар. ТИҚХММИ, 2019. 152 б.* *4. Авчиев Ш.К. Амалий геодезия. Ворис нашриёти, 2010. 350 б.* *5. Поклада Г.Г. Практикум по геодезии. Академический проект, Москва, 2015 г., 486 стр.*

Faculty of Land resources and cadaster
The direction of education: 60812600 – Remedial Hydrology

Educational Program

Module designation	*IG1105 Engineering Surveying*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Associate professor, PhD Jumanov Azamat Norbutaevich*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, Informatics (school subjects), Higher mathematics.*
Module objectives/intended learning outcomes	***As a result of mastering the subject, the student:*** *-knows and explain the tasks of plan and height geodetic networks, analytical networks and density polygonometry and their construction, geodetic research methods, to practical and theoretical knowledge, to be able to visualize acquired geodetic concepts from a geodetic-cartographic and geo-information point of view;* *-geodetic works performed in the alignment and construction of linear constructions, geodetic construction network, building, industrial, plan and height geodetic networks, analytical networks and compaction polygonometry tasks and can apply their construction in practice;* *-knows topographic maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-knows how to solve geodetic works performed in the search, design and construction of hydromelioration and hydrotechnical structures, geodetic works performed to determine the deformation of engineering structures, and engineering geodetic issues;* *-can define scales, conventional signs, topographic maps, their graphing and nomenclature;* *-learns to carry out measurements of the elements of the place using geodetic measuring instruments, geodetic equipment, methods of measurement and processing of results;* *-draws up the project of the construction object, carrying out topographic surveying, moving the designed buildings and structures to the place, carrying out geodetic control and measurement works during their construction;* *-during the period of use of structures, monitoring their deformation by geodetic methods, geodetic work performed in design and construction, mastering the methods of implementation of methods, acquires the skills to apply their solutions in practice;* *-acquires the skills of making topographical plans and profiles of the place, to have the competences to carry out geodetic surveys using geodetic measuring instruments and software.*

Content	*Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Understanding of card, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Level of difficulty: 2* *Horizontal transfer in analytical and graphical methods. Level of difficulty: 2* *Theodolite measurement and its essence, Level of difficulty: 3* *Grids of technical leveling Large-scale (1:5000-1:500) topographic maps height grids. Development of level networks in cities and settlements. Level of difficulty: 3* *Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation. Level of difficulty: 4* *Types of levelers, inspection and testing of leveling rods, leveling errors. Level of difficulty: 4* *Perform leveling and fill in the leveling log. Level of difficulty: 4* *Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty: 4*
Practical training	***After completing the internship, the student will:*** *-Strengthens theoretical knowledge obtained from "Engineering Geodesy".* *-study of geodetic measurement methods in field conditions.* *-gains experience in performing the main types of geodetic measurements and observations* *-will be qualified to use modern geodetic tools and technical equipment.* *-constitutes geodetic measurements and observations.* *-learns to process and analyze the obtained results.* *-prepares a practical report on the basis of scientific and research work carried out in the field.*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1.Х.Ж.Хайитов, А.Н.Инамов. Инженерлик геодезияси. «ТИҚХММИ» Миллий тадқиқот унверситети, 2022. 495 б* *2. А.Суюнов Инженерлик геодезияси. Тошкент.2021.-359 б.* *3. Абдуллаев Т.М., Инамов А. Н., Лапасов Ж.О. Инженерлик геодезияси гидротехника ншоотларини қуришда геодезик ишлар. ТИҚХММИ, 2019. 152 б.* *4.Ш.К.Авчиев. Амалий геодезия. Ворис нашриёт 2010. 350 б.* *5.Г.Г.Поклада. Практикум по геодезии. Академический проект, Москва, 2015 г., 486 стр.,*

Faculty of Land resources and cadaster
The direction of education: 60812900- Water supply engineering systems

Educational Program

Module designation	*IG2105 Engineering Surveying*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Associate professor, PhD Jumanov Azamat Norbutaevich*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self-learning – 60 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, Mathematics (school subjects), Higher mathematics*
Module objectives/intended learning outcomes	***As a result of mastering the subject, the student:*** *-knows and explain the tasks of plan and elevation geodetic networks,to practical and theoretical knowledge, to be able to visualize acquired geodetic concepts, from a geodetic-cartographic and geo-information point of view, analytical networks and density polygonometry and their construction, geodetic research methods;* *-topographical-geodesic search works, geodetic planning works, able to imagine from geodetic-cartographic and geoinformational point of view;* *- geodetic works performed in the alignment and construction of linear constructions, geodetic construction network, building, industrial, plan and height geodetic networks, analytical networks and density polygonometry tasks and can apply their construction in practice;* *- knows topographic maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *- knows how to solve geodetic works performed in the search, design and construction of hydromelioration and hydrotechnical structures, geodetic works performed in determining the deformation of engineering structures, and engineering geodetic problems;* *- determination of scales, conventional signs, topographic maps, their graphing and nomenclature;* *- learns to carry out measurements of the elements of the place using geodetic measuring instruments, geodetic equipment, methods of measurement and processing of results;* *- drawing up the project of the construction object, carrying out topographic surveying, moving the designed buildings and structures to the place, carrying out geodetic control and measurement works during their construction;* *- monitoring the deformation of structures during their use by geodetic methods; geodetic work performed in the design and construction, mastering the methods of implementation of the methods, will have the skills to apply the solutions in practice;* *- to acquire the skills of making topographical plans and profiles of the place, to have the competences to carry out geodetic surveys using geodetic measuring instruments and software.*

Practical training	*After completing the internship, the student will:* *- Strengthens theoretical knowledge obtained from "Engineering Geodesy".* *- study of geodetic measurement methods in field conditions;* *- gains experience in performing the main types of geodetic measurements and observations;* *- will be qualified to use modern geodetic tools and technical equipment;* *- constitutes geodetic measurements and observations;* *- learns to process and analyze the obtained results;* *-prepares a practical report on the basis of scientific and research work carried out in the field.*
Content	*Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Understanding of card, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Level of difficulty: 2* *Horizontal transfer in analytical and graphical methods. Level of difficulty:2* *Theodolite measurement and its essence, Level of difficulty: 3* *Grids of technical leveling Large-scale (1:5000-1:500) topographic maps height grids. Development of level networks in cities and settlements. Level of difficulty: 3* *Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation. Level of difficulty: 4* *Types of levelers, inspection and testing of leveling rods, leveling errors. Level of difficulty: 4* *Perform leveling and fill in the leveling log. Level of difficulty: 4* *Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1.Х.Ж.Хайитов, А.Н.Инамов. Инженерлик геодезияси. «ТИҚХММИ» Миллий тадқиқот унверситети, 2022. 495 б* *2. А.Суюнов Инженерлик геодезияси. Тошкент.2021.-359 б.* *3. Абдуллаев Т.М., Инамов А. Н., Лапасов Ж.О. Инженерлик геодезияси гидротехника ншоотларини қуришда геодезик ишлар. ТИҚХММИ, 2019. 152 б.* *4.Ш.К.Авчиев. Амалий геодезия. Ворис нашриёт 2010. 350 б.* *5.Г.Г.Поклада. Практикум по геодезии. Академический проект, Москва, 2015 г., 486 стр.,*

Faculty of Land resources and cadaster
The direction of education: 60812400 – Mechanization of water management and reclamation works

Educational Program

Module designation	*IG1105 Engineering Surveying*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Associate professor, PhD Jumanov Azamat Norbutaevich* *Senior teacher, Abdiramanov Rashid Duschanovich* *Assistant professor, Valieva Albina Robertovna* *Assistant professor Shavozov Temur Karimovich*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, Informatics (school subjectқ), Higher mathematics.*

Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- to be able to visualize acquired geodetic concepts from a geodetic-cartographic and geo-information point of view, to practical and theoretical knowledge, to know and explain the tasks of plan and height geodetic networks, analytical networks and density polygonometry and their construction, geodetic research methods;* *-able to imagine topographical-geodesic search works, geodetic planning works, from geodetic-cartographic and geoinformational point of view;* *-geodetic works performed in the alignment and construction of linear constructions, geodetic construction network, building, industrial, plan and height geodetic networks, analytical networks and compaction polygonometry tasks and can apply their construction in practice;* *-knows topographic maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-knows how to solve geodetic works performed in the search, design and construction of hydromeliorating and hydrotechnical structures, geodetic works performed in determining the deformation of engineering structures, and engineering geodetic problems;* *-can define scales, conventional signs, topographic maps, their graphing and nomenclature;* *-learns to carry out measurements of the elements of the place using geodetic measuring instruments, geodetic equipment, methods of measurement and processing of results;* *-draws up the project of the construction object, carrying out topographic surveying, moving the designed buildings and structures to the place, carrying out geodetic control and measurement works during their construction;* *-monitors the deformation of structures during their use by geodetic methods; geodetic work performed in the design and construction, mastering the methods of implementation of the methods, will have the skills to apply the solutions in practice;* *-to acquire the skills of making topographical plans and profiles of the place, to have the competences to carry out geodetic surveys using geodetic measuring instruments and software.*
Practical training	*After completing the internship, the student will:* *- Strengthens theoretical knowledge obtained from "Engineering Geodesy".* *- studies methods of geodetic measurement in field conditions.* *- gains experience in performing the main types of geodetic measurements and observations.* *- will be qualified to use modern geodetic tools and technical equipment.* *- constitutes geodetic measurements and observations.* *- learns to process and analyze the obtained results.* *-prepares a practical report on the basis of scientific and research work carried out in the field.*

Content	*Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Understanding of map, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Level of difficulty: 2* *Horizontal transfer in analytical and graphical methods. Level of difficulty: 2* *Theodolite measurement and its essence, Level of difficulty: 3* *Grids of technical leveling Large-scale (1:5000-1:500) topographic maps height grids. Development of level networks in cities and settlements. Level of difficulty: 3* *Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation. Level of difficulty: 4* *Types of levelers, inspection and testing of leveling rods, leveling errors. Level of difficulty: 4* *Perform leveling and fill in the leveling log. Level of difficulty: 4* *Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty : 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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 collect a high score in it.*
Reading list	*1.Х.Ж.Хайитов, А.Н.Инамов. Инженерлик геодезияси. «ТИҚХММИ» Миллий тадқиқот унверситети, 2022. 495 б* *2. А.Суюнов Инженерлик геодезияси. Тошкент.2021.-359 б.* *3. Абдуллаев Т.М., Инамов А. Н., Лапасов Ж.О. Инженерлик геодезияси гидротехника ншоотларини қуришда геодезик ишлар. ТИҚХММИ, 2019. 152 б.* *4.Ш.К.Авчиев. Амалий геодезия. Ворис нашриёт 2010. 350 б.* *5.Г.Г.Поклада. Практикум по геодезии. Академический проект, Москва, 2015 г., 486 стр.,*

Faculty of Land resources and cadaster
The direction of education: 60812400 – Mechanization of water management and reclamation works

Educational Program

Module designation	*IG1105 Engineering Surveying*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Associate professor, PhD Jumanov Azamat Norbutaevich* *Senior teacher, Abdiramanov Rashid Duschanovich* *Assistant professor, Valieva Albina Robertovna* *Assistant professor Shavozov Temur Karimovich*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, Informatics (school subjectқ), Higher mathematics.*

Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- to be able to visualize acquired geodetic concepts from a geodetic-cartographic and geo-information point of view, to practical and theoretical knowledge, to know and explain the tasks of plan and height geodetic networks, analytical networks and density polygonometry and their construction, geodetic research methods;* *-able to imagine topographical-geodesic search works, geodetic planning works, from geodetic-cartographic and geoinformational point of view;* *-geodetic works performed in the alignment and construction of linear constructions, geodetic construction network, building, industrial, plan and height geodetic networks, analytical networks and compaction polygonometry tasks and can apply their construction in practice;* *-knows topographic maps, location elements, description of terrain on maps and plans, orientation measurement and error theory;* *-knows how to solve geodetic works performed in the search, design and construction of hydromeliorating and hydrotechnical structures, geodetic works performed in determining the deformation of engineering structures, and engineering geodetic problems;* *-can define scales, conventional signs, topographic maps, their graphing and nomenclature;* *-learns to carry out measurements of the elements of the place using geodetic measuring instruments, geodetic equipment, methods of measurement and processing of results;* *-draws up the project of the construction object, carrying out topographic surveying, moving the designed buildings and structures to the place, carrying out geodetic control and measurement works during their construction;* *-monitors the deformation of structures during their use by geodetic methods; geodetic work performed in the design and construction, mastering the methods of implementation of the methods, will have the skills to apply the solutions in practice;* *-to acquire the skills of making topographical plans and profiles of the place, to have the competences to carry out geodetic surveys using geodetic measuring instruments and software.*
Practical training	*After completing the internship, the student will:* *- Strengthens theoretical knowledge obtained from "Engineering Geodesy".* *- studies methods of geodetic measurement in field conditions.* *- gains experience in performing the main types of geodetic measurements and observations.* *- will be qualified to use modern geodetic tools and technical equipment.* *- constitutes geodetic measurements and observations.* *- learns to process and analyze the obtained results.* *-prepares a practical report on the basis of scientific and research work carried out in the field.*

Content	*Understanding of the shape and dimensions of the Earth, the system of coordinates and heights used in Geodesy. State geodetic networks: plan and elevation networks. Methods of installing planned networks. Level of difficulty: 2* *Understanding of map, plan and profile. Scales, numerical and graphical. Numerical and linear scales of topographic maps. Understanding of line orientation. True azimuth and bearings. Level of difficulty: 2* *The main landforms. Ways of depicting the terrain on plans and maps. Depicting the terrain with horizontal. Level of difficulty: 2* *Horizontal transfer in analytical and graphical methods. Level of difficulty: 2* *Theodolite measurement and its essence, Level of difficulty: 3* *Grids of technical leveling Large-scale (1:5000-1:500) topographic maps height grids. Development of level networks in cities and settlements. Level of difficulty: 3* *Design and accuracy assessment of level grids. Perform reconnaissance. Types of leveling underground signs and their installation. Level of difficulty: 4* *Types of levelers, inspection and testing of leveling rods, leveling errors. Level of difficulty: 4* *Perform leveling and fill in the leveling log. Level of difficulty: 4* *Tacheometric surveying and its essence, GPS and GNSS surveying and its essence. Application of modern geodetic tools in geodesy. Level of difficulty : 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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 collect a high score in it.*
Reading list	*1.Х.Ж.Хайитов, А.Н.Инамов. Инженерлик геодезияси. «ТИҚХММИ» Миллий тадқиқот унверситети, 2022. 495 б* *2. А.Суюнов Инженерлик геодезияси. Тошкент.2021.-359 б.* *3. Абдуллаев Т.М., Инамов А. Н., Лапасов Ж.О. Инженерлик геодезияси гидротехника ншоотларини қуришда геодезик ишлар. ТИҚХММИ, 2019. 152 б.* *4.Ш.К.Авчиев. Амалий геодезия. Ворис нашриёт 2010. 350 б.* *5.Г.Г.Поклада. Практикум по геодезии. Академический проект, Москва, 2015 г., 486 стр.,*

Faculty of Land resources and cadastre
The direction of education: 60722600-Geodesy and geoinformatics
Education program

Module designation	*KD2108 Cartographic design*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Associate professor, PhD Rustam Oymatov* *Senior teacher Minashkina Natalya Alekseevna,* *Assistant teacher Shavazov Timur Karimjonovich*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical training – 40 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography (school subject)*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and can explain the use of cartographic symbols to express the quantitative and qualitative relations of events on the map and the creation of field, line, point and volumetric conditional symbols;* *-understands the features of expressing the characteristics of events with colors;* *-can perfectly master the methods of placing the common elements of the map and apply the solutions in practice;* *-understands the principles of applying artistic methods and styles (rans, visual arts, fine art methods) in the design of thematic maps;* *-development of the design of the interior and exterior of cartographic images;* *-works with reference literature;* *-is able to organize the implementation of a practical task using computer design technologies (GlobalMapper, AsrcGIS, Mapinfo, Surfer, Paint, CorelDRAW) in creating maps and atlases;* *-performs an independent search for data for analysis and comparative descriptions of design elements;* *-acquires the skills of creating thematic maps using modern geographic information technology programs;* *-to be able to imagine cartographic design concepts and confirmations from a geodetic-cartographic and geo-informational point of view, to acquire the competencies of cartographic research methods in their unique and important place in modern science and technology.*

Content	*Development trend of cartographic design science. Visual aids. Design factors. Design at different stages of making maps. Purpose-built design of maps and atlases. Multimedia cartographic works. Field of cartography. The emergence and development of modern cartography. Level of difficulty: 1* *Map design. Map design and its importance. Design as a plan. Design (composition) of map elements. Level of difficulty: 2* *Text materials on the map and them. equipment Textual materials. Placing labels. Geographical names. Fonts. Edit entries on the map. Level of difficulty: 2* *Color in cartographic design. The nature of colors. Dimensions of colors. Color classification system. Choose colors. Level of difficulty: 3* *Scaling, compilation and generalization. Scale: Zoom out of the globe. Compilation: collection of data. Generalization. Level of difficulty: 3* *Basics of description of conditional signs. The essence of geographical conditional signs. Classification level of geographic data. Visualization of cartographic symbols. change. Selection of conditional symbols and their design. Level of difficulty: 4* *Description of geographic information. Equipping dotted conditional characters. Fitting the data by lines. Equipping field data. Equip volume data. Selection of conditional character types. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Oymatov R.Q. «Kartografik dizayn». Darslik. Toshkent. 2019. -315 bet.* *2. Oymatov R.Q. «Kartografik dizayn». O‘quv qo‘llanma. Toshkent. 2017. -234 bet.* *3. Mirzaliyev T., Safarov E.Yu., Egamberdiyev A., Qoraboyev J. Kartashunoslik. – Toshkent.: “Cho’lpon”, 2012. – 235 b.* *4. Mirzaliyev T., Safarov E. Yu., Egamberdiyev A., Qoraboyev J. S. Atlas kartografiyasi. – Toshkent.: “Universitet”, 2015. – 248 b.* *5. Cartography: thematic map design/Borden D. Dent, Jeffrey S. Torguson, Thomas W. Hodler.—6th ed.*

Faculty of Land resources and cadastre
The direction of education: 60722600 – Geodesy and geoinformatics
Educational program

Module designation	***KSH2110 Cartography***

Semester(s) in which the module is taught	*5,6*
Person responsible for the module	*Associate professor, PhD Rustam Oymatov* *Senior teacher Hikmatullaev Sanjar Izzatillaevich* *Senior teacher Minashkina Natalya Alekseevna,*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 300* *Contact hours:* *lecture – 40 hours* *practical training – 80 hours* *self-learning – 180 hours*
Credit points	*10*
Required and recommended prerequisites for joining the module	*Geography (school subject)*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and can explain the use of cartographic symbols to express the quantitative and qualitative relations of events on the map and the creation of field, line, point and volumetric conditional symbols;* *-understands the features of expressing the characteristics of events with colors;* *-can perfectly master the methods of placing the common elements of the map and apply the solutions in practice;* *-understands the principles of applying artistic methods and styles (rans, visual arts, fine art methods) in the design of thematic maps;* *-development of the design of the interior and exterior of cartographic images;* *-works with reference literature;* *-is able to organize the implementation of a practical task using computer design technologies (GlobalMapper, AsrcGIS, Mapinfo, Surfer, Paint, CorelDRAW) in creating maps and atlases;* *-performs an independent search for data for analysis and comparative descriptions of design elements;* *-acquires the skills of creating thematic maps using modern geographic information technology programs;* *-to be able to imagine cartographic design concepts and confirmations from a geodetic-cartographic and geo-informational point of view, to acquire the competencies of cartographic research methods in their unique and important place in modern science and technology.*

Content	*History of development of cartography. Cartography of antiquity. Cartography in the Middle Ages. Cartography of the new era. Formation of cartography in Uzbekistan, current situation, problems and prospects. Level of difficulty: 1* *Definition, elements, characteristics of maps. Definition, elements, characteristics of maps. Theoretical concepts in cartography. Scientific and practical importance of geographical maps. Level of difficulty: 2* *Mathematical basis of maps.* *Concept of cartographic projections. Classification of cartographic projections according to error characteristics. Classification of projections by the method of using an auxiliary geometric surface. Level of difficulty: 3* *Cartographic symbols and methods of cartographic representation. Types of symbols and their distinction. Character method. Line marking method. Isolines (equal lines) method. Qualitative color (background) and quantitative color (background) methods. The nested diagram method. Point method. Areas method. The method of signs in action. Method of cartography and diagrams. Combined use of cartographic imaging methods. Level of difficulty: 3* *Methods of depicting relief. General requirements. Dashes. Horizontals. Depicting landforms that cannot be represented by horizontal lines. Height stamps. Digital models of terrain. Level of difficulty: 2* *Inscriptions on geographic maps. Significance and types of records. Inscriptions as conditional symbols. Features of records. Indicators of geographical names. Level of difficulty: 3* *Cartographic generalization. The essence and factors of generalization. Types of generalization. Accuracy and quality of generalization. Level of difficulty: 3* *Classification, types and types of geographic maps. Classification and classification principles of geographic maps. Classification of maps according to scale and area occupied. Functional types of maps. Level of difficulty: 2* *Geographical atlases. Definition and classification of geographic atlases. Characteristics of atlases as whole (whole, indivisible) works. National atlases. Level of difficulty: 3* *Base map and atlases. Information about maps. General geographic maps and atlases. Topographic study of drought. Complex atlases of the world, countries and regions. Level of difficulty: 3* *Resources for creating maps and atlases. Types of resources and their description. Main cartographic sources and their description. h. Level of difficulty: 3* *Design, layout and publication of maps. Steps to create maps. Map program and its development. Compilation of maps. Publish maps. Level of difficulty: 4* *Ways to use maps. The use of maps is history. Cartographic method of research. Ways to analyze maps. Graphical methods. Level of difficulty: 3* *Conduct research through maps. Ways to work with maps. Study the interdependence and dynamics of events and processes on the basis of maps. Cartographic*

Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Oymatov R.Q. «Kartografik dizayn». Darslik. Toshkent. 2019. -315 bet.* *2. Oymatov R.Q. «Kartografik dizayn». O'quv qo'llanma. Toshkent. 2017. -234 bet.* *3. Mirzaliyev T., Safarov E.Yu., Egamberdiyev A., Qoraboyev J. Kartashunoslik. – Toshkent.: "Cho'lpon", 2012. – 235 b.* *4. Mirzaliyev T., Safarov E. Yu., Egamberdiyev A., Qoraboyev J. S. Atlas kartografiyasi. – Toshkent.: "Universitet", 2015. – 248 b.* *5. Cartography: thematic map design/Borden D. Dent, Jeffrey S. Torguson, Thomas W. Hodler.—6th ed.*

Faculty of Land resources and cadastre
The direction of education: 60722600 – Innovative technologies in remote sensing of the Earth
Educational program

Module designation	***KSH2109 Cartography***
Semester(s) in which the module is taught	*4,5*
Person responsible for the module	*Associate professor, PhD Rustam Oymatov* *Assistant teacher Aminova Guljahon Rustam qizi*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 270* *Contact hours:* *lecture – 40 hours* *practical training – 80 hours* *self-learning – 150 hours*
Credit points	*9*
Required and recommended prerequisites for joining the module	*Geography (school subject)*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and can explain the use of cartographic symbols to express the quantitative and qualitative relations of events on the map and the creation of field, line, point and volumetric conditional symbols;* *-understands the features of expressing the characteristics of events with colors;* *-can perfectly master the methods of placing the common elements of the map and apply the solutions in practice;* *-understands the principles of applying artistic methods and styles (rans, visual arts, fine art methods) in the design of thematic maps;* *-development of the design of the interior and exterior of cartographic images;* *-works with reference literature;* *-is able to organize the implementation of a practical task using computer design technologies (GlobalMapper, AsrcGIS, Mapinfo, Surfer, Paint, CorelDRAW) in creating maps and atlases;* *-performs an independent search for data for analysis and comparative descriptions of design elements;* *-acquires the skills of creating thematic maps using modern geographic information technology programs;* *-to be able to imagine cartographic design concepts and confirmations from a geodetic-cartographic and geo-informational point of view, to acquire the competencies of cartographic research methods in their unique and important place in modern science and technology.*

Content	*History of development of cartography. Cartography of antiquity. Cartography in the Middle Ages. Cartography of the new era. Formation of cartography in Uzbekistan, current situation, problems and prospects. Level of difficulty: 1* *Definition, elements, characteristics of maps. Definition, elements, characteristics of maps. Theoretical concepts in cartography. Scientific and practical importance of geographical maps. Level of difficulty: 2* *Mathematical basis of maps.* *Concept of cartographic projections. Classification of cartographic projections according to error characteristics. Classification of projections by the method of using an auxiliary geometric surface. Level of difficulty: 3* *Cartographic symbols and methods of cartographic representation. Types of symbols and their distinction. Character method. Line marking method. Isolines (equal lines) method. Qualitative color (background) and quantitative color (background) methods. The nested diagram method. Point method. Areas method. The method of signs in action. Method of cartography and diagrams. Combined use of cartographic imaging methods. Level of difficulty: 3* *Methods of depicting relief. General requirements. Dashes. Horizontals. Depicting landforms that cannot be represented by horizontal lines. Height stamps. Digital models of terrain. Level of difficulty: 2* *Inscriptions on geographic maps. Significance and types of records. Inscriptions as conditional symbols. Features of records. Indicators of geographical names. Level of difficulty: 3* *Cartographic generalization. The essence and factors of generalization. Types of generalization. Accuracy and quality of generalization. Level of difficulty: 3* *Classification, types and types of geographic maps. Classification and classification principles of geographic maps. Classification of maps according to scale and area occupied. Functional types of maps. Level of difficulty: 2* *Geographical atlases. Definition and classification of geographic atlases. Characteristics of atlases as whole (whole, indivisible) works. National atlases. Level of difficulty: 3* *Base map and atlases. Information about maps. General geographic maps and atlases. Topographic study of drought. Complex atlases of the world, countries and regions. Level of difficulty: 3* *Resources for creating maps and atlases. Types of resources and their description. Main cartographic sources and their description. h. Level of difficulty: 3* *Design, layout and publication of maps. Steps to create maps. Map program and its development. Compilation of maps. Publish maps. Level of difficulty: 4* *Ways to use maps. The use of maps is history. Cartographic method of research. Ways to analyze maps. Graphical methods. Level of difficulty: 3* *Conduct research through maps. Ways to work with maps. Study the interdependence and dynamics of events and processes on the basis of maps. Cartographic*

Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Oymatov R.Q. «Kartografik dizayn». Darslik. Toshkent. 2019. -315 bet.* *2. Oymatov R.Q. «Kartografik dizayn». O'quv qo'llanma. Toshkent. 2017. -234 bet.* *3. Mirzaliyev T., Safarov E.Yu., Egamberdiyev A., Qoraboyev J. Kartashunoslik. – Toshkent.: "Cho'lpon", 2012. – 235 b.* *4. Mirzaliyev T., Safarov E. Yu., Egamberdiyev A., Qoraboyev J. S. Atlas kartografiyasi. – Toshkent.: "Universitet", 2015. – 248 b.* *5. Cartography: thematic map design/Borden D. Dent, Jeffrey S. Torguson, Thomas W. Hodler.—6th ed.*

Faculty of Land resources and cadastre
The direction of education: 60722700-Innovative technologies in remote sensing of the Earth
Educational program

Module designation	*KD2108 Cartographic design*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Associate professor, PhD Rustam Oymatov* *Senior teacher Minashkina Natalya Alekseevna,* *Assistant teacher Shavazov Timur Karimjonovich*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical training – 40 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography (school subject)*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and can explain the use of cartographic symbols to express the quantitative and qualitative relations of events on the map and the creation of field, line, point and volumetric conditional symbols;* *-understands the features of expressing the characteristics of events with colors;* *-can perfectly master the methods of placing the common elements of the map and apply the solutions in practice;* *-understands the principles of applying artistic methods and styles (rans, visual arts, fine art methods) in the design of thematic maps;* *-development of the design of the interior and exterior of cartographic images;* *-works with reference literature;* *-is able to organize the implementation of a practical task using computer design technologies (GlobalMapper, AsrcGIS, Mapinfo, Surfer, Paint, CorelDRAW) in creating maps and atlases;* *-performs an independent search for data for analysis and comparative descriptions of design elements;* *-acquires the skills of creating thematic maps using modern geographic information technology programs;* *-to be able to imagine cartographic design concepts and confirmations from a geodetic-cartographic and geo-informational point of view, to acquire the competencies of cartographic research methods in their unique and important place in modern science and technology.*

Content	*Development trend of cartographic design science. Visual aids. Design factors. Design at different stages of making maps. Purpose-built design of maps and atlases. Multimedia cartographic works. Field of cartography. The emergence and development of modern cartography. Level of difficulty: 1* *Map design. Map design and its importance. Design as a plan. Design (composition) of map elements. Level of difficulty: 2* *Text materials on the map and them. equipment Textual materials. Placing labels. Geographical names. Fonts. Edit entries on the map. Level of difficulty: 2* *Color in cartographic design. The nature of colors. Dimensions of colors. Color classification system. Choose colors. Level of difficulty: 3* *Scaling, compilation and generalization. Scale: Zoom out of the globe. Compilation: collection of data. Generalization. Level of difficulty: 3* *Basics of description of conditional signs. The essence of geographical conditional signs. Classification level of geographic data. Visualization of cartographic symbols. change. Selection of conditional symbols and their design. Level of difficulty: 4* *Description of geographic information. Equipping dotted conditional characters. Fitting the data by lines. Equipping field data. Equip volume data. Selection of conditional character types. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Oymatov R.Q. «Kartografik dizayn». Darslik. Toshkent. 2019. -315 bet.* *2. Oymatov R.Q. «Kartografik dizayn». O‘quv qo‘llanma. Toshkent. 2017. -234 bet.* *3. Mirzaliyev T., Safarov E.Yu., Egamberdiyev A., Qoraboyev J. Kartashunoslik. – Toshkent.: “Cho’lpon”, 2012. – 235 b.* *4. Mirzaliyev T., Safarov E. Yu., Egamberdiyev A., Qoraboyev J. S. Atlas kartografiyasi. – Toshkent.: “Universitet”, 2015. – 248 b.* *5. Cartography: thematic map design/Borden D. Dent, Jeffrey S. Torguson, Thomas W. Hodler.—6th ed.*

Faculty of Land resources and cadaster
The direction of education: 60722600 – Geodesy and geoinformatics
Educational Program

Module designation	***OG 3110- Higher geodesy***
Semester(s) in which the module is taught	7,8
Person responsible for the module	*Rajapbayev Maqsud, senior teacher* *Ten Yuriy, senior teacher.*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self- learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 300* *Contact hours:* *Lecture – 40 hours* *Practical training – 80 hours* *Self- learning – 180 hours*
Credit points	*10*
Required and recommended prerequisites for joining the module	*Geodesy -1 and 2 parts*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- learns the basic concepts of the shape, size and gravity field of the earth, displacement surface, reduction problem, basic geodetic grids, high-precision geometric and trigonometric leveling, equalization of the results of high-precision geodetic measurements in the construction of geodetic grids on the surface of the earth;* *- gets an idea about the essence and tasks of spheroidal geodesy, the essence and tasks of theoretical geodesy, geodetic research methods in modern science and technology;* *- learns the real shape of the earth, Krassovskiy reference - ellipsoid, geodetic and astronomical coordinates and azimuths, deviation of the Chauvin line, Laplace azimuths, solving the reduction problem, designing and reconnaissance of geodetic reference networks, geodetic networks;* *-has knowledge and ability to use high-precision line and angle measurement, high-precision theodolites and features of their use, high-precision geometric and trigonometric leveling, design of state geodetic base networks, leveling roads, reconnaissance and fixing in place;* *-gets an understanding of the ellipsoid, geodetic and astronomical coordinates and azimuths, deviation of the Chauvin line, Laplace azimuths, reduction problem;* *-has knowledge and skills in equalizing the results of high-precision geodetic measurements in the construction of geodetic networks on the surface of the earth. design and reconnaissance of geodetic base networks, geodetic networks, high-precision line and angle measurement, high-precision theodolites and their use, high-precision geometric and trigonometric leveling, state leveling networks, design, reconnaissance and fixing of leveling roads, high-precision Levels and invar rails.*

Content	*General concepts of geodesy. Application of the science of "Higher Geodesy" and its prospects, the role of the science in the preparation of bachelors and its connection with other sciences, its role in increasing the efficiency of production in the national economy, areas of use and future prospects. Level of difficulty: 2* *Earth's shape and gravitational field. Gravity and surface of the earth, geoid and quasi-geoid, general earth ellipsoid, normal earth and real shape of earth, Krassovsky reference ellipsoid, geodetic and astronomical coordinates and azimuths, deviation of Chauvin line, Laplace azimuths, concept of reduction problem. Reductive problem solving method. Level of difficulty: 2* *Geodetic base networks. Geodetic networks, their importance, necessary accuracy of establishing the State geodetic network. The main methods of establishing the state geodetic network, the sequence of performing basic geodetic works, designing geodetic networks. Reconnaissance of geodetic points, calculation of height of geodetic marks, geodetic marks, centres of geodetic points. Methods of determining, restoring and repairing geodetic points. Level of difficulty: 3* *Angle measurement with high accuracy. High-precision theodolites and their use, tests and studies of high-precision theodolites, theory and methods of high-precision angle measurement, the condition for obtaining directions with equal precision at a point, the circular reception method, the angle measurement method in all combinations, incomplete reception methods. High-precision angle measurement methods using modern electronic tachometers. Level of difficulty:4* *High-precision geometric and trigonometric levelling. State levelling networks, design of levelling roads, reconnaissance and fixing in place, high-precision levels and invar rails, sources of errors in high-precision geometric levelling and methods of reducing their influence, methods of high-precision levelling, trigonometric levelling. Geometric and trigonometric levelling methods using modern electronic levels. Level of difficulty: 5* *Alignment of geodetic grids. Preliminary calculations in geodetic networks, equalization of geodetic networks by the correlation method, number of conditional equations in triangulation, evaluation of the sequence and accuracy of equalization calculations, equalization of geodetic networks by the parametric method, calculation and accuracy of equalized elements of the network. Level of difficulty: 5* *Space methods of development of geodetic base networks. Methods and technologies of development of satellite geodetic networks, GPS and local coordinate systems, kinematic basis of satellite measurements, methods of determining location object coordinates, transformation of point coordinates, satellite GPS receivers. Scope of use of GPS receivers. Level of difficulty: 4* *GPS and GNSS surveying and its essence. Understanding and using receivers working in modern GPS and GNSS systems. Level of difficulty: 4*

Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	1. T.M.Abdullaev., O‘.P.Islomov., O‘.B.Muxtorov., A.N.Inamov Oliy geodeziya. Toshkent: TIQXMMI, 2016. – 166 bet 2. Muborakov H.M., Toshpo‘latov S.A., Nazarov B.R. Oliy geodeziya. Toshkent: TAQI, 2012. – 459 bet. 3. Mirziyoyev Sh.M. Erkin va farovon demokratik O‘zbekiston davlatini birgalikda barpo etamiz.Toshkent,O‘zbekiston, 2016.-56 b. 4. Mirziyoyev Sh.M. Tanqidiy tahlil, qatiy tartib - intizom va shaxsiy javobgarlik – xar bir raxbar faoliyatining kundalik qoidsi bo‘lishi kerak. Toshkent,O‘zbekiston, 2017.-104b. 5. Mirziyoyev Sh.M. Qonun ustivorligi va inson manfaatlarini taminlash – yurt taraqiyoti va xalq farovonligini garovi. Toshkent,O‘zbekiston, 2017.-48b. 6. Mirziyoyev Sh.M. O‘zbekistonni rivojlantirishning beshta ustuvor yo‘nalishi bo‘yicha Harakatlar strategiyasi. T., O‘zbekiston, 2017. «Gazeta.uz».

Faculty of Land resources and cadaster
The direction of education 60722700-Innovative technologies in remote sensing of the Earth
Educational Program

Semester(s) in which the module is taught	***RF3109 Digital Photogrammmetrie***
Person responsible for the module	7,8
Language	*Associate professor, Khamidova Maknona Bakhtiyarovna,.* *Assistant Professor, Teshaev Nasim Nusratovich*
Relation to curriculum	*Uzbek*
Teaching methods	*Mandatory*
Workload (incl. contact hours, self-study hours)	*Lecture, practical training, self-learning*
Credit points	*Total workload: 270* *Contact hours:* *Lecture – 40 hours* *Practical training – 80 hours* *Self-learning – 150 hours*
Required and recommended prerequisites for joining the module	*9*
Module objectives/intended learning outcomes	*Geodesy, cartography, GIS.*
Semester(s) in which the module is taught	***After mastering the subject, the student:*** *-has an understanding of photogrammetric processes and can explain them;* *-can perfectly master the processes of creating digital cards and apply their solutions in practice;* *-spatial phototriangulation can perfectly master the methods of creating a series and apply its solutions in practice;* *-can apply the methods of introducing geometric and radiometric corrections of satellite images into practice, the unique important solutions of modern science and technology;* *-perfectly masters the use of IDRISI and Cognetion software to study the object according to its characteristics, classify images, control the state of vegetation and water resources;* *-can create various thematic maps as a result of digital processing of aerial photographs;* *- can perform the sequence of creating digital maps based on the data of remote sensing of areas;* *-can organize the implementation of a practical task using data using the radiolocation method;* *-creates orthophotoplans and can apply them in practice.*

Content	*Understanding the science of photogrammetry. Relationship of photogrammetry with other sciences.* *Understanding aerial photography. Concept of aerial photography. Level of difficulty: 1* *Calculation of aerial photography parameters. An understanding of the aircraft used in aerial photography. Level of difficulty: 2* *Principles of flying aircraft. Requirements for the flight apparatus selected for aerial photography. Level of difficulty: 2* *Camera work of aerial photography. Negative process. Evaluation of quality of aerial photography.* *Understanding of aerial photography. Types and characteristics of aerial photography objects. Understanding of photographic materials used in aerial photography. Level of difficulty: 2* *Understanding of space photography. Classification of space photos. Frame shooting system. Optical-electronic imaging system. Level of difficulty: 2* *Laser shooting system. Radiophysical imaging system. Laser imaging system. Level of difficulty: 3* *Coordinate systems used in photogrammetry. Concept of central projection. Central projection elements. Level of difficulty: 3* *Coordinate systems and orientation elements used in photogrammetry. Geocentric coordinate system. Level of difficulty: 3* *Gauss coordinate system. Aerosurtani coordinate system. Level of difficulty: 3* *Errors in aerial photographs.* *Errors caused by the influence of the slope angle. An understanding of digital photogrammetry. Understanding pixels. Level of difficulty: 3* *Elements of internal and external orientation of aerial photos. Elements of mutual orientation of photos.* *Level of difficulty: 2* *Monocular, binocular, stereoscopic vision. Stereo effect. Level of difficulty: 3* *The use of aerial photographs in agriculture. The technological scheme used in the delivery of contour and topographic maps Level of difficulty: 3*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. M S Akabarov M., Dj.K Muxitdinov. “Fotogrammetriya O’quv qo’llamna. T., Taffakkur Bo`stoni.2015,-160 b. 2. N.V. Kovalyov, Dj.K. Muxitdinov, O.G. Shukina, M.B. Xamidova. “Fotogrammetriya va yerni masofadan tadqiq etish “O’quv qo’llamna. T., TAQI-2015,- 160 b. 3. Oymatov R.K., Abduraxmonov S.N., Reymov M.P. Aerokosmik suratlarning internet-resurs ma’lumotlari. O’quv qo’llanma. 2021 yil. 4. Шокиров Ш., Мусаев И., Акбар М. Масофадан зондлаш. Т.: 2015.

Faculty of Land resources and cadaster

The direction of education: 60722700- Innovative technologies in remote sensing of the earth

Educational program

Module designation	*RG2105 Regional geography*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Associate professor, Ph.D Rozikulova Aykhumor Shermamatovna*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self-learning – 90 hours*
Credit points	*30*
Required and recommended prerequisites for joining the module	*Geography (school program), Geodesy*
Module objectives/intended learning outcomes	*After mastering the subject, the student:* *-gets acquainted with the information of local history and can use it in reconnaissance work in working with topographical maps and maps in the course of his professional activity;* *-Uzbekistan's natural, agricultural, water and soil resources are effectively used and used in activities aimed at their protection;* *-the study of science uses the possibility of systematic research and protection of the potential of available resources (land, water, underground and surface) in our country;* *-helps students to grow their worldview and acquire general knowledge and skills about the laws of the earth's nature (rhythmicity, cyclicity, periodicity). It can apply in scientific and practical matters;* *-Knowledge and skills are formed on the comprehensive study and analysis of the natural conditions, climate, soil, water resources, natural reserves, agricultural development conditions of Uzbekistan, which is a region of the earth;* *- can use in remote sensing of each natural-geographical region of Uzbekistan based on its agro-climatic features,*

	natural-geographical conditions, placement of crop types and crop types; *-Acquires and uses information on the geographical location and natural conditions and resources of the Republic of Karakalpakstan and regions.*
Content	*Introduction to Regional Natural Geography. Object and subject of natural geography of Uzbekistan. Stages of development of science, directions of regional country studies and regional landscape studies. Level of difficulty: 1.* *History of the geographical study of the nature of Uzbekistan: the study of the territory of Uzbekistan in the geography of the ancient world; Development of geographical ideas about the nature of the territory of Uzbekistan in the Middle Ages; the development of geographical ideas about the nature of the country in the 18th century and the first half of the 19th century; development of geographical ideas during the colonial period (1850-1917); The development of geographical ideas in Uzbekistan during the Soviet period; Development of geography in Uzbekistan during the years of independence. Level of difficulty: 2.* *Peculiarities of the nature of Uzbekistan. The fact that it is an inner continental land, a closed basin-"land without flow", the uniqueness of the Earth's surface, tectonic activity, a land of sharp natural differences, a hydrographic and ecological closed area, the homeland of great scientists who made a great contribution to world science and culture. Level of difficulty: 2.* *Geological structure, minerals and seismicity of the territory of Uzbekistan. Stratigraphy and lithology, tectonics, stages of development of nature in the territory of the republic and emergence of relief, seismicity of the territory, minerals. Level of difficulty: 5.* *The main features of the orography and relief of Uzbekistan. Plain relief - Okhchadarya, Sarikamish delta, Kyzylkum, Tog Ody and plains. Snotkal-Kurama mountain system, Nurota-Turkestan, Hisar-Zarafshan, hollows of the mountain range. Level of difficulty: 3* *Description of the climate of Uzbekistan. Geographical location and the role of solar radiation and atmospheric circulation in determining the climate of Uzbekistan. The influence of terrain, humidity, precipitation, winds. Level of difficulty: 2.* *Effective use of internal waters and water resources of Uzbekistan. Protection of drinking water sources. Rivers, lakes and reservoirs. Glaciers. Level of difficulty: 3.* *Soils of Uzbekistan and their protection. Regional and zonal distribution of soils. Characteristics of desert, hill, pasture soils. Level of difficulty: 3.* *Fauna and flora of Uzbekistan. Red book, elevation*

	change, protection of introzonal plants, fauna and flora, and species propagation measures. Level of difficulty: 4. *Assessment of the natural conditions of the republic from the point of view of agriculture. Protection of the environment and natural resources. Level of difficulty: 5.*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	1. Hasanov I. va b., O‘zbekiston tabiiy geografiyasi. O‘quv qo‘llanma. TIMI, 2016. 113 bet 2. Baratov P. O‘zbekiston tabiiy geografiyasi. Toshkent "O‘qituvchi", 1996 yil. 3. P.Baratov O‘zbekiston tabiiy geografiyasidan amaliy mashg‘ulotlar. Toshkent "Cho‘lpon", 2005 4. Vahobov H. va b. Umumiy Yer bilimi. Toshkent, “Bilim”, 2005. 5. Safarov E.Yu.Musaev I.M., Prenov Sh., Abdurahmonov S. Tabiiy kartalarni loyihalash va tuzish. Toshkent 2014 y. -180 b. 6. Ro‘ziqulova O., Abdunazarov O‘.Q. Tabiiy geografiya. O‘quv qo‘llanma. TIMI, 2016 7. Safarov E.Yu.Musaev I.M., Prenov Sh., Abdurahmonov S. Tabiiy kartalarni loyihalash va tuzish. Toshkent 2014 y. -180 b. 8. Safarov E., Musaev I. Geoaxborot tizimi va texnologiyalar. T.,TIMI, 2008, -160b. 9. Mirzaliev T. Kartografiya. – Toshkent.: O‘z.MU, 2006. – 196 b.

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Education program

Module designation	***WGT3105 – Web-GIS***
Semester(s) in which the module is taught	*8*
Person responsible for the module	*Associate professor, PhD Rustam Oymatov*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning*

Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical training – 40 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography (school subject)*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- has in-depth practical and theoretical knowledge of the science program, the ability to imagine the mastered Web-GIS concepts, confirmations from the point of view of Internet networks, servers, web, cartographic and geoinformation, research methods of geoinformation systems and technologies in modern science and* *- is able to create, master the methods of placing common elements of the map and apply solutions through web maps working with web browsers, searching and analyzing geodata through browsers, using cartographic symbols to express quantitative and qualitative relationships of events on the map, developing area, line, point and volume layers, web maps on ArcGIS online and other platforms;* *-has the skills to create thematic maps, programming languages used for creating web maps, programming platforms, working with web browsers, giving cartographic design to web maps, developing the design of their internal and external views, Global Mapper 20, ArcGIS 10.8, Mapinfo related to geoinformation system and technologies , Surfer, Paint, CorelDRAW 20.*

Content	*Understanding the Web and GIS. General concepts of Internet, web and mobile web, Geoinformation systems. Level of diffilulty: 2* *The emergence and development of Web-GIS. The emergence of the first Web-GIS. Web-GIS in WEB 2.0 services. Level of diffilulty: 2* *Concept of Web-GIS. Definition of Web-GIS concept. Features of Web-GIS. Level of diffilulty: 3* *Web-GIS applications. Tasks of Web-GIS. Using Web-GIS. Web-GIS as a new business model and a new type of product. Level of diffilulty : 3* *Technical basics of Web-GIS. Web Basics. Web Principles. Dependence on technologies. Service technology. Level of diffilulty: 3* *Basic architecture and components of Web-GIS. Web-GIS servers, GIS database, Web-GIS clients, Problems and their elimination. Level of diffilulty: 3* *Architecture of primary and secondary clients of Web-GIS. Main client architecture. Architecture of the secondary client. A basic example of workload distribution. Basic cards. Level of diffilulty: 4* *Understanding Geospatial Web Services. Transition from websites to web services. Basic functions of geospatial web services. Level of diffilulty: 4* *Geospatial meshes (web applications). Development trend of geospatial meshes. Content, Functions and Interfaces of the Web. Meshap development and implementation. Complications and future plans. Level of diffilulty: 3* *Mobile GIS. Use of mobile GIS and its advantages. Technologies used. Software products. Examples of the use of mobile GIS. Practical studies. Level of diffilulty: 4* *Understanding Geoportals. The concept of geoportals and their use. Functional tasks and architecture. Thematic studies of geoportals. Types of geoportals. Organizational and general geoportals. Regional, national and global geoportals. Level of diffilulty: 4* *From data mining to web services. Information sharing in the National Spatial Data Infrastructure. Level of diffilulty : 4* *Determining the scale. Scale description. Select the scale. Data collection and compilation. Database. Sources of the internal data bank. Initial information. Level of diffilulty: 4* *Separation of web services. Providing geospatial information. Network services and special services. Level of diffilulty : 5* *AggreGISion of web services. Search for required web services. Using cloud web services. Level of diffilulty: 5* *Problems and prospects in the infrastructure of national spatial information. Data quality and semantic compatibility. Reliability and security of applications. Level of diffilulty : 4* *Importance of GIS in business. Emergence and development of electronic business. Level of diffilulty: 4* *Web-GIS networks in e-government. Introduction to e-Government and Geographical Governance. Importance of GIS for the government. Level of diffilulty: 4.* *Problems and future development. Design issues. The future of Web-GIS in e-government. Level of diffilulty: 4* *New thematic directions and research areas. Optional geographic information. GIS with public participation. Geotagging. Geoanalysis. Digital globe. Level of diffilulty : 4* *Sensory Web and Sensory Networks. Cloud computing and cloud-based GIS. Level of diffilulty: 4*

Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Oymatov R.Q. «Kartografik dizayn». Darslik. Toshkent. 2019. -315 bet.* *2. Oymatov R.Q. «Kartografik dizayn». O'quv qo'llanma. Toshkent. 2017. -234 bet.* *3. Mirzaliyev T., Safarov E.Yu., Egamberdiyev A., Qoraboyev J. Kartashunoslik. – Toshkent.: "Cho'lpon", 2012. – 235 b.* *4. Mirzaliyev T., Safarov E. Yu., Egamberdiyev A., Qoraboyev J. S. Atlas kartografiyasi. – Toshkent.: "Universitet", 2015. – 248 b.* *5. Cartography: thematic map design/Borden D. Dent, Jeffrey S. Torguson, Thomas W. Hodler.—6th ed.*

Faculty of Land resources and cadaster
The direction of education: 60813100-Land cadaster and land management

Educational Program

Module designation	*YYG 2103- Land cadaster and geodetic work in land formation*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Associate professor PhD, Jumanov Azamat Norbutaevich, Assistant Professor, Valieva Albina Robertovna*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 90* *Contact hours:* *Lecture – 20 hours* *Practical lessons – 20 hours* *Self-learning – 50 hours*
Credit points	*3*
Required and recommended prerequisites for joining the module	*Geodesy, Cadastre*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-should know the methods of land surveying and land cadastre, design of land areas, relocation of the project;* *- presents information from various sources and databases in the required format using information, computer and network technologies;* *-use of knowledge on modern technologies to conduct land surveying and cadastral works;* *-can choose appropriate methods for defining project boundaries;* *-knows the principles of occurrence of errors occurring at different stages of geodetic work and accounting methods;* *-learns the methods of processing the results of geodetic measurements;* *-the use of information technologies for information processing and design can be used in practice for the preparation of cadastral documents for state cadastre registration;* *-knows how to restore and survey land use boundaries, prepare project plans.* *-understands survey methods used in the preparation of land use plans;* *-knows the essence of land use, land area calculation methods;* *-knows the geodetic works and methods used in the design of fields, their relocation.*

Content	*The purpose and function of the science of geodetic works in land formation. The role and importance of geodetic works in the design of land formation, land cadastre and land reclamation works. The content of geodetic works performed in land preparation. Level of difficulty: 2* *Cadastre is currently maintained in all countries of the world. It is inextricably linked with accounting, assessment, condition and use of various natural resources, engineering activities, and concepts of ecology. Purpose and technology of geodetic work in determining (restoring) land boundaries. Level of difficulty: 4* *Survey methods used in the correction of land use plans. Alignment of plans using contour points as a reference. Surveying by the polar method using an electronic theodolite. Level of difficulty: 3* *Survey methods used in the correction of land use plans. Alignment of plans using contour points as a reference. Correction and updating of planning and cartographic material. Level of difficulty: 3* *When performing correction work, the task is to choose adjustment methods that practically ensure the correctness of the corrected plans. Surface determination methods used in land formation and land cadastre. Level of difficulty: 2* *Description of methods for determining land use land surfaces. Analytical surface determination. Graphical surface detection. Surface detection using palettes. Design of land areas. Level of difficulty: 3* *The nature and methods of project relocation. Preparatory work for the relocation of the project. Application of global navigation satellite systems. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. Oxunov Z.D. Yer tuzishda geodezik ishlar. T.: "Yangi asr avlodi", 2002. – 254 b.* *2. Абдираманов Р.Д., Успанкулов В.М. Геодезические работы при землеустройстве (учебное пособие) Ташкент, ТИИИМСХ, 2020. – 132 с.* *3. Ципинова Б.С. Геодезические работы при землеустройстве. Учебно-методическое пособие. – Майкоп, 2016. стр. 87.* *4. Денисова Е.С. Геодезические работы при землеустройстве: метод. указания по вып. лаб. работ / Е.С. Денисова. – Пенза: ПГУАС, 2016.* *5. Денисова Е.С. Геодезические работы при землеустройстве: метод. указания для сам. работы / Е.С. Денисова. – Пенза: ПГУАС, 2016.* *6. http://consultant.ru (Консультант плюс – правовая поддержка).* *7. http://dic.academic.ru (Словари и энциклопедии).* *8. http://elibrary.ru (Научная электронная библиотека).*

Faculty of Land resources and cadaster
The direction of education: 60722700 – Innovative technologies in remote sensing of the earth
Educational Program

Module designation	***ZGA3104- Modern geodesic instruments***
Semester(s) in which the module is taught	7
Person responsible for the module	*Associate professor, PhD Inamov Aziz*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self- learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 20 hours* *Practical training – 40 hours* *Self- learning – 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Geodesy, Geodesic works in Land Development*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- knows and can explain issues related to instrument error of electronic tachometers and their modelling;* *-can perform topographical surveying on the South 360 R electronic total station, can perform topographical surveying on the Trimble S3 electronic total station;* *-can process the results of the tachometric survey using the ArcGIS program, can perform the tasks of processing the results of the tachometric survey using the ArcGIS program;* *-has the ability to process digital level values in the AutoCAD program, draw the longitudinal and transverse profile of the level results in the AutoCAD program;* *-determines coordinate values using GPS, processing GPS values using Global Mapper software;* *-able to determine coordinate values using GNSS, conduct field and camera research work on processing GNSS values using Trimble Business Centre software;* *-can perform three-dimensional survey work on the Trimble TX-5 laser scanner, conduct field and camera survey work on processing Trimble TX-5 values using the Trimble Business Centre software;* *-able to carry out field and camera research work on drone surveying, processing drone values in software.*

Content	*Theoretical foundations of electronic tachometers. Design features of electronic tachometers. Modern charging devices. Instrument error of electronic tachometers and issues related to their modelling. Level of difficulty: 2* *Conducting field research on an electronic tachometer and processing results in software. Carrying out topographical survey work on Leica TS 06 Plus electronic tachometer. Carrying out topographic survey work on the Trimble S3 electronic total station. Processing of tachometric survey results using ArcGIS software. Level of difficulty: 4* *Digital and laser levels. Construction and calculation principle of Leica Geosystems AG digital levels. Construction and counting principles of Trimble digital levels. The principles of calculation on the rail introduced at the levels of the TOPCON company. Level of difficulty: 3* *Digital level rulers. Methods and means of research and verification of digital levels and rulers. Checking the status of individual barcodes. Research and inspection of digital levels. Study of the influence of magnetic fields on the accuracy of geometric levelling. Level of difficulty: 1* *Satellite devices. Antennas. Radio frequency blocks. Measure by codes. Keeping time in Sputnik technology. Satellite geodetic devices. Receiver errors. Antenna error. Level of difficulty: 5* *Satellite receivers. Software for GPS/GLONASS measurements. Use of GNSS system and satellite geodetic networks in our republic. Level of difficulty: 4* *The principle of operation of the ground laser scanner. The principle of operation of the ground laser scanner dalnomer block. Methods of measuring angles in ground-based laser scanning. Overview and classification of ground laser scanning scanners. Sources of errors in terrestrial laser scanning. Influence of the atmosphere on the accuracy of distance and angle measurements with terrestrial laser scanners. Influence on the accuracy of data acquisition and the description of scanners. Level of difficulty: 3* *Conducting field research on ground laser scanners. Ground laser scanners from Trimble. Laser scanners and modelling of hydro technical structures in them. Perform surface scanning. Level of difficulty: 3* *Remote controlled devices or drones. The history of the creation of drones. Types of drones and their classification. Carrying out filming with the help of a drone. Processing drone values in software. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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 collect a high score in it.*

Reading list	*1. Tashpolatov S.A., Islamov O'. P., Inamov A.N., Pardaboyev A.P. Zamonaviy geodezik asboblar. Darslik. "TIQXMMI" MTU 2022, 253-b.* *2. Tashpolatov S.A., Nazarov B.R., Shavkatova N.J. "Zamonaviy geodezik asboblar". Study guide. Tashkent, 2019. 300-b.* *3. Куприенко Н.О. Геодезические инструменты. Минск, 2016, 76 с.* *4. Елисеев С.В. Геодезические инструменты и устройства. Основы расчета, конструкции и особенности изготовления. Эд. 3-й, переработанный и Дон. М., «Недра», 2017. – 645 с.* *5. Захаров А.И. Геодезические инструменты: Справочник. – М.: Недра, 2017. – 314 с.*

Faculty of Land resources and cadaster
The direction of education: 60722600 – Geodesy and geoinformatics
Educational Program

Module designation	***ZGA3105- Modern geodesic instruments***
Semester(s) in which the module is taught	7
Person responsible for the module	*Associate professor, PhD Inamov Aziz* *Senior teacher, Abdiramanov Rashid*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self- learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical training – 40 hours* *Self- learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geodesy, Geodesic works in Land Development*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and can explain issues related to instrument error of electronic tachometers and their modelling;* *-can perform topographical surveying on the South 360 R electronic total station, can perform topographical surveying on the Trimble S3 electronic total station;* *-can process the results of the tachometric survey using the ArcGIS program, can perform the tasks of processing the results of the tachometric survey using the ArcGIS program;* *-has the ability to process digital level values in the AutoCAD program, draw the longitudinal and transverse profile of the level results in the AutoCAD program;* *-determines coordinate values using GPS, processing GPS values using Global Mapper software;* *-able to determine coordinate values using GNSS, conduct field and camera research work on processing GNSS values using Trimble Business Centre software;* *-can perform three-dimensional survey work on the Trimble TX-5 laser scanner, conduct field and camera survey work on processing Trimble TX-5 values using the Trimble Business Centre software;* *-able to carry out field and camera research work on drone surveying, processing drone values in software.*

Content	*Theoretical foundations of electronic tachometers. Design features of electronic tachometers. Modern charging devices. Instrument error of electronic tachometers and issues related to their modelling. Level of difficulty: 2* *Conducting field research on an electronic tachometer and processing results in software. Carrying out topographical survey work on Leica TS 06 Plus electronic tachometer. Carrying out topographic survey work on the Trimble S3 electronic total station. Processing of tachometric survey results using ArcGIS software. Level of difficulty: 4* *Digital and laser levels. Construction and calculation principle of Leica Geosystems AG digital levels. Construction and counting principles of Trimble digital levels. The principles of calculation on the rail introduced at the levels of the TOPCON company. Level of difficulty: 3* *Digital level rulers. Methods and means of research and verification of digital levels and rulers. Checking the status of individual barcodes. Research and inspection of digital levels. Study of the influence of magnetic fields on the accuracy of geometric levelling. Level of difficulty: 1* *Satellite devices. Antennas. Radio frequency blocks. Measure by codes. Keeping time in Sputnik technology. Satellite geodetic devices. Receiver errors. Antenna error. Level of difficulty: 5* *Satellite receivers. Software for GPS/GLONASS measurements. Use of GNSS system and satellite geodetic networks in our republic. Level of difficulty: 4* *The principle of operation of the ground laser scanner. The principle of operation of the ground laser scanner dalnomer block. Methods of measuring angles in ground-based laser scanning. Overview and classification of ground laser scanning scanners. Sources of errors in terrestrial laser scanning. Influence of the atmosphere on the accuracy of distance and angle measurements with terrestrial laser scanners. Influence on the accuracy of data acquisition and the description of scanners. Level of difficulty: 3* *Conducting field research on ground laser scanners. Ground laser scanners from Trimble. Laser scanners and modelling of hydro technical structures in them. Perform surface scanning. Level of difficulty: 3* *Remote controlled devices or drones. The history of the creation of drones. Types of drones and their classification. Carrying out filming with the help of a drone. Processing drone values in software. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. Tashpolatov S.A., Islamov O'.P., Inamov A.N., Pardaboyev A.P. Zamonaviy geodezik asboblar. Darslik. "TIQXMMI" MTU 2022, 253-b.* *2. Tashpolatov S.A., Nazarov B.R., Shavkatova N.J. "Zamonaviy geodezik asboblar". Study guide. Tashkent, 2019. 300-b.* *3. Куприенко Н.О. Геодезические инструменты. Минск, 2016, 76 с.* *4. Елисеев С.В. Геодезические инструменты и устройства. Основы расчета, конструкции и особенности изготовления. Эд. 3-й, переработанный и Дон. М., «Недра», 2017. – 645 с.* *5. Захаров А.И. Геодезические инструменты: Справочник. – М.: Недра, 2017. – 314 с.*

Faculty of Land resources and cadaster
The direction of education: 60722600 – Geodesy and geoinformatics

Educational Program

Module designation	***KLT3105- Designing and creating of the maps***
Semester(s) in which the module is taught	*8*
Person responsible for the module	*Associate professor, PhD Sarvar Abdurakhmonov* *Senior teacher Minashkina Natalya Alekseevna* *Assisstent-professor, Hayitova Maqsuda*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self-learning, coursework*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography (school program), Cartography, Geodesy*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-will have an idea about making maps and plans, cartographic projections, generalization works;* *-has knowledge and imagination about the technological processes of publishing maps and plans;* *-learns how to use methods of automating cartographic work, processes of publishing maps and plans;* *-acquires skills in the process of designing and creating maps, classifying maps, and preparing and publishing maps and atlases;* *-can perfectly master the methods of placing the common elements of the map and apply the solutions in practice;* *-able to organize a practical assignment using computer design technologies (GlobalMapper, AsrcGIS, Mapinfo, Surfer, Paint, CorelDRAW) in drawing up maps and atlases;*

Content	*The main content of designing and drawing up maps, cartographic information, conventional symbols and their design. Level of difficulty: 1* *Design maps. Meaning and essence of map design. The main feature of designing maps. Features of general geographic maps. Level of difficulty: 2* *Steps to get a map. Preparatory work, distribution of work. The sequence of map making works. Division of work. Creating the original of the map. Original and reproduction maps. Copyright materials and their types. The order of writing geographical names and placing them on the map. Level of difficulty: 3* *General geographic maps and their content. Design and layout of maps. Features of general geographic maps. Classification of general geographic maps. Organization of the creation of general geographic maps. Legend. Scale and its types. Design maps. Level of difficulty: 3* *Designing the geodetic and mathematical basis of general geographic maps. Basic geodetic and mathematical elements of maps. Selection of cartographic projections. Level of difficulty: 3* *Cartographic generalization. Generalization works in drawing up maps. The essence of cartographic generalization. Factors of cartographic generalization. Types of cartographic generalization. Geometrical accuracy of cartographic generalization and relevance to map content. Generalization of various events and processes (objects). The essence and characteristics of the generalization of natural objects. Stages of generalization work. Level of difficulty: 4* *The content of topographic maps and the main methods of their creation. Content of topographic maps, system of conventional signs. Differentiation of topographic maps of different scales according to their purpose. Basic methods of creating topographic maps (editing in field and camera conditions). Editing methods in the field. Geographical basis for decoding aerial photographs in the field. Level of difficulty: 3* *Update and improvement of topographic maps. The essence and technology of updating topographic maps. Creation and mathematical basis of the topographic map. Level of difficulty: 3* *View - topographic maps. Creation and mathematical basis of topographic maps. 1:200,000 scale map. 1:300,000 scale map. 1:500,000 scale map. 1:1,000,000 scale international map. Level of difficulty: 4* *Small-scale general geographic maps. Small-scale general geographic maps and their types. Special features of creating and editing small-scale maps. Level of difficulty: 4* *Design and layout of themed maps. Designing and making thematic maps (socio-economic, natural, historical) maps. Comprehensive mapping. Level of difficulty: 3* *Creating serial maps. Designing serial maps and complex atlases. Serial map coordination methodology. Editorial work in the compilation of maps. Level of difficulty: 3* *Creation of soil maps. The content and essence of the land map. Rules for developing the legend of the soil map. Ways to make small-scale soil maps. Level of difficulty: 3*

Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	1. *Safarov E.YU., Musayev I.M., Prenov SH., Abduraxmonov S. Tabiiy kartalarni loyihalash va tuzish. Toshkent 2014 y,-180 b* 2. *Ibragimova A.A. Kartalarni loyihalash va tuzish. "Tafakkur tomchilari". Toshkent-2021y.* 3. *Mirziyoyev Sh.M. O'zbekistonni rivojlantirishning beshta ustuvor yo'nalishi bo'yicha Harakatlar strategiyasi. T., O'zbekiston, 2017. «Gazeta.uz».* 4. *Kraak, M.J., Ormeling, F. [2010], Cartography: Visualization of Spatial Data. Prentice Hall.* 5. *Safarov E.Yu. va boshkalar. Kartografiya va geovizualizatsiya. T. Moliya-iktisod, 2015.-208 b.* 6. *Mirziyoev Sh.M. Erkin va farovon demokratik O'zbekiston davlatini birgalikda barpo etamiz.Toshkent,O'zbekiston, 2016.-56 b.*

Module designation	***KAR 2105 -Cartography***
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Associate professor, PhD* I.*M. Musayev* *Assistant professor G.R. Aminova*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours* *Contact hours:* *Lecture-30 hours* *Practical lesson-30 hours* *Self-learning - 90 hours*
/Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography (school subjects) Geodesy, Mathematics*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-studies the research object, subject and principles of cartography, the concept of a map, its content and classification, the formation of socio-economic cartography and the processes of publishing socio-economic maps;* *-will have an idea and knowledge about the theoretical and practical foundations of map design and construction, as well as solving problems aimed at determining the location of the main factors of map acquisition.* *- is able to describe the main factors of mapping, natural and social economic events on maps in relation to a certain time and place, and update and compile maps and plans in the implementation of nature protection measures;* *-knows how to apply his knowledge of cartography and its networks, the mathematical basis of the map, cartographic projections, projections used in making world maps, determining and orienting projections based on map grids;* *-can apply the knowledge of cartographic signs and their use, methods of describing the terrain in practice;* *-knows how to apply knowledge of cartographic generalization and its properties, pictures taken from space and their properties* *-creates the ability to use the most important map, atlasing view and information about cartographic geoinformatics and cartography and telecommunications, which summarizes the knowledge about the world obtained with modern techniques and technologies;* *-will have the skills to modernize cartographic processes, to apply methods of rapid mapping and planning for agriculture and water management with the help of space images.*

Content	*Cartography and geographic maps. Cartography and geographic maps. The connection of cartography with events and events. Parts, branches of cartography. Elements of geographic maps. Level of difficulty: 3* *Geographical globe. Geographical globe. A globe is a miniature model of the earth's surface. Positions of meridian and parallel. Features of the globe. Determination of orthodromia and loxodromia. Level of difficulty: 4* *History of cartography. History of cartography. Studying the history of cartography mainly on the basis of historical sources, determining the periods of development of the science. In the history of cartography, there are many scientists of this field in Central Asia and information about their contributions to cartography. Level of difficulty: 3* *Mathematical basis of maps. Mathematical basis of maps. Cartographic projections have two independent characteristics: error characteristics and division according to cartographic types. Change the scale, area and distance on the map. Level of difficulty: 4* *Cartographic symbols and their use. Cartographic symbols and their use Importance of cartographic symbols on the map. Cartographic symbols are the language of the map. Character method. The importance of the method of describing events and phenomena with symbols. Method of related diagrams. Level of difficulty: 3* *Features of geographic maps and their classification. Characteristics of geographic maps and their classification Conditional division of geographic maps into general geographic and thematic maps. Classification of geographical maps according to the area covered, scale, purpose Level of difficulty: 4* *Types of geographic maps. Division of maps into analytical and synthetic types according to the method of research of the depicted events. Understanding complex mapss. Importance of depicting related features on custom maps. Level of difficulty: 3* *Cartographic generalization and its features. The importance of sorting, selecting and summarizing some of the main and necessary ones when describing events and events on a map. In the process of generalization, taking into account the specific features of the scale, content, purpose, territory. Level of difficulty:4* *Geographical atlases and their classification. Definition of geographic atlas. Information about atlases published in our republic and abroad. Preparation and publication of maps. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. A.S. Suyunov, Sh.A. Suyunov, M.B. Aminjanova, D.D. Obidova - Kartografiya. Tashkent-2021* *2. E.Y. Safarov, I.M. Musayev, S.S. Salakhitdionov, R.Q. Oymatov – Umumgeografik xaritalarni loyihalash va tuzish, Tashkent-2022* *3. SH.M.Mirziyoyev "Tanqidiy tahlil, qat'iy tartib-intizom va shaxsiy javobgarlik har bir rahbar faoliyatining kundalik qoidasi bo'lishi kerak". Toshkent, "O'zbekiston", 2017 yil. -104 b.* *4. SH.M.Mirziyoyev "O'zbekistonni rivojlantirishning beshta ustuvor yo'nalishi bo'yicha Harakatlar strategiyasi" Toshkent, "O'zbekiston", 2017 yil. "Gazeta.uz".* *5. Antoni Moore and Igor Drecki, Geospatial Vision, New Dimensions in Cartography, 2008. Pages 253. Springer - Verlag Berlin Heidelberg.*

Faculty of Land resources and cadaster
The direction of education: 5313400-Geodesy and Geoinformatics

Educational Program

Module designation	***KGE4104 Space Geodesy ES (1)***
Semester(s) in which the module is taught	*11*
Person responsible for the module	*Associate professor, Islomov Utkir*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, Self- education*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 40 hours* *Practical lessons – 20 hours* *Self- learning – 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Mathematics, Physics, Informatics, Astronomy, Geography(school subjects) and Geodesy.*
Module objectives/intended learning outcomes	*After mastering the subject, the student:* *- knows and can explain the shape of the earth, the basic formulas of the earth's ellipsoid and their interconnections, coordinate systems and transition from one coordinate system to another coordinate system, determine the mutual locations of points on the earth's surface through an internationally accepted program;* *- understands the shape of the earth accepted at the international level with modern programs;* *- identifies the main formulas of the ellipsoid of the earth and their interconnections;* *- can use the transfer from one coordinate system to another coordinate system in practice;* *- learn the main tasks of space geodesy;* *- can apply in practice to determine mutual locations of points on the surface of the earth through an internationally accepted program;* *- will have the skills to organize the implementation of a practical task using geodetic tools used in space geodesy;* *- they know how to find the absolute coordinates of points relative to the center of gravity of the earth and create a single global coordinate system, the principles of operation of space geodetic instruments, measurement methods and methods of mathematical processing of measurement results, and the design of space geodetic grids.*

Content	*Application of space geodesy science and its prospects, the role of the science in the preparation of bachelors and its connection with other sciences, its role in increasing the efficiency of production in the national economy, areas of use and future prospects. Level of difficulty: 2* *Krasovsky reference-ellipsoid, astrogeodetic methods, determination of the external gravity field of the earth and the shape of the earth; to continuously define some fundamental constants of geodesy. Level of difficulty: 2* *Determination of mutual locations of points on the surface of the earth through an internationally accepted program; space vehicles, determination of the center of the reference ellipsoid relative to the center of gravity of the earth; finding the absolute coordinates of points relative to the center of gravity of the earth and creating a single global coordinate system; ensuring the connection between all geodetic systems. Level of difficulty: 3* *Observation of the shape of the earth and gravity field by satellites, spaceships, space velocity, beam and arrow, base stations for differential JPS, methods and technologies of development of geodetic networks using satellites. Level of difficulty: 4* *Space methods of development of geodetic reference networks, methods and technologies of development of satellite geodetic networks, JPS and local coordinate systems, kinematic basis of satellite measurements. Level of difficulty: 5*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	1. *S.A.Toshpo'latov., O'.P.Islomov., A.N. Inamov., Kosmik geodeziya 2018 yil 88 bet TIQXMMI* 2. *Muborakov H., Axmedov S. Geodeziya va kartografiya. Toshkent: O'qituvchi, 2012. – 304 bet.* 3. *Xamidov M., Z.D.Oxunov., A.S.Ro'ziyev.,X.Xayitov., G'.Z.Yaqubov Geodeziya darslik. Toshkent: Yangi asr avlodi, 2021 yil 512 bet.* 4. *Куприенко Н.О. Геодезические инструменты. Минск, 2016, 76 с.* 5. *Елисеев С.В. Геодезические инструменты и устройства. Основы расчета, конструкции и особенности изготовления. Эд. 3-й, переработанный и Дон. М., «Недра», 2017. – 645 с.*

Faculty of Land resources and cadastre
The direction of education: 5313400 – Geodesy and geoinformatics
Educational program

Module designation	*GTT4104 Geoinformation system and technologies*
Semester(s) in which the module is taught	*10*
Person responsible for the module	*Associate professor, PhD, Mukhtorov Uzbekkhan Burkhanovich, Assistant professor, Khayitova Maqsuda Rafiq qizi.*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 20 hours* *Practical lessons – 40 hours* *Self-learning – 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Geodesy, Designing and creating of maps, Remote sensing of the earth, Modern geodetic instruments.*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows and can provide information about the history and reasons for the creation of the geoinformation system;* *-understands terms and terms used in geoinformation systems and can use them;* *-can independently find, load, change and store raster and vector geodata;* *-recognizes programs used in GIS, can choose convenient programs based on their advantages and disadvantages;* *-can use and distinguish the structure of electronic and digital maps and use the necessary map based on the content of the map;* *-can create digital maps with a simple structure;* *-acquires theoretical knowledge about the importance of space images in GIS programs and can assess the quality of rasters;* *-knows how to enrich geographic information with data, types of attributive information and can use it in practice;* *-acquires the skills of creating thematic maps using modern geographic information technology programs;* *-knows directions for creating databases, using independent layers.*

Content	*Introduction to the science of GIS, concepts and tasks of the science. Introduction to Geoinformation Technologies. Development history of GIS. Basic concepts and terms. Evolution of GIS. Fields of application of GIS. Basic components of GIS. Geographical and attributive data. GIS and digital cartography GIS's hardware platform. GIS typology. Main components of GIS. Data models. Level of difficulty: 1* *Datums and Georeferencing. Special GIS programs. Digitization. Raster. Vector. Generalization of cartographic data. Buffering. Topology. Data collection and input for geographic information systems. Visualization of geographic data. Level of difficulty: 2* *Raster data processing. Measurement operations. Analysis of relations of spatial objects. Spatial queries. Overlay operations. Cutting and shearing operations. Aggregation and disaggregation of object attributes. Buffer zones. Proximity zones. Analysis of engineering fields. Analysis of geofields. Restore geofields. Vector data processing. Digital terrain models. Data collection and input for geographic information systems. Geodescription. Classify. Compare card. Three-dimensional imaging. Electronic cards. Plotter or graphing device. Level of difficulty: 3* *Obtaining spatial raster data for a geoinformation system. Getting digital cards over basic paper cards. Acquisition of maps based on remote sensing data. Obtaining vector information for the geoinformation system. Requirements for installing GIS programs. Management of GIS. Companies producing GIS programs. Expert systems. Obtaining data for GIS using modern geodetic instruments and technologies. Software of universal vector GISs. Software of universal raster GISs. Internet-GIS systems. Cartographic software modules. GIS applications. Level of difficulty: 4* *Remotely controlled devices and drones. Application of GISs. GISs of production significance. Application of GISs in geology and use of underground resources. GISs in state and administrative management bodies. Remote sensing of the earth. Concept of remote sensing. Optical methods of remote sensing. Modern development of geoinformation systems.* *Level of difficulty: 5*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *B.Markus, O‘.Muxtorov, Z.Mamatqulov, Z.Abduraxmonov, Sh.Sattorov Geoaxborot tizimlarida uch o‘lchamli modellashtirish. O‘quv qo‘llanma, Toshkent, TIQXMMI, 2021.* 2. *O‘.Muxtorov, A.Inamov Geoaxborot tizimi va texnologiyalari. O‘quv qo‘llanma Bosma Toshkent, TIQXMMI MTU.* 3. *O‘.Muxtorov, A.Inamov, J.Lapasov. “Geoaxborot tizim va texnologiyalar” fanidan amaliy mashg’ulotlarni bajarish bo‘yicha o‘quv qo‘llanma. T.: TIQXMMI, 2017.* 4. *Mirziyoyev SH.M. Erkin va farovon demokratik O‘zbekiston davlatini birgalikda barpo etamiz. Toshkent, O‘zbekiston, 2016.-56 b.* 5. *Mirziyoyev SH.M. Tanqidiy tahlil, qat’iy tartib - intizom va shaxsiy javobgarlik – har bir rahbar faoliyatining kundalik qoidsi bo‘lishi kerak. Toshkent,O‘zbekiston, 2017.- 104b.*

Faculty of Land resources and cadastre
The direction of education: 5313400 – Geodesy and geoinformatics
Educational program

Module designation	***ИИК 3206 Ижтимоий-иқтисодий картография***
Semester(s) in which the module is taught	*10*
Person responsible for the module	*Associate professor, Musayev Ilkhomjon* *Associate professor, PhD Sarvar Abdurakhmonov* *Assisstent-professor, Aminova Guljahon*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 180* *Contact hours:* *Lecture – 20 hours* *Practical lessons – 40 hours* *Self-learning – 120 hours*
Credit points	*6*
Required and recommended prerequisites for joining the module	*Geodesy, Cartography, Design and construction of maps, Remote sensing of the Earth*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- acquires an idea and knowledge about the research object, subject and principles of socio-economic cartography, the concept, content and classification of socio-economic map, the formation of socio-economic cartography and the processes of publishing socio-economic maps;* *- acquires knowledge and skills on the processes of making, methods of automating cartographic work projections on socio-economic maps, their generalization, classification of maps, object and subject of socio-economic cartography, industry, agriculture, transport, demographic processes, population, medical geography, socio-ecological cartography, cartographic symbols and their use, and publication of socio-economic maps;* *- will have skills in publishing social economic maps, development of map legends, generalization work, the process of creating a map and the experimental work performed on it, the sequence of creating maps and their coordination, general economic maps, systematic socio-economic mapping, generalization of socio-economic maps, classification of socio-economic maps.*

Content	*Socio-economic cartography is a research object and subject. Research object, subject and principles of socio-economic cartography. Concept, content and classification of socio-economic map. Level of difficulty: 2* *A brief history of socio-economic cartography. Formation of socio-economic cartography. Cartography of agriculture. Transport cartography. Cartography of demographic processes. Public service cartography. Socio-ecological cartography. Difficulty level: 2* *Analysis of features of population maps based on cartographic research methods, creation of "Demographic Processes" database based on geographic information system, development of methodology for creation of population maps using GIS technologies. Level of difficulty: 3* *Development and forecasting of maps of regional demographic processes using innovative methods and technologies. An innovative approach to creating electronic digital maps and visualization of demographic processes, demographic processes forecasting maps in GIS programs. Difficulty level: 4* *Selection of cartographic representation methods in socio-economic maps. Study of socio-economic maps from the point of view of methods of description. Selection of methods of depicting socio-economic maps in the structure. Level of difficulty: 4* *Cartographic sources. Contents of cartographic sources. Collect data from small areas. Resources for socioeconomic maps. Geographical basis of socio-economic maps. Socio-economic elements of the geographical basis. Level of difficulty: 4* *Methods of designing and compiling socio-economic maps. Methods of creating socio-economic maps. Development of the program of the map. The process of creating a map and the experimental work performed on it. The sequence of drawing maps and their coordination. Level of difficulty: 4* *Compilation of demographic maps based on modern cartographic methods. Demographic process maps. Geodetic works in geolocation of demographic processes. A method of creating interactive dynamic maps for population mapping. Systematic socio-economic mapping. Level of difficulty: 4*
Exams and assessment formats	*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.*

Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	1. *Mirzaliev T., Safarov E., Musaev I., Abduraxmonov S.N. Ijtimoiy iqtisodiy kartografiya. Darslik, T., Yangi asr avlodi, 2019, -200 b.* 2. *Thomas M.Lillesand, Ralph W.Kiefer, Jonathan W.Chipman (2008): Cartografiy and Image Interpretation. Sixth Edition. Wiley-India Edition* 3. ***Mirziyoev Sh.M. Tanqidiy tahlil, qatiy tartib - intizom va shaxsiy javobgarlik – xar bir raxbar faoliyatining kundalik qoidsi bo'lishi kerak. Toshkent,O'zbekiston, 2017.- 104b.*** 4. ***Mirziyoev Sh.M. Qonun ustivorligi va inson manfaatlarini taminlash – yurt taraqiyoti va xalq farovonligini garovi. Toshkent,O'zbekiston, 2017.- 48b.*** 5. *Mirzaliev T. Kartografiya. – Toshkent.: O'z.MU, 2006. – 196 b.* 6. *Mirzaliyev T., Musayev I. Kartografiya. Toshkent, Ziyonur, 2007.-160.* 7. *Safarov E.YU., Musaev I. M., Abduraxmonov S.N. "Geoaxborot tizim va texnologiyalar" fanidan amaliy mashg'ulotlarni o'tkazish bo'yicha metodik ko'rsatma. Toshkent - 2011 yil*.

Faculty of Land resources and cadastre
The direction of education: 60722600Faculty of Land resources and cadastre
Educational program

Module designation	*GAU3110 – Digital processing of space images*
Semester(s) in which the module is taught	*9,10*
Person responsible for the module	*Assistant professor, Ilhomjon Aslanov* *Assistant professor, Nozimjon Teshaev*
Language	*Uzbek, Russian and English*
Relation to curriculum	*elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 20 hours* *Practical lessons – 40 hours* *Self-learning – 60 hours*
Credit points	*10*
Required and recommended prerequisites for joining the module	*Geography, Astronomy (school subjects), Mathematics, Geodesy, Remote sensing of the earth, Photogrammetry, GIS*

Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- be able to download, process and analyze space images during the course;* *to have the skills to notice changes based on the analysis of aerial photographs, to assess the dynamics of change;* *- will have the ability to monitor the processes taking place on the surface of the earth based on the analysis of changes on the surface of the earth with the help of space photographs;* *- acquires an understanding of working with references and literature, the content and concepts of space photo analysis, processes of geographical research;* *- to have an idea about the types of space pictures, energy sources and electromagnetic waves, to develop skills and abilities in the use of computing techniques;* *-studies the use of computer programs used in their processing, the adaptation, enhancement and processing of images obtained by decoding space photographs;* *- to be able to distinguish objects from each other using the elements in space pictures. The ability to analyze the obtained results should have the skills, form the knowledge and skills to use as a resource.*
Content	*Stages of development of the science of decoding space pictures. Understanding satellites and their types. Level of difficulty: 2* *Modern programs and decoding of space pictures using them. Coordinate and time systems in decoding works. Space Image Decoding Software. Level of difficulty: 3* *Application and advantages of GPS and GNSS decoding. Level of difficulty: 3* *Agricultural Land Area Analysis and Land Area Monitoring Using Aero Space Image Data. Analysis of forest land areas based on the materials of remote sensing of the earth, technology of monitoring the condition of trees in forest areas. Level of difficulty: 3* *The influence of external environment on decoding results. Methods of determining location object coordinates. Software used in debugging. Methods used in deciphering work. Creation of relief maps based on space photographs. Analysis of space images in the monitoring of land areas. Monitoring of agricultural land. Calculation and accuracy assessment of equalized elements of the network. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. Ш.Шокиров, И.М.Мусаэв, М.С.Акбаров. Масофадан зондлаш. Тошкент, Иқтисод-молийа, 2015.* *2. Lavender S and Lavender A 2015 Practical Handbook of Remote Sensing (CRC Press)* *3. Wang Q 2018 Remote Sensing time Series Image Processing vol 4 (CRC Press)* *4. Wang Q 2018 Remote Sensing time Series Image Processing vol 4 (CRC Press)*

Faculty of Land resources and cadaster
The direction of education: 70722601-Geodesy and geoinformatics

Educational Program

Module designation	***AGE 5104- Practical geodesy***
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Zokhid Mamatkulov, PhD, senior teacher*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self- learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self- learning – 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Cartography, Geodesy*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- learns how to provide the necessary geodetic data to the structures to be built by carrying out geodetic measurements and calculation works;* *- during the construction process, the geometric shape and dimensions of the construction elements can be based on the project compliance;* *- able to use and put them into practice on the basis of ensuring project compliance;* *- the master's student develops the ability to analyze high-precision practical geodetic works on the ground;* *- has solid fundamental knowledge of design work in construction;* *- based on modern geodetic methods, the ability to move the project to its place and to work independently is formed;* *-the skill of moving the project of engineering structures to the place and analytical reasoning will grow.*

Content	*Geodetic work in the design and construction of roads and railways. Road search. Technical conditions for road design. Road route requirements. Road layout planning. Cross profile of the road. The main parts of cars and railways. Planning the upper part of the road. Paving of roads. Curves on the roads. Bending elements. Transition from one-way slope to two-way slope.. Level of difficulty: 2* *Geodetic works in the search and planning of main pipelines and electrical conductors. Search for pipelines. Structure of main pipelines. Technical search. Route planning. Selection of the electric line. Approaching speed of the track. Level of difficulty: 2* *Geodetic works in bridge construction. Crossing over the bridge. Composition of works. Plan the passage. Details plan. Basis for getting a plan. Get a detailed plan. Measure the length of the bridge. Accuracy. Water transfer through large bodies of water. Leveling through ice. Dual geometric leveling. Establishing the basis of the planning of the bridge. Types of planning networks. Bridge triangulation. Detailed planning of the bridge foundation. Level of difficulty: 3* *Geodetic works in airport exploration and construction. Exploration of airfields. Airport master plan. Field selection requirements. Geodetic grounding of airfields Grounding accuracy. Planned justification Planning of airport areas. Traversing works. Drop to plan. Level of difficulty: 3* *Geodetic works in industrial areas. Selection and planning of construction site. Establishment of industrial areas. Geodetic support in the installation and inspection of construction structures. Taking the verticality of the columns into an executive plan. Level of difficulty: 4* *Relocation of urban and residential projects. Composition of the city master plan. Detailed plan of construction site. Geodetic works in the construction of multi-storey prefabricated buildings. Technology scheme of geodetic works. Geodetic works in the construction of tall structures in the form of a tower. Stages of geodetic grounding. Level of difficulty: 4* *Geodesic work in the construction of hydraulic structures. Hydraulic facilities. Design of hydraulic structures. Topographic - geodetic works in water reservoirs. Planned justification. Measurement work. Measuring the depth of the river. Echolots. Photogrammetric and photometric methods. Stereophotogrammetric method of river depth measurement. Stereophotogrammetric method of measuring irrigation works. Topographic justification in the design of irrigation works. Level of difficulty: 5* *Geodetic works in the construction of hydroelectric dams. Hydrocells. Uniqueness of planning work. Development of a project of geodetic works. Construction of hydrocells. Geodetic grounding in the construction of a hydroplane. Level of difficulty: 5* *Tunnels, underground and unique structures. Geodetic grounding of the tunnel route. Tunnel design and construction methods. Portal and vertical mine shaft methods. Tunnel geodetic grounding scheme. Planned*

Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	1. *Halshofer B., Klas W. A Survey of Techniques for Achieving Metadata Interoperability /ACM Computing Surveys, Vol. 42, No. 2, Article 7, February 2010.* 2. *Suyunov A. S., Avchiev Sh. K. «Amaliy geodeziya» Samarkand, 2006 y. -236 b.* 3. *Булгаков Н.П., Рывина Е.М., Федотов Г.А. Прикладная геодезия. – М.: Недра, 2007. -228 с.* 4. *Avchiyev Sh. K., Toshpulatov S. A., «Amaliy geodeziya» 1, 2-qism, Toshkent 2002 y. -348 b.* 5. *Avchiyev Sh. K., Toshpulatov S. A. «Injenerlik geodeziyasi» Toshkent, 2000 y. -248 b.*

Faculty of Land resources and cadaster
The direction of education: 60722700 – Innovative technologies in remote sensing of the earth
Educational Program

Module designation	***ASM3104 Internet resource data of aerial photos***
Semester(s) in which the module is taught	*7*
Person responsible for the module	*Zokhid Mamatkulov, PhD, senior teacher*
Language	*Uzbek*
Relation to curriculum	*elective*
Teaching methods	*Lecture, practical training, self- learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical training – 40 hours* *Self- learning – 90 hours*
Credit points	*3*
Required and recommended prerequisites for joining the module	*Geography (school program), Information technology, Cartography, Geodesy*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- will have knowledge of general concepts about internet resource information of aerospace photos;* *- the basics of aerial and space photography will have an idea of receiving data using sensors and platforms, global navigation satellite systems;* *- acquires knowledge about the unique and important role of aerospace methods in modern science and technology;* *- uses of the results of analysis of aerial photographs for mapping is understood as a comprehensive reduction of programs of aerial photography of the earth's surface due to the extremely valuable features of satellite images;* *- perfectly master the use of modern GIS software in mapping remote sensing materials of the special importance of aerial photographs of the earth's surface;* *- acquires knowledge on obtaining data based on remote sensing, data integration, using aerospace data, conducting cartographic research using modern geographic information technology programs.*

Content	*Aero va kosmik fotosuratlarning asoslari. Aerofotosurat haqida umumiy tushunchalar. Aerofotosuratlarning turlari. Zamonaviy aerofoto va kosmik s'yomkalar. Qiyinchilik darajasi: 1* *Aerokosmik suratlarning internet-resurs ma'lumotlari bazasi. "Earth explorer", "LandsatLook", "Copernicus Open Access Hub", "USGS Global Visualization Viewer" va "Airbus Defence and Space – Geostore" internet-resurs ma'lumotlari bazasi. Tekin va foydalinish uchun ochiq bo'lgan aerokosmik suratlar bazasi. Aerokosmik suratlarni yuklab olish tartibi. Hududlarning aerokosmik suratlarning bazadan tanlash va yuklab olish. Aerokosmik suratlarni to'plash usullari. Qiyinchilik darajasi: 2* *Global navigatsion sun'iy yo'ldosh tizimlari yordamida ma'lumotlarni olish. Global navigatsion sun'iy yo'ldosh texnologiyalari va ularning ishlash prinsipi. O'lchash va ma'lumotlarni uzatish uchun radiosignallar. GNSYS da qo'llaniladigan koordinatalar sistemasi. O'lchashlar aniqligi va xatoliklar manbai. Qabul qilgichlarning turlari va texnik tavsiflari. GNSY bilan kuzatishlarni bajarish va ma'lumotlarni ishlab chiqish usullari. Mobil kartaga olish sistemasi. Qiyinchilik darajasi: 2* *Aerokosmik suratlarni qayta ishlash va masofadan zondlash asosida ma'lumotlar olish. Aerofkosmik surat turlari, Aerofkosmik suratlardagi xatoliklar, Aerokosmik suratlarning geometrik mohiyati, atmsfera va radimetrik xatolikalrni bartaraf qilish. Masofadan zondlash asosida ma'lumotlar olish. Qiyinchilik darajasi: 3* *Ma'lumotlar integratsiya qilish. Aerokosmik suratlardan kartografik malumotlar sifatida foydalanish. Yer tuzushda aerokosmik suratlarning ahamiyati. Tabiiy resurlarni boshqarishda aerokosmik suratlardan va GAT texnologiyalaridan foydalanish. Ma'lumotlarning turi va tarkibi, ma'lumotlar integratsiyasi.Qiyinchilik darajasi: 3* *Aerokosmik suratlarni deshifrovkalash. Aerokosmik suratlarni sinflash usullari, zamonaviy texnologiyalarni qo'llash orqali tasvirlarni o'qish. eCognition daturida tasvirlarni suratlarni deshifrlash. Edrisi Selva dasturidan foydalanib aerokosmik suratlar orqali tabiy resurslar holatini baholash. Qiyinchilik darajasi: 4* *Ma'lumotlar sifati va metama'lumotlar. Geografik axborot tizimlarida ma'lumotlar sifati, metama'lumotlar, ularning xususiyatlari, tasniflanishi va ifodalash vositalari, geoinformatsion kartaga olishda elektron kartalar metama'lumotlari.. Qiyinchilik darajasi: 5*
Exams and assessment formats	*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.*

Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Shokirov Sh., Musaev I., Akbar M. Masofadan zondlash. T.: 2015.* *2. Oxunov Z. va boshqalar. Ma'lumotlarni olish va integratsiyalash. T.: 2015.* *3. Waynne Randalph, James Campbell. Introduction to Remote Sensing. The Guilford Press. 2011.* *4. Halshofer B., Klas W. A Survey of Techniques for Achieving Metadata Interoperability /ACM Computing Surveys, Vol. 42, No. 2, Article 7,February 2010.* *5. Vlasov I.B. Global navigation satellite systems. M.: Rudomino, 2010.*

Faculty of Land resources and cadastre
The direction of education: 60722700-Innovative technologies in remote sensing of the Earth
Educational program

Module designation	***FMZ3104 - Photogrammetry and Remote Sensing***
Semester(s) in which the module is taught	*9*
Person responsible for the module	*Assisstant professor, Ilhomjon Aslanov* *Assisstant professor, Nozimjon Teshaev*
Language	*Uzbek, Russian, English*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self- learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical training – 40 hours* *Self- learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, Astronomy (school subjects), Mathematics, geodesy, Photogrammetry, GIS*

Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-able to download, process and analyze photogrammetry and remote sensing data;* *acquires the skills to notice changes and evaluate the dynamics of changes based on the analysis of photogrammetry and remote sensing data;* *- based on the analysis of land cover changes, will have the ability to monitor the processes taking place on the surface of the earth;* *- the content and concepts of the science of photogrammetry and remote sensing, the process and types of remote sensing of the earth, having an idea about energy sources and electromagnetic waves, forming skills and abilities in the use of computing techniques;* *-use of photogrammetry and remote sensing data and computer programs used in their processing, can distinguish objects from each other using elements in the image;* *- existing models for photogrammetry and remote sensing data processing, remote sensing can be used to manage land and water resources, forest monitoring;* *- the ability to evaluate the efficiency of the agricultural economy and to apply it to other areas, to analyze the obtained results.*
Content	*Land cover and land use from photogrammetry and remote sensing data. Land cover and land use change. creating a land cover map. Agriculture. Mapping of crop types. Level of difficulty: 2* *Classification of drone data processing. Image processing techniques. Raster data recording, storage and transmission media. Raster image data format. Metadata of a raster image. Preparation for recycling. Level of difficulty: 3* *Agricultural land area analysis and land area monitoring using drone and aerial data based on photogrammetry and remote sensing data. Analysis of forest land areas based on the materials of remote sensing of the earth, technology of monitoring the condition of trees in forest areas. Level of difficulty: 3* *Analysis of water bodies, monitoring of rivers and reservoirs based on photogrammetry and remote sensing data. Level of difficulty: 3* *Analysis of forest land areas based on the materials of photogrammetry and remote sensing data, technology of monitoring the condition of trees in forest areas. Level of difficulty: 4*
Exams and assessment formats	*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.*

Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Congalton R G 2015 Remote Sensing and Image Interpretation. 7th Edition Photogrammetric Engineering & Remote Sensing 81 615–6* *2. Moser G and Zerubia J 2018 Mathematical Models for Remote Sensing Image Processing* *3. Wang Q 2018 Remote Sensing time Series Image Processing vol 4 (CRC Press)*

Faculty of Land resources and cadaster
The direction of education: 70722601-Geodesy and Geoinformatics
Educational program

Module designation	***GIA5104 Scientific basis of Geoinformation System***
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Oymatov Rustam Kamariddinovich, PhD, associate professor*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 30 hours* *Practical lessons – 30 hours* *Self-learning – 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*GIS*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-knows the basic structure of the geographic information system;* *-can create components of the geographic information system;* *-knows basic geographic information system interfaces (GIS), models, data formats, spatial data entry methods;* *- develops geoinformation structure systems;* *- creating a program and developing the content of maps* *can create maps based on various data sources;* *-interpretation of geoinformation results, mapping and various preliminary studies;* *- creates geological databases;* *- maps, atlases and other types* *cartographic works using geoinformation* *performs;* *- can present basic information and critically analyze, apply theoretical knowledge in practice;* *-knows and can explain the use of cartographic symbols to express quantitative and qualitative relations of events on the map and the creation of field, line, point and volumetric conditional symbols;* *- understands the features of expressing the characteristics of events with colors;* *- can perfectly master the methods of placing the common elements of the card and apply their solutions in practice.*

Content	*The role of land categories and land types in analysis. Geospatial layer. The role of GAT programs in land resource management. Brief definition of geography information systems. Features of geography digital information. Level of difficulty: 1* *Technologies that collect and work with geographic information. The main 3 groups according to the tools used, the main features of the geographic information system and the tasks to be performed. Brief information on the history of the development of geography information systems, the tasks of mapping and collecting spatial data, their analysis, processing and modeling, and distribution. Level of difficulty: 1* *A key component of geocoding is DIME and TIGER files. Products such as ARCGIS, ARC/INFO, ArcView, and the role of the Environmental Systems Research Institute (ESRI). Features of geography map. Geographic information system is about the possibilities of finding an object or element according to its location and solving the reverse task. Level of difficulty 2* *Characteristics of maps from the point of view of use in the geographic information system: the map is a source of geographic information, a means of storing information in the geographic information system, the geometry of the map and the geometry of its elements. Position information: The position and coordinates of an object, with changes that occur as a result of moving the image from a flat surface to a plane. An important indicator of the map: its content and coordinate system. Mathematical basis and cartographic projection. Level of difficulty 2* *Classification by data types. The structure of geography information systems. Data processing system. Ways to enter the map into the computer. Field and remote data, special program "coordinate geometry" (COGO). Aerial photographs and satellite data. Data verification and correction methods. Database in the geographic information system. Some issues of using GAT. GAT in cadastral registration and land information systems. Raster and vector geographic information systems. Geospatial data analysis. Using spatial functions. Level of difficulty 3*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. Ian Heywood, Sarah Cornelius, Steve Carver. An introduction to Geographical Information Systems/Third edition. Pearson Education Limited. UK, 2006.- 464 p.* *2. Safarov E., Musayev I. Geoaxborot tizimi va texnologiyalar. T.,TIMI, 2008, -160b.* *3. O'.Muxtorov, A.Inamov, J.Lapasov. "Geoaxborot tizim va texnologiyalar" fanidan amaliy mashg'ulotlarni bajarish bo'yicha o`quv qo'llanma. T.: TIQXMMI, 2017.* *4. Zhiping Lu., Yunying Qu., Shubo Qiao, Geodesy. W.Schofield 2014. – 534 p.* *5. Basic Geodesy Rockville, Md. September 2010 – 424 r.* 6. *History of Geodesy, Institute of Geodesy, University of Stuttgart 2010. – 249 r.*

Faculty of Land resources and cadaster
The direction of education: 60722700 – Innovative technologies in remote sensing of the earth
Educational Program

Module designation	***GAU3110 – Aerospace Sensing in Geographical Surveys***
Semester(s) in which the module is taught	*9,10*
Person responsible for the module	*Assistant professor, Ilhomjon Aslanov* *Assistant professor, Nozimjon Teshaev*
Language	*Uzbek, Russian, English*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical lessons – 40 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, Astronomy (school subjects), Mathematics, Geodesy, Remote sensing of the earth, Photogrammetry, GIS*

Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-able to download, process and analyze aerial photographs in geographical studies;* *acquires the skills to notice changes based on the analysis of aerial photographs, to assess the dynamics of change;* *- will have the ability to monitor the processes taking place on the surface of the earth based on the analysis of changes on the surface of the earth with the help of aerial photographs;* *- gains an understanding of the content and concepts of the analysis of aerial photographs in geographical research, the processes of geographical research,* *-forms the formation of competences and skills in the use of computing techniques, having an idea about the types of aero space pictures, energy sources and electromagnetic waves;* *- distinguish objects from each other using the elements in the image, using the computer programs used in the processing of the materials of Aero space images,* *-studies the application of aero space images in the management of land and water resources, monitoring of forests with the help of existing models;* *- will have the skills and abilities to evaluate the efficiency of the agricultural economy and apply it to other areas, analyze the results obtained.*

Content	*Аэро космик суратларда пассив ва актив сенсорлар. ерни масофадан зондлашда атмосфера коррелацияси. Фазовий масофадан зондлаш. Қийинчилик даражаси: 2* *Аэро космик суратлар суратлар ёрдамида ернинг қоплами ва ердан фойдаланиш. Ер қоплами ва ердан фойдаланишнинг ўзгариши. ернинг қопламининг картасини тузиш. Қишлоқ хўжалиги. Экин турларини карталаштириш. Қийинчилик даражаси: 2* *Аэро космик суратларни қайта ишлашни тоифалаштириш. Тасвирни қайта ишлаш техникаси. Растор маълумотларни ёзиб олиш, сақлаш ва узатиш медиаси. Растор тасвирнинг маълумотлар формати. Растор тасвирнинг метамаълумоти. Қайта ишлашга тайёрлаш. Қийинчилик даражаси: 3* *Қишлоқ хўжалик ер майдонларини ерни Аэро космик суратлар маълумотларидан фойдаланган ҳолда таҳлил қилиш ва йер майдонларини мониторинг қилиш. Ерни масофадан зондлаш материаллари асосида ўрмон ер майдонларини таҳлили, Ўрмон майдонларини дарахларнинг ҳолати бўйича мониторингни олиб бориш технологияси. Қийинчилик даражаси: 3* *Аэро космик суратлар малумотлари асосида сув объектларини анализи, дарё ва сув омпорларини мониторингини юритиш. Қишлоқ хўжалик ер майдонларини ерни масофадан зондлаш маълумотларидан фойдаланган ҳолда таҳлил қилиш ва ер майдонларини мониторинг қилиш. Аэро космик суратлар материаллари асосида ўрмон ер майдонларини таҳлили, Ўрмон майдонларини дарахларнинг ҳолати бўйича мониторингни олиб боориш технологияси. Қийинчилик даражаси: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Ш.Шокиров, И.М.Мусаэв, М.С.Акбаров. Масофадан зондлаш. Тошкент, Иқтисод-молийа, 2015.* *2. Prasad S. Thenkabail, remote sensing handbook.volume II Taylor & Francis Group, LLC 2016* *3. Qihao Weng. Remote Sensing and GIS Integration. The McGraw-Hill Companies 2017.* *4. Берлянт А.М. Геоиконика-М.: МГУ, АЭН РФ, «Астрея», 2011 г.*

Faculty of Land resources and cadaster
The direction of education: 70722601-Geodesy and Geoinformatics
Educational program

Module designation	***GBVA 5204 Geodatabase and architecture***
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Oymatov Rustam Kamariddinovich, PhD, associate professor*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours: AEBD* *Lecture – 30 hours* *Practical lessons – 30 hours* *Self-learning – 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*cartography, geodesy*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-manages the planning, implementation and monitoring of projects in the field of geoinformatics, as well as the concept of a geodatabase, the types and stages of its design, the creation of a new geodatabase, the ability to use and manage all types of geodatabases, as well as the creation of a geodatabase using Oracle software has an idea about the ways;* *- determines the economic efficiency of the work that needs to be done through the implementation of GIS projects, to know and use them to develop GIS in the future;* *- knows how to distinguish objects from each other using the elements in the image;* *-will have the ability to implement the concept of geodatabase, geodatabase architecture, design and creation of geodatabase, matching, enhancing and processing of obtained images;* *- Geodatabase design. Imaging and data subjects. Stages of geodatabase design. The geodatabase design phase can use ArcGIS data model projects.*

Content	*Geodatabase. The dataset as the basis of the geodatabase. Geodatabase elements. Basic concepts about tables. Attribute data types in a geodatabase. Basic understanding of classes of spatial objects. Types of spatial object classes. Level of difficulty: 1* *A basic understanding of rasters. Types of geodatabase. Filed and personal geodatabase. ArcSDE geodatabase. Geodatabase architecture. Data storage in a geodatabase is based on relational principles. Geodatabase storage in relational databases. Storage in relational database management systems (RMBBT). Versioned geodatabases and distributed workflows. Difficulty level: 2* *Geodatabase transaction management. XML geodatabase. Create a new geodatabase. Lock and copy geodatabase schema. Copy the geodatabase. Defining data properties in a geodatabase. Table features. Spatial indices. Creating a new geodatabase using Oracle software. Administer and add Oracle users. The content of the geodatabase in Oracle. Connecting to a geodatabase in Oracle. The concept of distributed information in a geodatabase. Working with geodatabase replicas. Preparing data for replication. Types of replication. Difficulty level: 3*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Инамов А.Н., Лапаос Ж.О., Хикматуллаев С.И., "Инженерлик геодезияси". Ўқув қўлланма. Тошкент, 2012. – 220.* *2. ENGINEERING SURVEYING- W.Schofield 2001. 534-pag* *3. Тошпўлатов С.А., Назаров Б.Р., Шавкатова Н.Ж., "Замонавий геодезик техника ва технологиялар". Ўқув қўлланма. Тошкент, 2018. – 300.* *4. http://www.miigaik.ru/;* *5. http://www.guz.ru/;* *6. https://www.sciencedirect.com/science/article/pii/S0263224119305561*

Faculty of Land resources and cadaster
The direction of education: 60813100-Land cadastre and land composition
Educational program

Module designation	***KGI 2104- Geodetic works in the cadastre***
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Khikmatullayev Sanjar Izzatullaevich, technical sciences Doctor of Philosophy (PhD), senior teacher*
Language	*Uzbek*
Relation to curriculum	*elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *lecture – 30 hours* *practical lessons – 30 hours* *self-learning – 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Geodesy, Cadastre*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- should know the geodetic field research works used for topographic surveying of linear, point and area state cadasters and their digital form in the geodatabase;* *- is able to present information obtained from various sources and databases in the required format using information, computer and network technologies;* *- carries out cadastral works using knowledge of modern technologies;* *- based on implementation methods, modern techniques and technological tools, can choose suitable methods for project-research works in the cadastre, defining project boundaries;* *-knows the principles and methods of accounting for errors occurring at various stages of geodetic work;* *- learns the methods of processing the results of geodetic measurements;* *- the use of information technologies for information processing and design can be used in practice for the preparation of cadastral documents for state cadastral registration;* *- understands survey methods used in land use planning.*

Content	*The purpose and function of the science of geodetic works in the cadastre. Brief historical information about cadastre and geodetic foundations. Purpose and technology of geodetic work in determining (restoring) land boundaries. Level of difficulty: 1* *The content of work on the correction of plans and their organization. Survey methods used in the correction of land use plans. Level of difficulty: 2* *Today's state and prospects of maintaining existing state cadastres in our republic. Current state cadastre management system and world experiences. Principles of formation and maintenance of state cadastres. Development of a geodetic-cartographic framework for maintaining state cadastres. Level of difficulty: 3* *Use of remote sensing materials in the cadastral system and formation in the database. Overlay system of the method of creating digital cadastral cards. Formation of a geodatabase of state cadastres. Changes in land areas, population growth, dynamics of construction of buildings and structures. Level of difficulty: 4* *Formation of attributive data tables of state cadastres. Organizational structure of issuing conditional marks for state cadastres. Assigning conditional marks to digital cadastral cards. Level of difficulty: 5*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Oxunov Z.D. Yer tuzishda geodezik ishlar. T.: "Yangi asr avlodi", 2002. – 254 b.* *2. Абдираманов Р.Д., Успанкулов В.М. Геодезические работы при землеустройстве (учебное пособие) Ташкент, ТИИИМСХ, 2020. – 132 с.* *3. Ципинова Б.С. Геодезические работы при землеустройстве. Учебно-методическое пособие. – Майкоп, 2016. стр. 87.* *4. Денисова Ye.C. Геодезические работы при землеустройстве: метод. указания по вып. лаб. работ / Ye.C. Денисова. – Пенза: ПГУАС, 2016.* *5. Денисова Ye.C. Геодезические работы при землеустройстве: метод. указания для сам. работы / Ye.C. Денисова. – Пенза: ПГУАС, 2016.* *6. http://consultant.ru (Консультант плюс – правовая поддержка).* *7. http://dic.academic.ru (Словари и энsiklopedii).* *http://elibrary.ru (Научная электронная библиотека).*

Faculty of Land resources and cadastre
The direction of education: 60722600- Innovative technologies in remote sensing of the Earth
Educational program

Module designation	***KDQ3105 – Digital processing of space images***
Semester(s) in which the module is taught	*9*
Person responsible for the module	*Assistant professor, Ilhomjon Aslanov* *Assistant professor, Nozimjon Teshaev*
Language	*Uzbek, Russian and English*
Relation to curriculum	*elective*
Teaching methods	*Lecture, practical lesson, self-learning,*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 20 hours* *Practical lessons – 20 hours* *Self-learning – 90 hours*
Credit points	*10*
Required and recommended prerequisites for joining the module	*Geography, Astronomy (school subjects), Mathematics, Geodesy, Remote sensing of the earth, Photogrammetry, GIS*

Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- be able to download, process and analyze space images during the course;* *to have the skills to notice changes based on the analysis of aerial photographs, to assess the dynamics of change;* *- will have the ability to monitor the processes taking place on the surface of the earth based on the analysis of changes on the surface of the earth with the help of space photographs;* *- acquires an understanding of working with references and literature, the content and concepts of space photo analysis, processes of geographical research;* *- to have an idea about the types of space pictures, energy sources and electromagnetic waves, to develop skills and abilities in the use of computing techniques;* *-studies the use of computer programs used in their processing, the adaptation, enhancement and processing of images obtained by decoding space photographs;* *- to be able to distinguish objects from each other using the elements in space pictures. The ability to analyze the obtained results should have the skills, form the knowledge and skills to use as a resource.*
Content	*Stages of development of the science of decoding space pictures. Understanding satellites and their types. Level of difficulty: 2* *Modern programs and decoding of space pictures using them. Coordinate and time systems in decoding works. Space Image Decoding Software. Level of difficulty: 3* *Application and advantages of GPS and GNSS decoding. Level of difficulty: 3* *Agricultural Land Area Analysis and Land Area Monitoring Using Aero Space Image Data. Analysis of forest land areas based on the materials of remote sensing of the earth, technology of monitoring the condition of trees in forest areas. Level of difficulty: 3* *The influence of external environment on decoding results. Methods of determining location object coordinates. Software used in debugging. Methods used in deciphering work. Creation of relief maps based on space photographs. Analysis of space images in the monitoring of land areas. Monitoring of agricultural land. Calculation and accuracy assessment of equalized elements of the network. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. Ш.Шокиров, И.М.Мусаэв, М.С.Акбаров. Масофадан зондлаш. Тошкент, Иқтисод-молийа, 2015.* *2. Lavender S and Lavender A 2015 Practical Handbook of Remote Sensing (CRC Press)* *3. Wang Q 2018 Remote Sensing time Series Image Processing vol 4 (CRC Press)* *4. Wang Q 2018 Remote Sensing time Series Image Processing vol 4 (CRC Press)*

Faculty of Land resources and cadastre
The direction of education: 70722601 – Geodesy and geoinformatics
Educational program

Module designation	*MZ5104 – Remote sensing*
Semester(s) in which the module is taught	*2*
Person responsible for the module	*Shokirov Shukhrat, professor*
Language	*Uzbek, Russian, English*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self- learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self- learning – 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Geography, Astronomy (school textbook), Mathematics, geodesy, Photogrammetry, GIS*

Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- is able to download, process and analyze space images; acquires the skills to notice changes based on the analysis of space photographs, to assess the dynamics of change;* *- based on the analysis of land cover changes, will have the ability to monitor the processes taking place on the surface of the earth;* *- to have an idea about the content and concepts of the science of remote sensing of the earth, the process and types of remote sensing, energy sources and electromagnetic waves, and the formation of competences and skills in the use of computing techniques;* *-use of remote sensing materials and computer programs used in their processing, can distinguish objects from each other using elements in the image;* *- existing models of satellite images, remote sensing in the management of land and water resources, forest monitoring;* *- will have the skills and abilities to evaluate the efficiency of the agricultural economy and to apply it to other areas, to analyze the obtained results.*
Content	*Passive and active sensors in remote sensing. Atmospheric Correlation in Earth Remote Sensing. Spatial remote sensing. Level of difficulty: 2* *Agriculture. Mapping of crop types. Level of difficulty: 2* *Classification of space image processing. Image processing techniques. Raster data recording, storage and transmission media. Raster image data format. Metadata of a raster image. Preparation for recycling. Level of difficulty: 3* *Analysis of Agricultural Land Areas Using Remote Land Sensing Data and Land Area Monitoring. Analysis of forest land areas based on the materials of remote sensing of the earth, technology of monitoring the condition of trees in forest areas. Level of difficulty: 3* *Analysis of water bodies, monitoring of rivers and reservoirs based on remote sensing data. Analysis of Agricultural Land Areas Using Remote Land Sensing Data and Land Area Monitoring. Analysis of forest land areas based on the materials of remote sensing of the earth, technology of monitoring the condition of trees in forest areas. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. Ш.Шокиров, И.М.Мусаэв, М.С.Акбаров. Масофадан зондлаш. Тошкент, Иқтисод-молийа, 2015.* *2. J. Guo and P. J. Mason, Image processing and GIS for remote Sensing. John Wiley & Sons, Ltd., 2016.* *3. Rafael C. Gonzalez, Richard E. Woods. Digital Image Processing. 4th Edition, 2017.* *4. Берлянт А.М. Геоиконика-М.: МГУ, АЭН РФ, «Астрея», 2011 г.*

Faculty of Land resources and cadaster
The direction of education: 60722600-Geodesy and Geoinformatics
Educational program

Module designation	***MGTCH 2204- Engineering geodesy and topographic drawing***
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Associate professor, Rozikulova Oykhumor Shermamatovna* *Senior teacher, Minashkina Natalya Alekseevna*
Language	*Uzbek and Russian*
Relation to curriculum	*elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *lecture – 20 hours* *practical lessons – 40 hours* *self-learning – 60 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, geodesy, regional geography, cartography*
Module objectives/intended learning outcomes	***After mastering the discipline, the student:*** *-the theoretical and practical foundations of knowledge in engineering geodesy and topographic drawing, basic geodetic-cartographic methods, teaching the basic principles in the process of using topographic conditional marks and forming the skills to apply them in practice;* *-theoretical knowledge, practical skills, measurement and graphing in the creation of topographic maps, the laws of describing the quantity and quality indicators of the mapped objects with graphic tools, colors and other conventional signs, and the essence of the categories;* *-will be able to visualize geodetic and geoinformation processes, such as describing the results of geodetic measurements using topographic conditional signs, and will have competencies about the specific important role of cartographic research methods in modern science and technology.*

Content	*-Development trend of engineering geodesy and topographic drawing science. The purpose and tasks of science. The role of geodesy in engineering geodesy. Level of difficulty: 2.* *-Weapons used in topographical drawing. Different stages of creating topokartas. Contents of topographic maps. Level of difficulty: 1* *- Pencils used in drawing. Angle measurement. To study the properties of dot graphics. Measurement of horizontal and vertical angles. Level of difficulty: 3* *- Theodolite set, installation of theodolite road. Drawing parallel lines with an interval of 1 mm with the help of a sine ruler and a simple ruler. Land surveying. The importance and tasks of topographical drawing. Level of difficulty: 3* *-Methods for calculating land areas. Height 8 mm, spacing 2 mm, thickness 0.1; Draw vertical lines at 0.3 and 0.5. Coordinates. Use of computer graphics in topographical drawing. Level of difficulty: 3* *-Types of leveling, Field leveling. Fonts, their types and inscriptions on cards. Writing numbers used in geodesy. Geoid and Ellipsoid dimensions. Level of difficulty: 2* *-Importance and tasks of topographic drawing. Drawing tools and equipment: types of paper. Draw the letters drawn in pencil with a dream on a reisfeder. Leveling. Types of paint, their preparation and painting methods. Level of difficulty: 2* *-Plan and color the cards. Use of modern geodetic tools. Use of drawing tools and equipment. Level of difficulty: 2* *-Color models. Topographic map, plan, scale. Orientation. Color models. (Topographic conventional signs). Level of difficulty: 2* *-Units of measurement used in geodesy. Topographic conventional signs and their types. The procedure for applying warm and cold colors. (Topographic and cartographic conventional symbols) application in program work and mapping. Level of difficulty: 3*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Карабаева Т.М., Ойматов Р. Қ., Аширов Ю. Р. Муҳандислик геодезияси ва топографик чизмачилик. Ўқув қўлланма, 2017, 332 бет.*

Faculty of Land resources and cadaster
The direction of education: 5313400-Geodesy and Geoinformatics
Educational program

Module designation	***MK4205 Multimedia cartography***
Semester(s) in which the module is taught	*11*
Person responsible for the module	*Oymatov Rustam Kamariddinovich, PhD, associate professor*
Language	*Uzbek and Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical lessons – 40 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Cartography, GIS*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-can create various graphic images, including animation, hologram, 3D images;* *- can use methods and tools for creating and editing web maps;* *- knows the theoretical foundations of 3D visualization and animation;* *-able to create and edit 3D models, publish animations and 3D web scenes;* *- creates various graphic images, animation, hologram, 3D images, web maps;* *- can do 3D modeling using computer graphics and GIS programs;* *- knows how to use computer technologies to create and edit three-dimensional models, publish animation and 3D web scenes;* *-creates realistic 3D scenes with the possibility of publishing in 3D web scenes;* *-will be acquired to create 3D animations, theoretical knowledge of topographic and thematic maps, cartographic projections.*

Content	*Multimedia technologies and tools in cartography. Use of multimedia technologies and tools in cartography, concepts of multimedia cartography. Computer technologies for creating multimedical cards and atlases. Level of difficulty: 1* *Creation of interfaces, programs for processing cartographic materials, creation of three-dimensional objects in the creation of multimedical maps (atlases), processing of remote sensing materials, processing of photo materials and creation of panoramic images. General design of multimedical cartographic products. Interactive virtual photographic images, Animation sequences, General design of multimedia cartographic products, Creation of audio-visual reference and supporting materials. Level of difficulty: 2* *Creation of multi-medical cartographic works. Basic methods of developing multi-medical cartographic works, main components of multi-medical cards, forms and technologies of graphic information representation on multi-medical cards. Level of difficulty: 2* *Technologies for presentation of multi-medical information, technologies for processing multi-medical data, technology for creating multi-medical cartographic works.* *Animation features for multimedia cartographic works. The essence and classification of cartographic animation, General description of animations in cartographic aspect, Interface animation. Level of difficulty: 4* *Map animation effects, Animation effects for map objects, Examples for multimedia cartographic products. Creating a multimedical atlas.* *Multimedia atlas program of higher education institutions, order and scheme of the atlas, creation of the multimedia atlas. Level of difficulty: 5*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *Р.Ойматов. Мультимедик картография. Тошкент, Ўзбекистон, 2023.-130 б.* 2. *Д. В. Лисицкий и друг. Мультимедийная картография [Текст]: учеб. пособие /. – Новосибирск: СГУГ и Т, 2016. – 108 с.* 3. *Beata M., Gulij, D. and Paweł C. Modern Cartographic Forms of Expression: The Renaissance of Multimedia Cartography. Reprinted from: ISPRS Int. J. Geo-Inf. 2021, 10, 484, doi:10.3390/ijgi10070484* 4. *Dong, W.; Ran, J.; Wang, J. Effectiveness and Efficiency of Map Symbols for Dynamic Geographic Information Visualization. Cartogr. Geogr. Inf. Sci. 2012, 39, 98–106. [CrossRef]*

Faculty of Land resources and cadaster
The direction of education: 60722600-Geodesy and Geoinformatics
Educational program

Module designation	***TKT3205-Design and layout of natural maps***
Semester(s) in which the module is taught	*9*
Person responsible for the module	*Associate professor, Rozikulova Oykhumor Shermamatovna* *Senior teacher, Minashkina Natalya Alekseevna*
Language	*Uzbek and Russian*
Relation to curriculum	*elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *lecture – 20 hours* *practical lessons – 40 hours* *self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geography, geodesy, regional geography, cartography*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-learns how to design and build natural maps. In particular, he can apply the principles of a systematic approach to the creation of natural maps;* *-students will have the skills to describe the location of events and phenomena in nature and society and their interrelationships, to reduce and generalize mathematically on a plane by means of special image-figurative symbol models, and to use it as a method of scientific research;* *-to be able to imagine such concepts as periodicity, rhythmicity, unity, regionality, zonality in nature from a geodetic-cartographic and geo-informational point of view, to acquire the competencies of cartographic research methods in the modern science and technology.*

Content	*- The main directions and tasks of creating natural maps: complex and systematic mapping methodology; explore concepts of geosystems. Level of difficulty: 2* *- basis for development of geographical laws-natural map methodology; analysis of connections between natural objects and their types. Level of difficulty: 3* *- the sequence of natural map construction; author's materials and their types; preparatory work, preparation of map program and geographical basis. Level of difficulty: 2* *-geographical analysis of resources, use of aerospace materials in the creation of maps; the essence and tasks of map making, choosing methods for map making. Level of difficulty: 3* *-Mathematical and automatic methods are used to create natural maps; essence, types of legends; objects and natural boundaries are selected; application of automatic and mathematical methods. Level of difficulty: 3* *- highlighting the importance of remote sensing materials in the development of relief, geomorphological, genetic, morphogenetic and morpho-composition maps and their types and content. Level of difficulty: 1* *-hydrographic maps, ways of creating water regime maps; development of methods of obtaining operative maps. Level of difficulty: 1* *- to study the sources and methods of creating landscape maps, practical landscape maps, and other ways of creating natural maps. Level of difficulty: 3* *- creation, updating and filling of the database in the preparation of soil and geobotanical maps. Level of difficulty: 3* *-In the preparation of irrigation and land reclamation maps, information is taken from organizations related to the field (Institute of Water Problems, Center of Hydrometeorology, Institute of Hydrogeology, etc.) and used in program work and mapping. Level of difficulty: 2*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. Сафаров Э. Пренов Ш, Абдураҳмонов С. Табиий карталарни лойиҳалаш ва тузиш, Ўқув қўлланма, Тошкент, 2015 йил, -160 bet.* *2.Абдураҳмонов С.Н., Рщзиыулова О.Ш., Пренов Ш.. Табиий карталарни лойиҳалаш ва тузиш фанидан амалий машғулотларни бажариш учун услубий қўлланма, Тошкент, ТИҚХММИ-МТУ, 2022 йил, 124 бет*

Faculty of Land resources and cadaster
The direction of education: 5311200 – Innovative technologies in remote sensing of the earth
Educational Program

Module designation	***TA 4205 Fundamentals of Topography***
Semester(s) in which the module is taught	*11*
Person responsible for the module	*Oymatov Rustam Kamariddinovich, PhD, associate professor*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours:* *Lecture – 20 hours* *Practical lessons – 40 hours* *Self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geodesy, cartography*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-acquire theoretical knowledge about topographic and thematic maps, cartographic projections;* *-can compare maps, orient by map and location, measure area and length on a topographic map;* *-reading topographic maps, reading through the terrain and conventional signs, determined the position in the area with the help of a topographic map;* *-able to use modern geodetic equipment, geographical classification of the place, topographic maps;* *-orientation by location, measures area and length on a topographic map;* *-can read topographic maps, create a plan of the place, read the relief of the place and conventional signs, determine the direction along the horizon, determine the position in the area using the topographic map;* *-knows and can explain the use of cartographic symbols to express quantitative and qualitative relations of events on the map and the creation of field, line, point and volumetric conditional symbols;* *-understands the features of expressing the characteristics of events with colors;* *-can perfectly master the methods of placing the common elements of the card and apply their solutions in practice.*

Content	*Basic principles of topography. The subject, problem, methods and content of topography, the Earth as a celestial body, physical characteristics of the Earth. Depicting land on a map. The concept of a map, the representation of the Earth on a map, the purpose and importance of maps, the elements of maps. Level of difficulty: 1* *Mathematical elements of the map. Concept of cartographic projection, Classification of cartographic projections, Setting the scale on the map, Use of digital scale, Types of map boundaries. Level of difficulty: 2* *Geographical elements of maps. Relief as a map element, Cartographic relief mapping methods, Terrain shading, Orthophoto maps, Symbols for depicting relief on maps. Level of difficulty: 3* *Hydrographic elements on maps. Image of water level, Image of water flows, View of water bodies, Cartographic symbols for the description of hydrographic elements. Level of difficulty: 3* *Land and vegetation as map elements* *Classification of land and vegetation, cartographic representation of land and vegetation, cartographic symbols for depicting land and vegetation. Settlements as map elements. Geographical names and titles. Classification, Cartographic representation of settlements, Cartographic representation of communications, Boundaries as map elements, Geographical names and titles, Titles in foreign territories. Level of difficulty: 3* *Cartometry. Determination of point coordinates, Determination of geographic coordinates, Determination of rectangular coordinates, Determination of polar coordinates, Measurement of distances on the map, Determination of close distances on the ground. Concept of Orientation, Types of Orientation, Geographic Orientation, Orientation on Earth based on celestial bodies, Orientation using various objects and signs on Earth, Playing on Earth using Compass tools. Level of difficulty: 2* *Aero and space photography. Mapping vegetation classes. Aerial photogrammetric images, Use of aerial photogrammetric images, Satellite systems and images, Global navigation satellite systems, Principles of thematic cartographic imaging. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *Oymatov R. Topografiya asoslari. Toshkent, O‘zbekiston, O‘quv qo‘llanma. 2023 – 225 b.* 2. *Курошев ГД. Основы геодезии и топографии / Г.Д. Курошев, Л. Е. Смирнов. — СПб.: Изд-во СПбГУ, 2009* 3. *Markoski B (2016) Topography. Geomap Skopje, pp 1–148 (in Macedonian)* 4. *Ferguson C, Turbyfill R (2013) Discovering orienteering: skills, techniques and activities. Orienteering USA, Champaign, p 188.* 5. *Department of the Army FM 3-25.26 (2001) Map reading and land navigation. Washington*

Faculty of Land resources and cadaster
The direction of education: 70722601-Geodesy and geoinformatics

Educational Program

Module designation	***WEBK5108-Web mapping***
Semester(s) in which the module is taught	*2,3*
Person responsible for the module	*Zokhid Mamatkulov, PhD, senior teacher*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self- learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 240* *Contact hours:* *Lecture – 60 hours* *Practical training – 60 hours* *Self- learning – 120 hours*
Credit points	*8*
Required and recommended prerequisites for joining the module	*Cartography, Geoinformation system, Information technologies, Geodesy*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- acquired general understanding of computer networks and means of communication and the use of networks;* *- will have the ability to work with Internet-based geoinformation system software and multi-layer vector files, perform geoanalysis, develop mathematical models using geospatial dimensions;* *- will have the ability to develop web applications using hypertext markup language HTML and multi-paradigm programming language JavaScript;* *- is able to put into practice the ways and methods of improving the efficiency of cartographic products through web mapping;* *- learns about geoportals, mapping services and their cartographic standards;* *- spatial data publishing tools will have the ability to publish spatial data using ArcGIS Server and GeoServer.*

Content	*Computer networks and the Internet. General concepts of computer networks and communication tools. Advantages of using networks. Local area network (LAN) and LAN components. Workstations. Network adapters. File servers. Network operating systems. Network software. Data protection. Level of difficulty: 1* *Migration of GIS to the Internet. The concept of web hosting, its main tasks. Necessary conditions for the emergence of web marketing. The development of the Internet and the World Wide Web. The emergence and development of GIS. The Origins and Evolution of Web Hosting. The main advantages and disadvantages of using web mapping applications. Level of difficulty: 2* *Web Mapping and Web GIS: Definitions and Tasks. Network technologies and the Internet. Spatial data and geoinformation systems. Web GIS. Web mapping is a field of computing related to the delivery of spatial data to end users. Spatial data retrieval and location of objects for network, routing and other services. Level of difficulty: 3* *Web applications. Virtual globes, key terms, scope. Special GIS and how to use them. Map servers, functions of map servers. Integrate components into applications. Interaction between applications. Level of difficulty: 3* *Principles of Web Application Development. Skills required for web application development. Hypertext Markup Language Basics HTML, Terminology, Functionality. Basics of multi-paradigm programming language JavaScript, terminology, functionality. Tools for building server-side web applications. Level of difficulty: 4* *Web Mapping and Web GIS Standards. Data description and transmission standards, terminology, the most common standards. Opening of the GIS consortium. OGC specifications. Web Maps Service (WXX). Web coverage service (VQX). Other standards for data description and transmission. Level of difficulty: 4* *Technical basics of creating web applications. Principles of the Internet and the World Wide Web. Web application architecture. Web application development technologies. Characteristics of Web Application Mapping Architecture. Geoportals. Level of difficulty: 5* *Technologies for developing the client section of cartographic web applications. HTML markup language and CSS style sheets. JavaScript programming language. Client-side web application development using the ArcGIS API for JavaScript. Development of client web application using OpenLayers and Leaflet interfaces. Leaflet library. OpenLayers library. Level of difficulty: 5*
Exams and assessment formats	*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.*

Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	1. *Michael Dorman. "Introduction to Web Mapping". CRC Press. Taylor & Francis Group 6000 Broken Sound Parkway NW, Suite 300. Boca Raton, FL 33487-2742. 2020. 452-p.* 2. *А. В. Быков, С. В. Пьянков, Web-картографирование: учеб. Пособие. Перм. гос. нац. исслед. ун-т. – Пермь, 2015. – 110 с* 3. *Murray, S. (2017). Interactive Data Visualization for the Web: An Introduction to Designing with D3. O'Reilly Media, Inc, 2nd edition, Sebastopol, CA, USA.* 4. *Rubalcava, R. (2015). ArcGIS Web Development. Manning Publications, Co., Shelter Island, NY, USA.* 5. *Tufte, E. (2001). The quantitative display of information. Graphics Press, 2nd edition. Cheshire, CT, USA.*

Faculty of Land resources and cadaster
The direction of education: 60722700 – Innovative technologies in remote sensing of the earth
Educational Program

Module designation	***YMZ3113 – Remote sensing of the Earth***
Semester(s) in which the module is taught	*9*
Person responsible for the module	*Associate professor, Xamidova Maknona*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self- learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours:* *Lecture – 30 hours* *Practical training – 30 hours* *Self- learning – 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Three-dimensional modeling in Geodesy, Cartography, Geoinformation systems*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *-perfectly master the concepts of the physical foundations of remote sensing, the methods of studying the earth from space, the methods of making geometric and radiometric corrections of satellite scanning images, the specific important aspects of modern science and technology;* *- perfectly masters the use of IDRISI and COGNETION software to create various themed maps as a result of digital processing of aerospace images, classify images by object recognition, and monitor the status of vegetation and water resources;* *- general information on digital processing of aerospace images, distortions in satellite scanned images, satellites used for remote sensing, types of images;* *-uses aerospace images in environmental protection using modern programs;*
Content	*Introduction to digital photogrammetry; Concept of aerial photography; Concept of space photography; Coordinate systems used in photogrammetry; Monocular, binocular vision; Level of difficulty: 2* *Optical methods of studying the earth from space. Reception of satellite data. Detection of distortions in satellite scanner images. Detection of distortions in satellite scanner images. Identify types of images. Inserting images into the IDRISI program. Level of difficulty: 3* *The structure and principle of operation of digital cameras. Radiometric correction of remote sensing data. Atmospheric correction of remote sensing data. Image segmentation in IDRISI program. Level of difficulty: 3*
Exams and assessment formats	*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.*

Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*N.V.Kovalyov, Dj.K.Muxitdinov, O.G.Shukina, M.B.Xamidova. "Fotogrammetriya va yerni masofadan tadqiq etish "O'quv qo'llamna. T., TAQI-2015,- 160 b.* *П.Р.Реймов, Я.Г.Худайбергенов. Фазовий маълумотлар моделлари Toshkent, 2014.-149 b.* *Wilfred Linder Digital Photogrammetry A Practical Counse 2009, 211p.*

Faculty of Land resources and cadaster
The direction of education: 70722601-Geodesy and geoinformatics

Educational Program

Module designation	***KGV 5108- Cartography and geovisualization***
Semester(s) in which the module is taught	*2,3*
Person responsible for the module	*Oymatov Rustam,PhD, associate professor* *Abdurakhmanov Sarvar, associate professor* *Rahmonov Sherzod, PhD, associate professor*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training, self- learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 240* *Contact hours:* *Lecture – 60 hours* *Practical training – 60 hours* *Self- learning – 120 hours*
Credit points	*8*
Required and recommended prerequisites for joining the module	*Cartography, Geoinformation system, Information technologies, Geodesy*
Module objectives/intended learning outcomes	***After mastering the subject, the student:*** *- will have an idea of the principles of visual communication, the ability to design visualization and maps from the point of view of geoinformation, to use cartographic modeling and abstraction methods, to be able to demonstrate various methods of surface visualization, dynamic visualization, to be able to use geovisualization to find solutions to various problems;* *- knows and can use the terms and explanations of geoinformatics and geoinformation, relations of cartography, geoinformation system and remote sensing sciences, classes of geoimages, principles of classification of geoimages, relationships between the scales of maps, aerial and space photographs, cartographic and mathematical modeling analysis;* *- to be able to choose modern geoinformation technology programs, develop a database for designing and creating natural and socio-economic maps, study new types and types of geosystems, develop dynamic and animated geoimages, generalize geoimages, select a legend and use them will acquire skills in developing and equipping maps.*

Content	*Visual communication. Structure of telecommunication networks. The role of telecommunications in card acquisition in computer networks. Problems of using cartographic information. Purpose and direction of the card. Classification of cards. Types of cards. Level of difficulty: 2* *Card design and visualization in GIS. Methods of depicting cartographic data. Graphic variables. Notes on the card, approaches to their location and design. Requirements for cartographic components in GIS programs. Equipping and creating cards in GIS programs. Web cards and their creation. Web cards and multimedia. Level of difficulty: 2* *Cartographic modeling. The concept of cartographic modeling. Modeling process. Modeling a known place with layers. Terms of use of cartographic models. Creating a model that can be quickly adapted to practice. Level of difficulty: 2* *Design and layout of cards. Layout composition. Development of a card program. Legend. Scale and its types. Design cards. Draw cards. Aerospace methods in creating cards. Level of difficulty: 3* *Surface visualization. Isolines. Description of the relief by casting shadows. Triangulated irregular network. Raster data. 3D visualization. Level of difficulty: 3* *Virtual and augmented reality. Description of virtual reality. Description of augmented reality. Relationship of virtual reality with 3D-GIS. Use of 3D-GIS in the design process. Requirements for GIS virtual reality system. Level of difficulty: 3* *Fundamentals of working with networks of the Internet and Internet GIS. Internet and its possibilities. Intranet and Extranet: A secure networking tool for organizations and partners. OSI model. Server-side Internet GIS. Internet GIS. Level of difficulty: 4* *Geovisualization as a decision support device. General information. Decision making and GIS. Definition of a spatial decision support system. Principles of decision support system. Level of difficulty: 4*
Exams and assessment formats	*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.*
Study and examination requirements	*Requirements for successfully passing the module:* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. Kraak, M.J., Ormeling, F. [2010], Cartography: Visualization of Spatial Data. Prentice Hall. 2. Safarov E.Yu. va boshkalar. Kartografiya va geovizualizatsiya. T. Moliya-iktisod, 2015.-208 b. 3. Safarov E.Yu. Geografik axborot tizimlari. – Toshkent, Universitet, 2010. 4. Safarov E.Yu., Abduraximov X.A., Oymatov R.Q. Geoinformatsion kartografiya. – Toshkent.: Universitet, 2012. 5. www.lex.uz – O‘zbekiston Respublikasi Qonun hujjatlari ma’lumotlari milliy bazasi. *6.* www.gov.uz – O‘zbekiston Respublikasi hukumat portali.

Uzbek translation

Name of the module/subject and password in the curriculum	***GMTA 05-41-*** **Hydromeliorative from systems to use automation**
Semester in which science is taught	*8-9 semester*
Responsible teacher of the module/subject FISh, degree and title	Sherov Anvar Gulamovich is a professor. Tfd
In which language to be taught	*Uzbek, Russian*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Educational load (auditory hours by types and independent education hours)	*Total load : 300* *Auditorium Hours:* *Lecture - 60 hours;* *Practical training 60 hours* *Independent education 180 hours*
Number of credits allocated to science	*10 credits*
This is a list of prerequisite subjects	*Engineering Geodesy , Hydraulics , Hydromelioration systems automation , hydromelioration to systems service service show _*
Expected Learning Objectives	***Knowing and understand :*** *- Hydromeliorating systems automation about _ to knowledge have to be need _* *- Hydromeliorating systems automation about to knowledge have to be need _* *- Irrigation and reclamation systems improvement about to knowledge have to be need _* *- Irrigation in the field technological processes automation about to knowledge have to be need _* ***To skill have to be :*** *- Irrigation in systems irrigation hydromoduli identify , village economy crops irrigation order marking , watering technology , method and technique elements identification , irrigation and reclamation from systems reasonable use of water use plans make up do it takes ;* *- Water thrifty modern innovative technique and technologies in the design construction standards rules as well another normative documents , water thrifty irrigation modern innovative technique and technologies master takes* *- Hydromeliorating systems in use , farms order according to take went hydromeliorating systems monitoring and scientific research _ based on irrigation and reclamation systems reasonable manage for instruction - recommendations work exit knows _* **Competencies formation :** *- hydromeliorating computing in systems design and management methods ,* *- high good quality hydromeliorating the system preparation methods work exit according to scientific research of work main directions about to the imagination have to be* *- hydromelioration system situation improve in order to there is water pipes study ,* *- systems exploitation to do and them automation , - hydromelioration in the field scientific and technical of development main directions and methods ,* *- hydromeliorating objects to build done increase ability ,*

Exams and assessment format	*To science about theoretical and methodical concepts complete mastering , analysis the results right reflection seven getting , being studied processes independent respectively observation and intermediate control in forms given assignment and assignments completion , final control according to written the work submit*
Students who will study and take the exam	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Books	*1. Amanov BT, Sherov AG, Resource-efficient innovative irrigation technologies. -T.: "Darslik", 2021., 204 pages.* *2. Serikbayev B, Dostnazarova S "Use and automation of irrigation systems" Textbook. Tashkent TIQXMMI, 2020. – 258 p;* *3. Barayev FA, Bazarov RX, Shaymanov NO "Operation and automation of hydromelioration systems", Textbook. Tashkent. "TIMI", 2008. - 396 p.* *4. Sherov A.G'., Amanov BT, Mukhammadiyeva M., Gadayev N. Study guide on the science of service in the use of hydromelioration systems// Tashkent TIQXMMI 2019, 180 pages.* *5. Serikbayev BS, Sherov AG'., Ibragimova XR "Modernization of hydromelioration systems", Textbook. Tashkent. "TIQHMMI" 2018y.- 467 b;*

Uzbek translation

Name of the module/subject and password in the curriculum	*GMTLB 05-41- Hydromeliorating systems design and manage*
Semester in which science is taught	*10th semester*
Responsible teacher of the module/subject FISh, degree and title	Sherov Anvar Gulamovich is a professor. Tfd
In which language to be taught	*Uzbek, Russian*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Study load (by types of classroom hours and independent study hours)	*Total load : 120* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 60 hours*
Number of credits allocated to science	*4 credits*
This is a list of prerequisite subjects	*Foreign language , engineering Geodesy , Hydraulics , Hydromelioration systems automation , hydromelioration to systems service service show _*
Expected Learning Objectives	***Knowing and understand :*** *- general principles of calculation and design of hydromelioration system objects,* *- construction of types there is classification ,* *- scientific and technological bases of hydromelioration system design,* *- hydromeliorating of systems main hydraulic and structural to the dimensions effect doer factors about* ***Having the skills to :*** *- selection of methods and tools for cleaning the hydromelioration system ;* *- calculation of elements of treatment facilities;* *- drawing up schemes of hydromelioration treatment facilities;* *- calculation of elements of hydromelioration networks;* *- graphic representation of engineering networks of hydromelioration systems;* *- perform hydraulic and structural calculation of hydromelioration system networks and structures;* *- adoption of solutions for construction and design of hydromelioration systems* **Formation of competences:** *- the ability to implement the construction of hydromelioration facilities,* *- operation of systems and their automation, - main directions and methods of scientific and technical development in the field of hydromelioration,* *- study of existing water pipelines in order to improve the state of the hydromelioration system ,* *- high-quality hydromeliorating agent to have an idea about the main directions of scientific research work on the development of system preparation methods;* *- calculation methods in the design and management of hydromelioration systems ,*

Exams and assessment format	*To science about theoretical and methodical concepts complete mastering , analysis the results right reflection seven getting , being studied processes independent respectively observation and intermediate control in forms given assignment and assignments completion , final control according to written the work submit*
study and take the exam	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Books	*1. Decree of the President of the Republic of Uzbekistan No. PF-6024 of July 10, 2020 "On approval of the concept of water management development of the Republic of Uzbekistan for 2020-2030". National database of legal documents, 11.07.2020, No. 06/20/6024/1063.* *2. Amanov BT, Sherov AG, Resource-efficient innovative irrigation technologies. -T.: "Darslik", 2021., 204 pages.* *3. Design norms of irrigation systems. ShNQ 2.06.03-12. The State Architecture and Construction Committee of the Republic of Uzbekistan. Tashkent-2012.* *4. Barayev FA, Bazarov RX, Shaymanov NO "Operation and automation of hydromelioration systems", Textbook. Tashkent. "TIMI", 2008. - 396 p.*

Uzbek translation

Name of the module/subject and password in the curriculum	*GMTLB 05-41- Hydromeliorating systems design and manage*
Semester in which science is taught	*10th semester*
Responsible teacher of the module/subject FISh, degree and title	Sherov Anvar Gulamovich is a professor. Tfd
In which language to be taught	*Uzbek, Russian*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Study load (by types of classroom hours and independent study hours)	*Total load : 120* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 60 hours*
Number of credits allocated to science	*4 credits*
This is a list of prerequisite subjects	*Foreign language , engineering Geodesy , Hydraulics , Hydromelioration systems automation , hydromelioration to systems service .*

Expected Learning Objectives	***Knowing and understand :*** *- general principles of calculation and design of hydromelioration system objects,* *- construction of types there is classification ,* *- scientific and technological bases of hydromelioration system design,* *- hydromeliorating of systems main hydraulic and structural to the dimensions effect doer factors about* ***Having the skills to :*** *- selection of methods and tools for cleaning the hydromelioration system ;* *- calculation of elements of treatment facilities;* *- drawing up schemes of hydromelioration treatment facilities;* *- calculation of elements of hydromelioration networks;* *- graphic representation of engineering networks of hydromelioration systems;* *- perform hydraulic and structural calculation of hydromelioration system networks and structures;* *- adoption of solutions for construction and design of hydromelioration systems* **Formation of competences:** *- the ability to implement the construction of hydromelioration facilities,* *- operation of systems and their automation, - main directions and methods of scientific and technical development in the field of hydromelioration,* *- study of existing water pipelines in order to improve the state of the hydromelioration system ,* *- high-quality hydromeliorating agent to have an idea about the main directions of scientific research work on the development of system preparation methods;* *- calculation methods in the design and management of hydromelioration systems ,*
Exams and assessment format	*To science about theoretical and methodical concepts complete mastering , analysis the results right reflection seven getting , being studied processes independent respectively observation and intermediate control in forms given assignment and assignments completion , final control according to written the work submit*
study and take the exam	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Books	*1. Amanov BT, Sherov AG, Resource-efficient innovative irrigation technologies. -T.: "Darslik", 2021., 204 pages.* *2. Serikbayev BS, Barayev FA, Teshaboyev B. and others. "Using hydromelioration systems", Training manual. Tashkent. "Labor", 2008. - 181 p.* *3. Barayev FA, Bazarov RX, Shaymanov NO "Operation and automation of hydromelioration systems", Textbook. Tashkent. "TIMI", 2008. - 396 p.* *4. Barayev FA, Bazarov RX and others. Methodical instructions for performing laboratory work on the subject "Using hydromelioration systems". Tashkent. "TIMI", 2013.*

Uzbek translation

Name of the module/subject and password in the curriculum	*GMTLB 05-41- Hydromeliorating systems design and manage*
Semester in which science is taught	*10th semester*
Responsible teacher of the module/subject FISh, degree and title	Sherov Anvar Gulamovich is a professor. Tfd
In which language to be taught	*Uzbek, Russian*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Study load (by types of classroom hours and independent study hours)	*Total load : 120* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 60 hours*
Number of credits allocated to science	*4 credits*
This is a list of prerequisite subjects	*Foreign language , engineering Geodesy , Hydraulics , Hydromelioration systems automation , hydromelioration to systems service .*
Expected Learning Objectives	***Knowing and understand :*** *- general principles of calculation and design of hydromelioration system objects,* *- construction of types there is classification ,* *- scientific and technological bases of hydromelioration system design,* *- hydromeliorating of systems main hydraulic and structural to the dimensions effect doer factors about* ***Having the skills to :*** *- selection of methods and tools for cleaning the hydromelioration system ;* *- calculation of elements of treatment facilities;* *- drawing up schemes of hydromelioration treatment facilities;* *- calculation of elements of hydromelioration networks;* *- graphic representation of engineering networks of hydromelioration systems;* *- perform hydraulic and structural calculation of hydromelioration system networks and structures;* *- adoption of solutions for construction and design of hydromelioration systems* **Formation of competences:** *- the ability to implement the construction of hydromelioration facilities,* *- operation of systems and their automation, - main directions and methods of scientific and technical development in the field of hydromelioration,* *- study of existing water pipelines in order to improve the state of the hydromelioration system ,* *- high-quality hydromeliorating agent to have an idea about the main directions of scientific research work on the development of system preparation methods;* *- calculation methods in the design and management of hydromelioration systems ,*

Exams and assessment format	*To science about theoretical and methodical concepts complete mastering , analysis the results right reflection seven getting , being studied processes independent respectively observation and intermediate control in forms given assignment and assignments completion , final control according to written the work submit*
study and take the exam	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Books	*1. Amanov BT, Sherov AG, Resource-efficient innovative irrigation technologies. -T.: "Darslik", 2021., 204 pages.* *2. Serikbayev BS, Barayev FA, Teshaboyev B. and others. "Using hydromelioration systems", Training manual. Tashkent. "Labor", 2008. - 181 p.* *3. Barayev FA, Bazarov RX, Shaymanov NO "Operation and automation of hydromelioration systems", Textbook. Tashkent. "TIMI", 2008. - 396 p.* *4. Barayev FA, Bazarov RX and others. Methodical instructions for performing laboratory work on the subject "Using hydromelioration systems". Tashkent. "TIMI", 2013.*

Name of the module/subject and related number in the curriculum	*ID2103-Irrigation and drainage*
Semester(s) in which the module is taught	*5*- semester
Responsible Person for the module/subject, full name	*Ph.D. Professor Sherov Anvar Gulomovich, assistant Sirojiddin Djalilov*
Language of study	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*lecture, practical training*
Workload (incl. contact hours, self-study hours)	*Total workload:* *Auditorium Hours:* *Lecture - 20 hours;* *Practical training 20 hours;* *Self-learning - 50 hours*
Credit points	*3 credits*
Required and recommended prerequisites for joining the module	*For example: Design of irrigation systems, design of resource-efficient irrigation technologies. Irrigation and reclamation, use of hydromelioration systems*
Module objectives/intended learning outcomes	***Know and understand:*** ✓ *to have an idea about the improvement and development of irrigation and reclamation systems,* ✓ *know the causes of salinity of irrigated lands and their effect on the productivity of agricultural crops in the process of modernization of hydromelioration systems and be able to use them* ***To be able to:*** ✓ in the modernization of hydromelioration systems, it is necessary to have the skills and methods of reconstruction and improvement of irrigation networks and collectors and their implementation, ✓ must have the skills to operate and maintain irrigation networks, ditches and collector systems **To form competences in:** ✓ *by assessing the demand for irrigation, forming skills for designing irrigation schemes, modern scientific methods of canal exploitation, demand irrigation and drainage systems,* ✓ *from building knowledge on irrigation network mapping, drainage pipes and accessories, surface and underground drainage, drainage and disposal systems, training and maintenance, irrigation project evaluation.*
Content of subject	*Students will learn about the types of water use plans and land-water balances, water use based on limits, determining the possibilities of*

	irrigation of rivers, reservoirs and catchment waters. *Level of difficulty: 2* *Types of irrigation systems, measures of their use. Information on the need to prepare irrigated fields for the salinization season and control of farm internal drainage networks and structures.* *Level of difficulty: 3* *Irrigation systems, drainage systems, geomorphology of irrigation systems, classification of irrigation systems, corrective drainage networks in irrigated lands, construction and calculation of horizontal ditches.* *Level of difficulty: 2*
Exams and assessment formats	*One midterm exam (30 minutes each of them) and final oral exam (40 minutes), a short computerized test and question for test got from homework.*
Study and examination requirements	*Requirements for passing the course* *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..*
Literatures	***1. P. WAllaer. Irrigation and drainage engineering. Agricultural and Biosystems Engineering University of Arizona Tucson, Arizona, USA. 2016.*** ***2. Sherov A., Serikbayev B.S. Modernization of hydromelioration systems. Tashkent, TIQXMMI, 2018.-380 p.*** ***3. Barayev F.A., Sherov A.G., Yuldasheva S. "Using meliorational systems" Textbook. Tashkent "Science and technology", 2016. - 258 p;*** ***4. Serikbayev B.S., Sherov A.G., Ibragimova H.R. "Modernization of hydromelioration systems", Textbook. Tashkent. "TIQHMMI" 2018y.-467 p;*** ***5. Barayev F.A., Serikbayev B.S., Bazarov R.Kh., "Use of hydromelioration systems", Textbook. Tashkent Institute of Irrigation and Reclamation. "TIMI", 2012. - 260 p;***

Name of the module/subject and related number in the curriculum	*MR6104- Ameliorative regime*
Semester(s) in which the module is taught	*3rd semester*
Responsible Person for the module/subject, full name	*Postdoc. Gadaev Nodirjon Nasirjonovich*
Language of study	*Uzbek*
Relation to curriculum	*Ellective*
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 – 600 hour.*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Land reclamation monitoring in irrigated lands. Irrigation and land reclamation, water conservation technologies, engineering service in hydromelioration systems.*
Module objectives/intended learning outcomes	***Know and understand:*** ✓ *conducting observations and obtaining data on the reclamation status and regime of irrigated lands, irrigation canals and ditches,* ✓ *is to provide skills to analyze the current situation and develop measures and solutions to improve the situation, as well as to implement them in practice.* ***To be able to:*** ✓ *to have an idea about irrigation and drainage networks in man-made agrolandscapes;* ✓ *know about water-salt balances and melioration regime and be able to use them;* ✓ *must have the skills to determine the productivity of irrigation water in the conditions of automorphic melioration regimes;* ***To form competences in:*** ✓ *knowledge of management of water-salt regimes of irrigated lands and organization of reclamation monitoring,* ✓ *methods and principles of water-salt regime monitoring in irrigated lands. to be able to operate the conceptual algorithm of meliorative monitoring of irrigation land regime in hydromelioration systems,* ✓ *to be able to create monitoring opportunities in the management of the soil water-salt regime in order to obtain a high yield of agricultural products.*
Content of subject	*Regime and balance of seepage waters of irrigated lands, water-salt regime of soils, quality of irrigation canals and ditches.*

	Level of difficulty: 2 *Organization and conduct of hydrogeological-ameliorative observations on flooding of populated areas and other engineering-geological processes and phenomena.* *Level of difficulty: 4* *It consists in forming knowledge on the timely and appropriate application of crop productivity prediction and justification of the measures developed on their basis.* *Level of difficulty: 3*
Exams and assessment formats	*One midterm exam (30 minutes each of them) and final oral exam (40 minutes), a short computerized test and question for test got from homework.*
Study and examination requirements	*Requirements for passing the course* *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.*
Literatures	*1. Gouri Sankar Bhunia. Land reclamation and restoration strategy for sustainable development, November 17, 2021.* *2. Zeeshan Mustafa Maan (author) Reclamation of soil salinity through use of control drainage.2010.* *3. R.K. Ikramov, G.U. Yusupov, F.A. Baraev, N.M. Karimova. "Irrigated land reclamation monitoring and cadastre", Textbook. Tashkent "TIMI" 2010 240b.* *4. From the science of melioration regime. Complex. Tashkent-2020.* *5. Methodological support for management of practical exercises in the field of melioration regime.*

Name of the module/subject and related number in the curriculum	*RTIST6104- Resource economical innovative irrigation technologies*
Semester(s) in which the module is taught	*3-семестр*
Responsible Person for the module/subject, full name	*т.ф.ф.д.доцент. Гадаев Нодиржон Носиржонович*
Language of study	*Ўзбек*
Relation to curriculum	*Асосий*
Teaching methods	*Маъруза, амалий машғулот*
Workload (incl. contact hours, se`lf-study hours)	Total workload: Auditorium hours: lecture - 30 hour; Practical training - 30 hour; Self-learning – 120 hour.
Credit points	8 credits
Required and recommended prerequisites for joining the module	*For example: Design of irrigation systems, design of resource-economical irrigation technologies.*
Module objectives/intended learning outcomes	***Know and understand:*** – *general concepts about the design and construction of resource-efficient irrigation technologies and their use,* – *to have an idea about the development of irrigation procedures for agricultural crops, improvement of irrigation technologies and methods in irrigation through modern, advanced water-saving irrigation technologies.* ***To be able to:*** – *theoretical foundations of resource-efficient irrigation technologies,* – *General concepts of scientifically based detailed design and construction of resource-efficient irrigation technologies and their use.* – *selective irrigation of new, modern, advanced water-saving irrigation technologies suitable for each type of crop.* – *development of irrigation procedures for agricultural crops, scientific justification of irrigation technologies and methods.* **To form competences in:** – *theoretical foundations of resource-efficient irrigation technologies Scientifically based principles on resource-efficient irrigation systems.* – *scientific analysis and current prospects of the work being carried out on the introduction of resource-saving irrigation technology.* – *scientifically based study of the impact of resource-saving irrigation technologies on the development of the field of irrigation and melioration.* – *selection of the main parts of the resource-saving irrigation system and the types of drippers of the drip*

	irrigation system, as well as technical elements based on the type of soil, climate, crop.
Content of subject	*Masters Resource-efficient irrigation technical and technological scientifically based principles and characteristics. Application of science-based agrotechnologies in resource-efficient irrigation.* *Level of difficulty: 2* *Scientific justification of the parameters of resource-efficient irrigation technologies and the scheme of the irrigation system. Development of calculation of irrigation procedures of agricultural crops according to the international FAO method, taking into account local conditions.* *Level of difficulty: 3* *Calculation of the regime of irrigation of agricultural crops and the norms of biological water consumption in resource-efficient irrigation and their comparison with the scientific research conducted in our republic.* *Level of difficulty: 2* *Selection of methods and methods for calculating the parameters of resource-saving irrigation technologies, taking into account the objects of scientific research. Implementation of resource-efficient irrigation technologies and methods, hydraulic calculation of irrigation techniques and their design based on scientifically based conclusions.* *Level of difficulty: 4*
Exams and assessment formats	*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 examination requirements	*Requirements for passing the course* *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.*
Literatures	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.

Name of the module/subject and related number in the curriculum	RST4108-Resource economical irrigation technologies
Semester(s) in which the module is taught	10, 11- semester
Responsible Person for the module/subject, full name	Postdoc. Gadaev Nodirjon Nasirjonovich, *assistant Sirojiddin Djalilov*

Language of study	Uzbek
Relation to curriculum	Mandatory
Teaching methods	lecture, practical training
Workload (incl. contact hours, self-study hours)	Total workload: Auditorium hours: lecture - 60 hour; Practical training - 60 hour; Self-learning – 120 hour.
Credit points	8 credits
Required and recommended prerequisites for joining the module	*For example: Design of irrigation systems, design of resource-economical irrigation technologies.*
Module objectives/intended learning outcomes	***Know and understand:*** ✓ scientific justification of the development of the field of irrigation and melioration in bachelors. ✓ theoretical foundations of resource-saving irrigation technologies, scientifically based categories. ✓ new, modern, suitable for them in the cultivation of agricultural crops. ✓ to teach the laws and principles of using advanced water-saving irrigation technologies, and to develop skills in scientifically based detailed design, implementation, and field experiments. ***To be able to:*** ✓ general concepts about the design and construction of resource-efficient irrigation technologies and their use. ✓ to have an idea about the development of irrigation procedures for agricultural crops in irrigation through new, modern, advanced water-saving irrigation technologies ✓ know and be able to use irrigation technologies and methods, hydraulic calculation of irrigation equipment and the development of irrigation and melioration in their design **To form competences in:** ✓ must have the skills to learn the methods of resource-saving irrigation technologies and the selection of technical elements and the technical and economic options for the placement of irrigation networks. ✓ analysis of introduction of water-saving technologies in agriculture in foreign countries. ✓ design of drip irrigation system
Content of subject	Students will gain a general understanding of the theoretical foundations of resource-efficient irrigation technologies, the science-based detailed design and construction of resource-efficient irrigation technologies, and their use. *Level of difficulty: 2* Selective irrigation of new, modern, advanced water-saving irrigation technologies suitable for each type of crop, development of irrigation procedures for agricultural crops, scientific justification of irrigation technologies and methods.

	Level of difficulty: 3 Scientific assessment of the influence of irrigation and melioration on the development of the field of irrigation and melioration in the detailed design of irrigation equipment. *Level of difficulty: 2* The resource consists in studying methods of efficient irrigation technologies and methods of choosing technical and economic options for placing irrigation networks based on soil, climate, crop type. *Level of difficulty: 4*
Exams and assessment formats	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 examination requirements	Requirements for passing the course 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.
Literatures	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.

Name of the module/subject and related number in the curriculum	*STMM 3108-Mathematical Modeling of Irrigation Orders*
Semester(s) in which the module is taught	7, 8 - semester
Responsible Person for the module/subject, full name	*Ph.D.* postdoc. *Gadaev Nodirjon Nasirjonovich, assistant Dilshod Rakhmonov*
Language of study	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*lecture, practical training*
Workload (incl. contact hours, self-study hours)	*Total workload:* *Auditorium hours:* *lecture - 60 hour;* *Practical training - 60 hour;* *Self-learning – 120 hour.*
Credit points	*8 credits*
Required and recommended prerequisites for joining the module	*For example: Design of irrigation systems, design of resource-efficient irrigation technologies.*
Module objectives/intended learning outcomes	***Know and understand:*** ✓ *student watering procedures to accept solutions to problems,* ✓ *should have knowledge about the technical condition of irrigated lands and hydromelioration systems, research on water use in irrigated agriculture,* ✓ *to have knowledge and understanding of activities carried out in irrigation systems,* ✓ *to determine the hydromodule of irrigation in irrigation systems, to know how to determine the procedure for watering agricultural crops,* ✓ *able to learn and understand the rules of construction standards and other normative documents, modern innovative techniques and technologies of water-saving irrigation in the design of water-saving modern innovative techniques and technologies.* ***To be able to:*** ✓ *to have an idea about the basis of knowledge of irrigation procedures of agricultural crops, the state of development of irrigation standards through modern programs, being able to use them in new programs,* ✓ *to know and be able to use the basis of various special model programs used in the field of water management and land reclamation, methods of collecting climate data and methods of developing measures to improve the conditions based on the obtained data,*

	✓ *student should have problem solving skills in irrigation procedures* **To form competences in:** ✓ *Must have understanding of irrigation procedures and modeling,* ✓ *To have the concepts of obtaining climate data using the ClimWat model program,* ✓ *Calculation of standard evapotranspiration by Penman-Montaigne method.*
Content of subject	*Students will learn how to calculate crop coefficients, calculate the water demand of* crops, *calculate the irrigation regime of crops using the CropWat model, determine the irrigation regime based on the CropWat computer program.* *Level of difficulty: 2* *How to use the AquaCrop model software, predicting crop productivity using the AquaCrop model software.* *Level of difficulty: 3* *AquaCrop Agricultural Crop Productivity Assessment Model, Soil-Water-Atmosphere-Vegetation (SWAP) Model:* *Level of difficulty: 2*
Exams and assessment formats	*One midterm exam (30 minutes each of them) and final oral exam (40 minutes), a short computerized test and question for test got from homework.*
Study and examination requirements	*Requirements for passing the course* *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..*
Literatures	*1.UN-FAO, Crop evapotranspiration - Guidelines for computing crop water requirements - FAO Irrigation and drainage paper 56, Rome: FAO, 1998.* *2. Texas A&M University, "Global Weather Data for SWAT," 08 2014. [Online]. Available: http://globalweather.tamu.edu. [Accessed 02 10 2020].* *3. "Revised fao methodology for crop requirement," [Online]. Available: https://inis.iaea.org/collection/NCLCollectionStore/_Public/29/062/29062763.pdf.* *4. Bahodir & Sons, F/X, "Ekin suv talabini aniqlashning tekin usuli," 06 09 2020. [Online]. Available: https://youtu.be/3c6CI07YF9E. [Accessed 16 10 2020].* *5. ISAREG for cotton and winter wheat in Central Asia. In: Pereira et al. (Eds.) Irrigation management for combating desertification in the Aral Sea basin. Assessment and tools. INCO-Copernicus, Vita Color, Tashkent, pp. 97-124.* *6. Christmann S., 2009. Food Security and Climate Change in Central Asia and the Caucasus. CGIAR-PFU,Tashkent, Uzbekistan. p. 75.*

Name of the module/subject and related number in the curriculum	*SFRAHB3104-Crops fertile prediction based on water use planning*
Semester(s) in which the module is taught	*8*- semester
Responsible Person for the module/subject, full name	*Ph.D.* postdoc. *Gadaev Nodirjon Nasirjonovich*
Language of study	*Uzbek*
Relation to curriculum	*Choice*
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	*For example: Irrigation reclamation, Water efficiency and crop yield prediction.*
Module objectives/intended learning outcomes	***Know and understand:*** ✓ *managing irrigation networks, carrying out water measurement and distribution in them, having an idea about irrigation techniques and their use,* ✓ *students should be able to know and use the theory of predicting the productivity of agricultural crops grown on irrigated lands, their types and structure, as well as the application of appropriate irrigation and fertilization methods for certain climate and soil-melioration conditions* ***To be able to:*** ✓ *determining the hydromodule of irrigation in irrigation systems, determining the order of irrigation of agricultural crops, irrigation technology being able to use them,* ✓ *should know how to identify technical elements, know how to use irrigation and melioration systems rationally, have the skills to draw up water use plans and find technical and economic options.* **To form competences in:** ✓ *formation of students' knowledge, skills and competence in accordance with the profile of the course on providing unfavorable natural conditions of the external environment for the normal development of cultural crops with the help of irrigation and drainage methods and techniques,* ✓ *to provide students with full and effective use of land, regular increase of soil fertility, productivity and productivity of agricultural crops through irrigation, implementation of land*

	reclamation in connection with high-performance agrotechnical activities
Content of subject	Water Use Planning (SFR) is the distribution of water from a water source according to the amount of water intended for irrigation by water-using farms, crops and type, and the irrigation plan. *Level of difficulty: 2* Water resources are delivered to consumers by means of open channels, rivers, ditches and water intake and distribution facilities, pumping stations, and delivery of water to consumers in terms of measuring water consumption. *Level of difficulty: 3* To have an idea about the improvement of technologies of economic irrigation and cultivation of agricultural crops in irrigated lands. *Level of difficulty: 2*
Exams and assessment formats	*One midterm exam (30 minutes each of them) and final oral exam (40 minutes), a short computerized test and question for test got from homework.*
Study and examination requirements	*Requirements for passing the course* *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.*
Literatures	*1. A. Sherov and N. Gadaev. Prediction of crop productivity based on water use plan. Study guide. Tashkent-2022.* *2. Petter Wallaer. Irrigation and Drainage Engineering. Textbook. 2014 year.* *3. Isashov A., Sobitov A. Application of modern agrotechnological methods to improve soil fertility (water-saving and drip irrigation, laser leveling, soil softening with deep plowing, etc.). Study guide. Alisher Navoi publishing house, 2016.54 p.* *4. F. Baraev. Prediction of crop productivity. Methodical instructions for conducting practical training. Tashkent-2014.*

Example form for Module Handbook

Faculty of Agricultural Mechanization

The direction of education: 60810100 - Agricultural mechanization

Module designation	*GTZ2106-Hydraulics and hydraulic systems*
Semester(s) in which the module is taught	*6- semester*
Person responsible for the module	*Doctor of technical sciences, professor Arifjanov A.M., doctor of philosophy in technical sciences. Xoshimov S.N.*
Language	*Uzbek, Russian*
Relation to curriculum	*Main*
Teaching methods	*Lecture, practical training, laboratory training, self-study*
Workload (incl. contact hours, self-study hours)	*Total workload:180 hours* *Auditorium Hours:* *Lecture – 40 hours;* *Practical training - 20 hours* *Laboratory training -20 hours* *Self-study – 100 hours*
Credit points	*6 credits*
Required and recommended prerequisites for joining the module	*Physics, Mathematics, Theoretical Mechanics, Information Technologies*

Module objectives/intended learning outcomes	***To know and understand:*** *- should have knowledge of physical properties of liquids and cases of their practical use, laws of liquids in equilibrium and motion, and methods of their application in solving technical problems;* *- it is necessary to have knowledge about hydrostatic pressure, hydrostatic pressure force and its effect on various surfaces, a body immersed in a liquid, fluid laws in equilibrium and methods of their application in solving technical problems;* *- it is necessary to have knowledge about the types of fluid movement, hydraulic elements of the flow, the laws of fluid in motion and their application in solving technical problems;* *- it is necessary to know the laminar and turbulent flow patterns of the liquid, the hydraulic resistance of the liquid in the pipes, the determination of the head losses;* *- it is necessary to have knowledge of simple and complex, short and long pipes, methods of determining liquid flow rate in holes and tubes, calculation of their hydraulic parameters;* *- should have knowledge about hydraulic systems, hydraulic devices and hydraulic processes in hydraulic machines, agricultural and construction machines, working characteristics of pumps.* ***To be able to:*** *- knows how to calculate the force of hydrostatic pressure acting on flat and curved surfaces;* *- knows how to solve problems related to the flow types;* *- knows how to solve problems related to simple and complex pipes;* *-knows hydraulic systems, their main parameters, their components and related processes;* ***To form competences in:*** *- forming the ability to think logically about the science of hydraulics and hydraulic systems;* *- formation of solid knowledge of the laws of equilibrium and movement of liquids and machines and systems operating on the basis of these laws, and the ability to apply the acquired knowledge to solve practical problems related to the field.*
Content	*It is to teach students the fundamentals of hydraulics, the laws and processes of fluid in equilibrium, movement, and the hydraulic calculation of hydraulic systems, and to develop the skills of practical application.*
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	*Requirements for successfully passing the module* *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.*

Reading list	1. *Melvyn Kay "Practical Hydraulics", Taylor & Francis, 2008u.- 253 pages.* 2. *K.Sh.Latipov, A.Arifjanov, X.Kadirov, B.Toshov «Gidravlika va gidravlik mashinalar», Navoiy sh., Alisher Navoiy, 2014 y. -268b.* 3. *T.Kaletova, A.Arifjanov "Hydromechanika", Nitra, 2019y, -160 pages.* 4. *A.M.Arifjanov, T.U.Apakxujaeva. Gidravlika (Uchebnoe posobie). – Tashkent. Faylasuflar, 2019 g. -280s.* 5. *Latipov K.Sh., Arifjanov A.M., Fayziev X «Gidravlika», Toshkent, TAQI, 2015 y. 459b.* 6. *A A.M.Arifjanov, P.N.Gurina, T.U.Apakxujaeva "Gidravlika", Toshkent, TIQXMMI, 2018g, -171 s.* 7. *A.M.Arifjanov «Gidravlikadan masalalar to'plami», Toshkent, 2004y. -89b.* 8. *Hubert Chanson "Enviromental Hydraulics of open chennal flows", Butterworth-Heinemann, UK, 2004u, 634 pages.* 9. *John Fenton "A First Course in Hydraulics", Vienna University of Technologiy, Austria, 2012u, 120pages.* *A.M. Arifjanov, S.N.Xoshimov, «Gidravlika va gidravlik tizimlar». Darslik – Toshkent, "TIQXMMI"MTU, 2022 y. -340 b.*

Example form for Module Handbook

Faculty of Agricultural Mechanization

The direction of education: 60810100 - Agricultural mechanization

Module designation	*GTZ2106-Hydraulics*
Semester(s) in which the module is taught	*6 - semester*
Person responsible for the module	*Doctor of technical sciences, professor Arifjanov A.M., doctor of philosophy in technical sciences. Xoshimov S.N.*
Language	*Uzbek, Russian*
Relation to curriculum	*Main*
Teaching methods	*Lecture, practical training, laboratory training, self-study*
Workload (incl. contact hours, self-study hours)	*Total workload:180 hours* *Auditorium Hours:* *Lecture – 40 hours;* *Practical training - 20 hours* *Laboratory training -20 hours* *Self-study – 100 hours*
Credit points	*6 credits*
Required and recommended prerequisites for joining the module	*Physics, Mathematics, Theoretical Mechanics, Information Technologies*

Module objectives/intended learning outcomes	***To know and understand:*** *- should have knowledge of physical properties of liquids and cases of their practical use, laws of liquids in equilibrium and motion, and methods of their application in solving technical problems;* *- it is necessary to have knowledge about hydrostatic pressure, hydrostatic pressure force and its effect on various surfaces, a body immersed in a liquid, fluid laws in equilibrium and methods of their application in solving technical problems;* *- it is necessary to have knowledge about the types of fluid movement, hydraulic elements of the flow, the laws of fluid in motion and their application in solving technical problems;* *- it is necessary to know the laminar and turbulent flow patterns of the liquid, the hydraulic resistance of the liquid in the pipes, the determination of the head losses;* *- it is necessary to have knowledge of simple and complex, short and long pipes, methods of determining liquid flow rate in holes and tubes, calculation of their hydraulic parameters;* *- should have knowledge about hydraulic systems, hydraulic devices and hydraulic processes in hydraulic machines, agricultural and construction machines, working characteristics of pumps.* ***To be able to:*** *- knows how to calculate the force of hydrostatic pressure acting on flat and curved surfaces;* *- knows how to solve problems related to the flow types;* *- knows how to solve problems related to simple and complex pipes;* *-knows hydraulic systems, their main parameters, their components and related processes;* ***To form competences in:*** *- forming the ability to think logically about the science of hydraulics and hydraulic systems;* *- formation of solid knowledge of the laws of equilibrium and movement of liquids and machines and systems operating on the basis of these laws, and the ability to apply the acquired knowledge to solve practical problems related to the field.*
Content	*It is to teach students the fundamentals of hydraulics, the laws and processes of fluid in equilibrium, movement, and the hydraulic calculation of hydraulic systems, and to develop the skills of practical application.*
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	*Requirements for successfully passing the module* *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.*

Reading list	1. *Melvyn Kay "Practical Hydraulics", Taylor & Francis, 2008u.- 253 pages.* 2. *K.Sh.Latipov, A.Arifjanov, X.Kadirov, B.Toshov «Gidravlika va gidravlik mashinalar», Navoiy sh., Alisher Navoiy, 2014 y. -268b.* 3. *T.Kaletova, A.Arifjanov "Hydromechanika", Nitra, 2019y, -160 pages.* 4. *A.M.Arifjanov, T.U.Apakxujaeva. Gidravlika (Uchebnoe posobie). – Tashkent. Faylasuflar, 2019 g. -280s.* 5. *Latipov K.Sh., Arifjanov A.M., Fayziev X «Gidravlika», Toshkent, TAQI, 2015 y. 459b.* 6. *A A.M.Arifjanov, P.N.Gurina, T.U.Apakxujaeva "Gidravlika", Toshkent, TIQXMMI, 2018g, -171 s.* 7. *A.M.Arifjanov «Gidravlikadan masalalar to'plami», Toshkent, 2004y. -89b.* 8. *Hubert Chanson "Enviromental Hydraulics of open chennal flows", Butterworth-Heinemann, UK, 2004u, 634 pages.* 9. *John Fenton "A First Course in Hydraulics", Vienna University of Technologiy, Austria, 2012u, 120pages.* *A.M. Arifjanov, S.N.Xoshimov, «Gidravlika va gidravlik tizimlar». Darslik – Toshkent, "TIQXMMI"MTU, 2022 y. -340 b.*

Example form for Module Handbook

Faculty of Hydromelioration

The direction of education: 60530800 – Hydrology (river and reservoir hydrology)

Module designation	*Hydraulics, GID 3110*
Semester(s) in which the module is taught	*7,8- semesters*
Person responsible for the module	*Doctor of technical sciences, professor Arifjanov A.M., doctor of philosophy in technical sciences. Babajanov F.K.*
Language	*Uzbek, Russian*
Relation to curriculum	*Main*
Teaching methods	*Lecture, practical training, laboratory training*
Workload (incl. contact hours, self-study hours)	*Total workload:300 hours* *Auditorium Hours:* *Lecture – 40 hours;* *Practical training - 40 hours* *Laboratory training -40 hours* *Self-study – 180 hours*
Credit points	*10 credits*
Required and recommended prerequisites for joining the module	*Physics, Mathematics, Hydrometry, Terrestrial Hydrology, Theoretical Mechanics*
Module objectives/intended learning outcomes	***To know and understand:*** *-about the laws of liquids in equilibrium and motion and their application in solving technical problems, physical properties of liquids and their practical use, bodies in liquids and their interaction; to have an idea about the application of hydraulic systems, hydraulic devices and hydraulic machines to agricultural reclamation;* ***To be able to:*** *- know hydrostatic pressure, hydrostatic pressure force, types of fluid movement, hydraulic elements of flow, laminar and turbulent flow procedures of fluid, laws of flow of fluid in pipes and hydraulic structures and determination of hydraulic parameters, hydraulic resistances and their determination, methods of hydraulic calculation of hydraulic structures, and be able to use them;* ***To form competences in:*** *-methods of determining fluid consumption in simple and complex pipes, holes and tubes, calculating the hydrostatic pressure force affecting hydraulic structures, performing hydraulic calculation of pressure systems and hydraulic structures, performing hydraulic calculation of pipes and hydraulic systems, acquiring skills in smooth and non-uniform movement of flow in open channels*
Content	*It is to teach students the basics of hydraulics, the laws and processes of fluid in equilibrium, movement, and the hydraulic calculation of water management structures, and to develop the skills of practical application.*
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	*Requirements for successfully passing the module* *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.*
Reading list	*Зуйков А.Л. «Гидравлика», учебник, Москва, 2014 г., 517 с.* *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. -388б* *А.Арифжанов, Т.Апакхужаева. Гидравлика. -Ташкент. Файласуф, 2019б. – 224б.* *А.Арифжанов, Қ.Рахимов, А.Ходжиев Гидравлика. Тошкент. ТИМИ 2016й. – 189б.* *Арифжанов А.М. Гидравлика (гидростатика). Тошкент. ТИҚХММИ 2022й. – 137б.* *А.М. Арифжанов, Х.Файзиев, А.У.Тошхожаев Гидравлика. Тошкент. ТАҚИ 2019й. – 157б.* *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. – 121б.* *Philip M. Gerhart Andrew L. Gerhart John I. Hochstein Fundamentals of Fluid Mechanics. ISBN 978-1-119-08070-1 (Binder-Ready Version). USA 2016* *Philippe Gourbesville • Jean Cunge Guy Caignaert Advances in Hydroinformatics. ISBN 978-981-10-7217-8. Springer Nature Singapore Pte Ltd. 2018* *T.Kaletova, A.Arifjanov “Hydromechanika”, Nitra, 2019y, -160 pages.*

Ўзбекча таржимаси

Модулнинг/фаннинг номи ва ўқув режасидаги шифри	*Гидравлика, GID 3110*
Фан ўқитиладиган семестр	*7,8- семестрлар*
Модул/фан бўйича масьул ўқитувчи Ф.И.Ш, илмий даражаси ва унвони	*Техника фанлари доктори., профессор Арифжанов А.М., техника фанлари бўйича фалсафа доктори. Бабажанов Ф.К.*
Қайси тилда ўқитилиши	*Ўзбек, рус*
Ўқув режасидаги ўрни	*Асосий*
Ўқитиш усуллари	*Маъруза, амалий машгулот, лаборатория машгулоти*

Ўқув юкламаси (аудитория соатлари турлари бўйича ва мустакил таълим соатлари)	*Умумий юклама: 300 соат* *Аудитория соатлари:* *Маъруза - 40 соат;* *Амалий машғулот - 40 соат* *Лаборатория машғулоти – 40 соат* *Мустақил таълим – 180 соат*
Фанга ажратилган кредитлар сони	*10 кредит*
Бу фандан олдин ўзлаштирилиши талаб этиладиган фанлар рўйхати	*Физика, Математика, Назарий механика, Гидрометрия, Қуруқлик гидрологияси*
Кутиладиган таълим мақсадлари	***Билиш ва тушуниш:*** *-мувозанатдаги ва ҳаракатдаги суюқлик қонунлари ва уларни техник масалаларни ечишда қўллаш усуллари ҳақида, суюқликларнинг физик хусусиятлари ва улардан амалиётда фойдаланиш ҳолатлари, суюқликлардаги жисм ва уларнинг ўзаро таъсири; гидравлик тизимлар, гидравлик қурилмалар ва гидравлик машиналарда, қишлоқ хўжалиги мелиорациясига қўллаш ҳақида тасаввурга эга бўлиши;* ***Кўникмага эга бўлиш:*** *-гидростатик босим, гидростатик босим кучини, суюқлик ҳаракатининг турларини, оқимнинг гидравлик элементларини, суюқликнинг ламинар ва турбулент ҳаракат тартибларини, суюқликнинг қувурларда ва гидротехник иншоотлардаги оқим ҳаракати қонуниятларини ва гидравлик параметрларини аниқлашни, гидравлик қаршиликларни ва уларни аниқлаш, гидротехник иншоотлар бандини гидравлик ҳисоблаш усулларини билиши ва улардан фойдалана олиши;* **Компетенцияларни шакллантириш:** *-оддий ва мураккаб қувурларда, тешик ва найчаларда суюқлик сарфини аниқлаш услубларини, гидротехник иншоатларга таъсир этаётган гидростатик босим кучини ҳисоблаш, напорли тизимлар ва гидротехник иншоотларнинг гидравлик ҳисобини бажариш, қувурлар ва гидравлик тизимнинг гидравлик ҳисобини бажариш, очиқ ўзанларда оқимнинг текис ва нотекис ҳаракати бўйича кўникмаларига эга бўлиши керак.*
Фаннинг мазмуни	*Талабаларга гидравликанинг асосларини, суюқликнинг мувозанатдаги, ҳаракатдаги қонуниятларини ва жараёнларини, ҳамда сув хўжалиги иншоотларнинг гидравлик ҳисобини ўргатиш, амалиётда тадбиқ этиш кўникмасини ҳосил қилишдан иборат.*
Имтихонлар ва бахолаш формати	*Битта оралик назорат (ёзма ёки тест) (30 минутдан вакт берилади) ва якуний оғзаки имтихон (60 мин берилади), қисқа компьютерлаштирилган тест ва ёзма бажариладиган уй топшириклари кўзда тутилган*
Ўқиш ва имтихонга қўйиладиган талабалар	*Фандан муваффақиятли ўтиш талабалари* *Жами йиғиладиган максимал баллар якуний имтихонгача (60%), Оралик назоратга (24%), уй вазифасига (24%) ва аудиториядаги машғулотларда фаолликка (12%) ажратиладиган баллар йиғиндисидан иборат бўлади. Фандан муваффақиятли ўтиш учун талаба ажратилган балларинг 60% ва унда юкори микдорини тўплаши керак.*

Адабиётлар	1. *Зуйков А.Л. «Гидравлика», учебник, Москва, 2014 г., 517 с.* 2. *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. -388б* 3. *А.Арифжанов, Т.Апаккужаева. Гидравлика. -Ташкент. Файласуф, 2019б. – 224б.* 4. *А.Арифжанов, Қ.Рахимов, А.Ходжиев Гидравлика. Тошкент. ТИМИ 2016й. – 189б.* 5. *Арифжанов А.М. Гидравлика (гидростатика). Тошкент. ТИҚХММИ 2022й. – 137б.* 6. *А.М. Арифжанов, Х.Файзиев, А.У.Тошхожаев Гидравлика. Тошкент. ТАҚИ 2019й. – 157б.* 7. *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. – 121б.* 8. *Philip M. Gerhart Andrew L. Gerhart John I. Hochstein Fundamentals of Fluid Mechanics. ISBN 978-1-119-08070-1 (Binder-Ready Version). USA 2016* 9. *Philippe Gourbesville • Jean Cunge Guy Caignaert Advances in Hydroinformatics. ISBN 978-981-10-7217-8. Springer Nature Singapore Pte Ltd. 2018* 10. *T.Kaletova, A.Arifjanov "Hydromechanika", Nitra, 2019y, -160 pages.*

Example form for Module Handbook

Faculty of Energy Supply of Agriculture and Water Resources

The direction of education: 60711500- Mechatronics and robotics

Module designation	*GID2105-Hydraulics*
Semester(s) in which the module is taught	*4 - semester*
Person responsible for the module	*Doctor of technical sciences, professor Arifjanov A.M., doctor of philosophy in technical sciences. Xoshimov S.N.*
Language	*Uzbek, Russian*
Relation to curriculum	*Main*
Teaching methods	*Lecture, practical training, laboratory training*

Workload (incl. contact hours, self-study hours)	*Total workload:150 hours* *Auditorium Hours:* *Lecture – 20 hours;* *Practical training - 30 hours* *Laboratory training -10 hours* *Self-study – 90 hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Physics, Mathematics, Theoretical Mechanics, Information Technologies*
Module objectives/intended learning outcomes	***To know and understand:*** *- should have knowledge of physical properties of liquids and cases of their practical use, laws of liquids in equilibrium and motion, and methods of their application in solving technical problems;* *- it is necessary to have knowledge about hydrostatic pressure, hydrostatic pressure force and its effect on various surfaces, a body immersed in a liquid, fluid laws in equilibrium and methods of their application in solving technical problems;* *- it is necessary to have knowledge about the types of fluid movement, hydraulic elements of the flow, the laws of fluid in motion and their application in solving technical problems;* *- it is necessary to know the laminar and turbulent flow patterns of the liquid, the hydraulic resistance of the liquid in the pipes, the determination of the head losses;* *- it is necessary to have knowledge of simple and complex, short and long pipes, methods of determining liquid flow rate in holes and tubes, calculation of their hydraulic parameters;* *- should have knowledge about hydraulic systems, hydraulic devices and hydraulic processes in hydraulic machines, agricultural and construction machines, working characteristics of pumps.* ***To be able to:*** *- knows how to calculate the force of hydrostatic pressure acting on flat and curved surfaces;* *- knows how to solve problems related to the flow types;* *- knows how to solve problems related to simple and complex pipes;* *-knows hydraulic systems, their main parameters, their components and related processes;* ***To form competences in:*** *- forming the ability to think logically about the science of hydraulics and hydraulic systems;* *- formation of solid knowledge of the laws of equilibrium and movement of liquids and machines and systems operating on the basis of these laws, and the ability to apply the acquired knowledge to solve practical problems related to the field.*
Content	*It is to teach students the fundamentals of hydraulics, the laws and processes of fluid in equilibrium, movement, and the hydraulic calculation of hydraulic systems, and to develop the skills of practical application.*
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	*Requirements for successfully passing the module* *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.*
Reading list	1. *Melvyn Kay "Practical Hydraulics", Taylor & Francis, 2008u.-253 pages.* 2. *K.Sh.Latipov, A.Arifjanov, X.Kadirov, B.Toshov «Gidravlika va gidravlik mashinalar», Navoiy sh., Alisher Navoiy, 2014 y. -268b.* 3. *T.Kaletova, A.Arifjanov "Hydromechanika", Nitra, 2019y, -160 pages.* 4. *A.M.Arifjanov, T.U.Apakxujaeva. Gidravlika (Uchebnoe posobie). – Tashkent. Faylasuflar, 2019 g. -280s.* 5. *Latipov K.Sh., Arifjanov A.M., Fayziev X «Gidravlika», Toshkent, TAQI, 2015 y. 459b.* 6. *A A.M.Arifjanov, P.N.Gurina, T.U.Apakxujaeva "Gidravlika", Toshkent, TIQXMMI, 2018g, -171 s.* 7. *A.M.Arifjanov «Gidravlikadan masalalar to'plami», Toshkent, 2004y. -89b.* 8. *Hubert Chanson "Enviromental Hydraulics of open chennal flows", Butterworth-Heinemann, UK, 2004u, 634 pages.* 9. *John Fenton "A First Course in Hydraulics", Vienna University of Technologiy, Austria, 2012u, 120pages.* *A.M. Arifjanov, S.N.Xoshimov, «Gidravlika va gidravlik tizimlar». Darslik – Toshkent, "TIQXMMI"MTU, 2022 y. -340 b.*

Example form for Module Handbook

Faculty of Hydromelioration

The direction of education: 60711400 – Automation and control of technological processes and production (in water industry)

Module designation	*Hydraulics, GID 2204*
Semester(s) in which the module is taught	*4-semester*
Person responsible for the module	*Doctor of technical sciences, professor Arifjanov A.M., doctor of philosophy in technical sciences. Babajanov F.K.*
Language	*Uzbek, Russian*
Relation to curriculum	*Main*
Teaching methods	*Lecture, practical training*
Workload (incl. contact hours, self-study hours)	*Total workload:180 hours* *Auditorium Hours:* *Lecture – 30 hours;* *Practical training - 30 hours* *Self-study – 120 hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Physics, Mathematics, Hydrometry, Terrestrial Hydrology, Theoretical Mechanics*
Module objectives/intended learning outcomes	***To know and understand:*** *-about the laws of liquids in equilibrium and motion and their application in solving technical problems, physical properties of liquids and their practical use, bodies in liquids and their interaction; to have an idea about the application of hydraulic systems, hydraulic devices and hydraulic machines to agricultural reclamation;* ***To be able to:*** *- know hydrostatic pressure, hydrostatic pressure force, types of fluid movement, hydraulic elements of flow, laminar and turbulent flow procedures of fluid, laws of flow of fluid in pipes and hydraulic structures and determination of hydraulic parameters, hydraulic resistances and their determination, methods of hydraulic calculation of hydraulic structures, and be able to use them;* ***To form competences in:*** *-methods of determining fluid consumption in simple and complex pipes, holes and tubes, calculating the hydrostatic pressure force affecting hydraulic structures, performing hydraulic calculation of pressure systems and hydraulic structures, performing hydraulic calculation of pipes and hydraulic systems.*
Content	*It is to teach students the basics of hydraulics, the laws and processes of fluid in equilibrium, movement, and the hydraulic calculation of water management structures, and to develop the skills of practical application.*
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	*Requirements for successfully passing the module* *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.*
Reading list	*Зуйков А.Л. «Гидравлика», учебник, Москва, 2014 г., 517 с.* *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. -388б* *А.Арифжанов, Т.Апакхужаева. Гидравлика. -Ташкент. Файласуф, 2019б. – 224б.* *А.Арифжанов, Қ.Рахимов, А.Ходжиев Гидравлика. Тошкент. ТИМИ 2016й. – 189б.* *Арифжанов А.М. Гидравлика (гидростатика). Тошкент. ТИҚХММИ 2022й. – 137б.* *А.М. Арифжанов, Х.Файзиев, А.У.Тошхожаев Гидравлика. Тошкент. ТАҚИ 2019й. – 157б.* *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. – 121б.* *Philip M. Gerhart Andrew L. Gerhart John I. Hochstein Fundamentals of Fluid Mechanics. ISBN 978-1-119-08070-1 (Binder-Ready Version). USA 2016* *Philippe Gourbesville • Jean Cunge Guy Caignaert Advances in Hydroinformatics. ISBN 978-981-10-7217-8. Springer Nature Singapore Pte Ltd. 2018* *T.Kaletova, A.Arifjanov “Hydromechanika”, Nitra, 2019y, -160 pages.*

Ўзбекча таржимаси

Модулнинг/фаннинг номи ва ўқув режасидаги шифри	*Гидравлика, GID 2204*
Фан ўқитиладиган семестр	*4-семестр*
Модул/фан бўйича масьул ўқитувчи Ф.И.Ш, илмий даражаси ва унвони	*Техника фанлари доктори., профессор Арифжанов А.М., техника фанлари бўйича фалсафа доктори. Бабажанов Ф.К.*
Қайси тилда ўқитилиши	*Ўзбек, рус*

Ўқув режасидаги ўрни	*Асосий*
Ўқитиш усуллари	*Маъруза, амалий машгулот*
	Ўқув юкламаси (аудитория соатлари турлари бўйича ва мустакил таълим соатлари)
Фанга ажратилган кредитлар сони	*4 кредит*
Бу фандан олдин ўзлаштирилиши талаб этиладиган фанлар рўйхати	*Физика, Математика, Назарий механика, Гидрометрия, Қуруқлик гидрологияси*
Кутиладиган таълим мақсадлари	***Билиш ва тушуниш:*** *-мувозанатдаги ва ҳаракатдаги суюқлик қонунлари ва уларни техник масалаларни ечишда қўллаш усуллари ҳақида, суюқликларнинг физик хусусиятлари ва улардан амалиётда фойдаланиш ҳолатлари, суюқликлардаги жисм ва уларнинг ўзаро таъсири; гидравлик тизимлар, гидравлик қурилмалар ва гидравлик машиналарда, қишлоқ хўжалиги мелиорациясига қўллаш ҳақида тасаввурга эга бўлиши;* ***Кўникмага эга бўлиш:*** *-гидростатик босим, гидростатик босим кучини, суюқлик ҳаракатининг турларини, оқимнинг гидравлик элементларини, суюқликнинг ламинар ва турбулент ҳаракат тартибларини, суюқликнинг қувурларда ва гидротехник иншоотлардаги оқим ҳаракати қонуниятларини ва гидравлик параметрларини аниқлашни, гидравлик қаршиликларни ва уларни аниқлаш, гидротехник иншоотлар бандини гидравлик ҳисоблаш билиши ва улардан усулларини фойдалана олиши;* **Компетенцияларни шакллантириш:** *-оддий ва мураккаб қувурларда, тешик ва найчаларда суюқлик сарфини аниқлаш услубларини, гидротехник иншоатларга таъсир этаётган гидростатик босим кучини ҳисоблаш, напорли тизимлар ва гидротехник иншоотларнинг гидравлик ҳисобини бажариш, қувурлар ва гидравлик тизимнинг гидравлик ҳисобини бажариш.*
Фаннинг мазмуни	*Талабаларга гидравликанинг асосларини, суюқликнинг мувозанатдаги, ҳаракатдаги қонуниятларини ва жараёнларини, ҳамда сув хўжалиги иншоотларнинг гидравлик ҳисобини ўргатиш, амалиётда тадбиқ этиш кўникмасини ҳосил қилишдан иборат.*
Имтихонлар ва бахолаш формати	*Битта оралик назорат (ёзма ёки тест) (30 минутдан вакт берилади) ва якуний оғзаки имтихон (60 мин берилади), қисқа компьютерлаштирилган тест ва ёзма бажариладиган уй топшириклари кўзда тутилган*
Ўқиш ва имтихонга қўйиладиган талабалар	*Фандан муваффақиятли ўтиш талабалари* *Жами йиғиладиган максимал баллар якуний имтихонгача (60%), Оралик назоратга (24%), уй вазифасига (24%) ва аудиториядаги машғулотларда фаолликка (12%) ажратиладиган баллар йиғиндисидан иборат бўлади. Фандан муваффақиятли ўтиш учун талаба ажратилган балларинг 60% ва унда юкори микдорини тўплаши керак.*

Адабиётлар	11. *Зуйков А.Л. «Гидравлика», учебник, Москва, 2014 г., 517 с.* 12. *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. -388б* 13. *А.Арифжанов, Т.Апаккужаева. Гидравлика. -Ташкент. Файласуф, 2019б. – 224б.* 14. *А.Арифжанов, Қ.Рахимов, А.Ходжиев Гидравлика. Тошкент. ТИМИ 2016й. – 189б.* 15. *Арифжанов А.М. Гидравлика (гидростатика). Тошкент. ТИҚХММИ 2022й. – 137б.* 16. *А.М. Арифжанов, Х.Файзиев, А.У.Тошхожаев Гидравлика. Тошкент. ТАҚИ 2019й. – 157б.* 17. *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. – 121б.* 18. *Philip M. Gerhart Andrew L. Gerhart John I. Hochstein Fundamentals of Fluid Mechanics. ISBN 978-1-119-08070-1 (Binder-Ready Version). USA 2016* 19. *Philippe Gourbesville • Jean Cunge Guy Caignaert Advances in Hydroinformatics. ISBN 978-981-10-7217-8. Springer Nature Singapore Pte Ltd. 2018* 20. *T.Kaletova, A.Arifjanov “Hydromechanika”, Nitra, 2019y, -160 pages.*

Example form for Module Handbook

Master's Degree Department

The direction of education: 70812306 – Water saving irrigation technologies

Module designation	*Engineering hydraulics*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*The doctor of philosophy in technical sciences. Otakhanov M. Y.*
Language	*Uzbek*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical training*
Workload (incl. contact hours, self-study hours)	*Total workload:120 hours* *Auditorium Hours:* *Lecture – 30 hours;* *Practical training - 30 hours* *Self-study – 60 hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Physics, Mathematics, Hydrometry, Terrestrial Hydrology, Theoretical Mechanics, Hydraulics*
Module objectives/intended learning outcomes	***To know and understand:*** *-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;* ***To be able to:*** *- 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:* ***To form competences in:*** *- 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.*
Content	*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.*
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	*Requirements for successfully passing the module* *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.*
Reading list	*А.М.Арифжанов. Гидравлика. Тошкент 2022.* *А.Л. Зуйков. Гидравлика. Том 2. Напорные и открытые потоки. Гидравлика сооружений. Москва 2017.* *И.В. Качанов. Гидравлика,гидрология,гидрометрия. Минск 2017.* *Н. В. Васильева. Гидравлика гидравлические расчеты открытых потоков и сооружений. Горки 2022.* *А.Арифжанов, Қ.Рахимов, А.Ходжиев Гидравлика. Тошкент. ТИМИ 2016й. – 189б.* *А.Арифжанов, Х.Файзиев, А.Тошхўжаев «Гидравлика», Тошкент, Фан ва технология, 2019й.-366 б.* *Латипов К.Ш., Арифжанов А.М., Файзиев Х «Гидравлика», Тошкент, ТАҚИ, 2015 й.-459 б.* *Melvyn Kay “Practical Hydraulics”, Taylor & Francis, 2008y.-253 pages.* *T.Kaletova, A.Arifjanov “Hydromechanika”, Nitra, 2019y, -160 pages.* *А.М.Арифжанов, П.Н.Гурина, Т.У.Апакхужаева “Гидравлика”, Тошкент, ТИҚХММИ, 2018г, -171 с.*

Example form for Module Handbook

Faculty of Ecology and Law
The direction of education: 60710400 – Ecology and Environmental protection (water sector option)

Module designation	*Hydraulics, GID 2104*
Semester(s) in which the module is taught	*3-semester*
Person responsible for the module	*Doctor of technical sciences, professor Arifjanov A.M., doctor of philosophy in technical sciences. Apakxujaeva T. U.*
Language	*Uzbek, Russian*
Relation to curriculum	*Main*
Teaching methods	*Lecture, practical training, seminar*
Workload (incl. contact hours, self-study hours)	*Total workload:150 hours* *Auditorium Hours:* *Lecture – 30 hours;* *Practical training - 10 hours* *Seminar -20 hours* *Self-study – 90 hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Physics, Mathematics, Terrestrial Hydrology, Theoretical Mechanics*
Module objectives/intended learning outcomes	***To know and understand:*** *- about the laws of liquids in equilibrium and motion and their application in solving technical problems, physical properties of liquids and their practical use, bodies in liquids and their interaction; to have an idea about hydraulic processes in environmental protection, hydraulic devices and hydraulic machines, agricultural and construction machines;* ***To be able to:*** *- determine hydrostatic pressure, hydrostatic pressure force, types of fluid movement, hydraulic elements of flow, laminar and turbulent flow patterns of fluid, laws of fluid movement in pipes and hydraulic machines and hydraulic parameters, determination of the effect of hydraulic processes in environmental protection, resistances and their determination know their styles and be able to use them;* ***To form competences in:*** *- methods of determining fluid consumption in simple and complex pipes, holes and tubes, calculation of hydrostatic pressure force affecting hydraulic machine elements, performing hydraulic calculation of pressure systems and hydraulic machines, performing hydraulic calculation of pipes and pipe systems in modern methods, impact of hydraulic processes on the environment must have secret assessment skills.*
Content	*It is to teach students the basics of hydraulics, the laws and processes of fluid in equilibrium, movement, and the hydraulic calculation of water management structures, and to develop the skills of practical application.*
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	*Requirements for successfully passing the module* *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.*
Reading list	*Зуйков А.Л. «Гидравлика», учебник, Москва, 2014 г., 517 с.* *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. -388б* *А.Арифжанов, Т.Апакхужаева. Гидравлика. -Ташкент. Файласуф, 2019б. – 224б.* *А.Арифжанов, Қ.Рахимов, А.Ходжиев Гидравлика. Тошкент. ТИМИ 2016й. – 189б.* *Арифжанов А.М. Гидравлика (гидростатика). Тошкент. ТИҚХММИ 2022й. – 137б.* *А.М. Арифжанов, Х.Файзиев, А.У.Тошхожаев Гидравлика. Тошкент. ТАҚИ 2019й. – 157б.* *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. – 121б.* *Philip M. Gerhart Andrew L. Gerhart John I. Hochstein Fundamentals of Fluid Mechanics. ISBN 978-1-119-08070-1 (Binder-Ready Version). USA 2016* *Philippe Gourbesville • Jean Cunge Guy Caignaert Advances in Hydroinformatics. ISBN 978-981-10-7217-8. Springer Nature Singapore Pte Ltd. 2018* *T.Kaletova, A.Arifjanov "Hydromechanika", Nitra, 2019y, -160 pages.*

Example form for Module Handbook

Faculty of Hydromelioration

The direction of education: 60812300 – Water Management and Land Reclamation

Module designation	*Hydraulics, GID 2110*
Semester(s) in which the module is taught	*6,7- semesters*
Person responsible for the module	*Doctor of technical sciences, professor Arifjanov A.M., doctor of philosophy in technical sciences. Otakhanov M. Y.*
Language	*Uzbek, Russian*
Relation to curriculum	*Main*
Teaching methods	*Lecture, practical training, laboratory training*
Workload (incl. contact hours, self-study hours)	*Total workload:300 hours* *Auditorium Hours:* *Lecture – 50 hours;* *Practical training - 60 hours* *Laboratory training -10 hours* *Self-study – 180 hours*
Credit points	*10 credits*
Required and recommended prerequisites for joining the module	*Physics, Mathematics, Hydrometry, Terrestrial Hydrology, Theoretical Mechanics*
Module objectives/intended learning outcomes	***To know and understand:*** *-about the laws of liquids in equilibrium and motion and their application in solving technical problems, physical properties of liquids and their practical use, bodies in liquids and their interaction; to have an idea about the application of hydraulic systems, hydraulic devices and hydraulic machines to agricultural reclamation;* ***To be able to:*** *- know hydrostatic pressure, hydrostatic pressure force, types of fluid movement, hydraulic elements of flow, laminar and turbulent flow procedures of fluid, laws of flow of fluid in pipes and hydraulic structures and determination of hydraulic parameters, hydraulic resistances and their determination, methods of hydraulic calculation of hydraulic structures, and be able to use them;* ***To form competences in:*** *-methods of determining fluid consumption in simple and complex pipes, holes and tubes, calculating the hydrostatic pressure force affecting hydraulic structures, performing hydraulic calculation of pressure systems and hydraulic structures, performing hydraulic calculation of pipes and hydraulic systems, acquiring skills in smooth and non-uniform movement of flow in open channels*
Content	*It is to teach students the basics of hydraulics, the laws and processes of fluid in equilibrium, movement, and the hydraulic calculation of water management structures, and to develop the skills of practical application.*
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	*Requirements for successfully passing the module* *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.*
Reading list	*Зуйков А.Л. «Гидравлика», учебник, Москва, 2014 г., 517 с.* *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. -388б* *А.Арифжанов, Т.Апакхужаева. Гидравлика. -Ташкент. Файласуф, 2019б. – 224б.* *А.Арифжанов, Қ.Рахимов, А.Ходжиев Гидравлика. Тошкент. ТИМИ 2016й. – 189б.* *Арифжанов А.М. Гидравлика (гидростатика). Тошкент. ТИҚХММИ 2022й. – 137б.* *А.М. Арифжанов, Х.Файзиев, А.У.Тошхожаев Гидравлика. Тошкент. ТАҚИ 2019й. – 157б.* *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. – 121б.* *Philip M. Gerhart Andrew L. Gerhart John I. Hochstein Fundamentals of Fluid Mechanics. ISBN 978-1-119-08070-1 (Binder-Ready Version). USA 2016* *Philippe Gourbesville • Jean Cunge Guy Caignaert Advances in Hydroinformatics. ISBN 978-981-10-7217-8. Springer Nature Singapore Pte Ltd. 2018* *T.Kaletova, A.Arifjanov "Hydromechanika", Nitra, 2019y, -160 pages.*

Example form for Module Handbook

Faculty of Ecology and Law
The direction of education: 60710400 – Ecology and Environmental protection (water sector option)

Module designation	*Modeling of ecological processes, IMI2105*
Semester(s) in which the module is taught	*4-semester*
Person responsible for the module	*Doctor of technical sciences, professor Arifjanov A.M., doctor of technical sciences. Samiyev L. N.*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical training*
Workload (incl. contact hours, self-study hours)	*Total workload:150 hours* *Auditorium Hours:* *Lecture – 30 hours;* *Practical training – 30 hours* *Self-study- 90 hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Physics, Mathematics, Theoretical Mechanics, Hydraulics, Ecology, Water Resources Management, Terrestrial Hydrology*
Module objectives/intended learning outcomes	***To know and understand:*** *-about the universe as a holistic, physical object and its evolution, about the theoretical unity of the Natural Sciences, its incompleteness and further development, about the principles of proportionality and conservation laws, about their changes in nature and over time, the peculiarities of objects in nature, the principles of the emergence and development of living systems, the ecological principles of Rational Use and conservation of nature, , the interconnectedness of biological components of ecosystems and abiotic and biological factors, methods of scientific research in the field of Ecology and the environment, treatment of natural and okava waters, assessment methods and an idea of the main environmental problems;* *- theoretical and experimental scientific research methods in the sciences of physics, chemistry, ecology, means and methods of measuring the environment and the harmful effects of human physical, chemical and biological agents, principles of substantiating complex measures to eliminate the negative consequences of the impact of water on the natural environment and agriculture, harmless and resource-efficient technologies in the use of nature;* ***To be able to:*** *-assess of the state of the environment and its components, water, soil, air, solving various environmental issues, finding solutions to improve the natural environment and objects, planning the use of nature, performing calculations of damages caused by the pollution of nature and the sharp reduction of its resources, physical and conducting scientific research on hydraulic models, using simple models of various reclamation systems in production conditions;* ***To form competences in:*** ***-****the skills to determine the need for natural resources and choose technologies for their use, choose technologies for the use of monitoring systems and techniques, justify and evaluate safe technologies for the use of natural resources in water and agriculture, monitor experimental and production systems and evaluate the obtained results.*

Content	*The purpose of the science of modeling processes in the ecosystem is to evaluate and predict the consequences of changes occurring in the ecosystem with the help of modeling. In order to achieve this goal, the subject fulfills the tasks of forming the independent calculation of various methods based on the teaching of ecological processes to the students.*
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	*Requirements for successfully passing the module* *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.*
Reading list	*Арифжанов А.М. Экологик жараёнларни моделлаштириш – Тошкент, 2011.-106 б.* *Ю.А.Афанасьев и др. Мониторинг и методы контроля окружающей среды – М.Издательство МНЭПУ, 2001 – 332 с.* *Арифжанов А.М. Гидравлик ва гидрологик жараёнларни моделлаштириш. Дарслик. Тошкент. – 2022й. 120б.* *Hubert Chanson (2004) Environmental Hydraulics of open channel flows (Butterworth –Heinemann: Oxfort, UK), 634pages.* *Латипов Қ.Ш., Арифжанов А.М., Файзиев Х., «Гидравлика», Тошкент. ТАҚИ, 2015й. -388б* *T.Kaletova, A.Arifjanov “Hydromechanika”, Nitra, 2019y, -160 pages.*

Faculty of Ecology and Law
The direction of education: 60610700 – Artificial intellegence

Module designation	*NT2204 Fuzzy sets*
Semester(s) in which the module is taught	*5- semester*
Person responsible for the module	*Doctor of technical sciences, professor Muhamediyeva Dilnoz Tulkunovna*
Language	*Uzbek*
Relation to curriculum	*Selection*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours: lecture - 20, practical lessons –40, self-learning – 60, hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Programming* *Calculus* *Database* *Data structure and algorithms* *Introduction to Software Engineering*
Module objectives/intended learning outcomes	***To know and understand:*** *- theory of fuzzy sets, fuzzy arithmetic, fuzzy logic, problem of clustering;* *- to have an idea about the problem of classification, the problem of regression, the problem of prediction and the method and algorithms of solving them;* *- the ability to process, analyze and use large volumes of data* ***To be able to:*** *- Data clustering methods based on the theory of fuzzy sets;* *-recognizing symbols to organize elements of intellectual analysis of data;* *- should have the skills to solve classification, clustering and forecasting problems* **To form competences in:** *- ability to use, summarize and analyze information, set goals and find ways to achieve them in the conditions of the formation and development of the information society* *- ability to apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, program and test programs,* *- ability to apply application domain analysis methods at the conceptual, logical, mathematical and algorithmic levels.*

Content	*Concept of fuzzy sets* *Operations on fuzzy sets* *Generalization principle* *Fuzzy numbers and operations on them* *Fuzzy numbers of L-R type and operations on them* *Comparing odd numbers* *Vague logic* *Fuzzy implications* *Fuzzy linguistic modeling* *Classification of intelligent systems*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *The maximum points to be summed will consist of the final exam (50%), the interval control (25%), the sum of the points to be separated. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Леоненков А.В. Нечёткое моделирование в среде MATLAB и fuzzyTECH. - СПб.: БХВ-Петербург, 2003. - 736 с.* *2. Яхъяева Г.Э. Нечеткие множества и нейронные сети : учебное пособие, 2-е изд., испр. - М.: Интернет-Ун-т Информ. Технологий: Бином. Лаборатория знаний, 2012, - 315с.* *3. Пегат А. Нечеткое моделирование и управление. - М.: Бином. Лаборатория знаний, 2009. - 798с.* *4. Усков А.А. Системы с нечеткими моделями объектов управления. Монография. – Смоленск: СФРУК, 2013. – 153 с.: ил.* *5. Еремин Н.А. Моделирование месторождений углеводородов методами нечеткой логики. – М.: Наука, 1994. – 462 с.* *6. Дьяконов В.П., Круглов В. Математические пакеты расширения MATLAB. - СПб: Питер, 2001. - 480 с.* *7. Начало работы с MatLab.* *8. Дьяконов В.П. MATLAB 7.*/R2006/R2007: Самоучитель. – М.: ДМК Пресс, 2008*

Faculty of Ecology and Law
The direction of education: 60610700 – Artificial intellegence

Module designation	*MIH2105 Intellectual analysis of data*
Semester(s) in which the module is taught	*4- semester*
Person responsible for the module	*Doctor of technical sciences, professor Muhamediyeva Dilnoz Tulkunovna*
Language	*Uzbek*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture - 20, practical lessons –40, self-learning – 90, hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Mathematics* *Data structure and algorithms* *Programming*
Module objectives/intended learning outcomes	***To know and understand:*** *- - to have an idea about the basic concepts, architecture, types, knowledge representation models, modern models, methods and tools of building intelligent data analysis systems;* *- to know and be able to use models, methods, algorithms and instrumental tools for forming, reflecting and processing knowledge in the subject area for the effective organization of computer-based teaching* ***To be able to:*** *to learn the models of knowledge representation and to solve the problems of the subject area with a complex structure from them; to recognize symbols to organize elements of intellectual analysis of information; based on the principles of expert systems, an expert should have the skills to design an expert system and solve practical problems by mastering genetic algorithms* **To form competences in:** *- ability to use, summarize and analyze information, set goals and find ways to achieve them in the conditions of the formation and development of the information society* *- ability to apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, program and test programs,* *- ability to apply application domain analysis methods at the conceptual, logical, mathematical and algorithmic levels.*

Content	*Introduction to intelligent data analysis. Problems of intelligent data analysis. The concept of intelligent data analysis. Intelligent data analysis tasks: classification, regression, clustering, etc.* *Introduction to intelligent data analysis. Methods of intellectual data analysis. The damn problem of dimensionality. Size reduction methods.* *Teaching and classification with a teacher. Classification algorithms. Split the data into training and test sets. Simple linear regression.* *Classification algorithms. Multivariate regression. Teaching problem and methods of struggle.* *Classification algorithms. Simple Bayes algorithm.* *Classification algorithms. Basis vector method (SVM).* *Unsupervised learning and clustering. Clustering: definition and principles. k-means method.* *Teaching without a teacher and clustering. EM algorithm.* *Associative analysis in datasets. Apriori algorithm.* *Decision making. Decision making algorithm.*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *The maximum points to be summed will consist of the final exam (50%), the interval control (25%), the sum of the points to be separated. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *Clark, Robert M. (2019). Intelligence Analysis: A Target-Centric Approach (6th ed.). Los Angeles: CQ Press.* 2. *Айзек М.П. Графика, формулы, анализ данных в Excel. Пошаговые примеры / М.П. Айзек. — СПб.: Наука и техника, 2019. — 384 с.* 3. *Бабенко М. А., Левин М. В. Введение в теорию алгоритмов и структур данных. — М.: МЦНМО. 2020. 144 с.* 4. *Бенгфорт, Б. Прикладной анализ текстовых данных на Python. Машинное обучение и создание приложений обработки естественного языка / Б. Бенгфорт. — СПб.: Питер, 2019. — 368 с.* 5. *Гашев С. Н. Математические методы в биологии: анализ биологических данных в системе Statistica. — М.: Юрайт. 2020. 208 с.* 6. *Козлов А.Ю. Статистический анализ данных в MS Excel: Учебное пособие / А.Ю. Козлов, В.С. Мхитарян, В.Ф. Шишов. — М.: Инфра-М, 2018. — 80 с.* 7. *Кравченко А. И. Анализ и обработка социологических данных. Учебник. — М.: КноРус. 2020. 498 с.* 8. *Кулаичев А.П. Методы и средства комплексного анализа данных: Учебное пособие / А.П. Кулаичев. — М.: Форум, 2018. — 160 с.* 9. *Макшанов А.В. Технологии интеллектуального анализа данных: Учебное пособие / А.В. Макшанов, А.Е. Журавлев. — СПб.: Лань, 2018. — 212 с.* 10. *Макшанов А.В. Технологии интеллектуального анализа данных. — М.: Лань. 2019. 212 с.* 11. *Миркин Б. Г. Введение в анализ данных. — М.: Юрайт. 2020. 175 с...*

Faculty of Ecology and Law
The direction of education: 60610700 – Artificial intelligence
60610600 - Software engineering

Module designation	*X1113 Calculus*
Semester(s) in which the module is taught	*1,2,3- semester*
Person responsible for the module	*Doctor of technical sciences, professor Mamatov Narzullo Solidjonovich*
Language	*Uzbek*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 390* *Contact hours: lecture - 60, practical lessons –100, self-learning – 230, hours*
Credit points	*5,5,3 credits*
Required and recommended prerequisites for joining the module	*Mathematics* *Mathematical modeling*
Module objectives/intended learning outcomes	***To know and understand:*** *-having a clear idea of the basics of calculus, basic concepts, and their practical application* ***To be able to:*** *-know the basics of calculus, sets, functions, limits, exponents and logarithms and the rules and concepts related to them and be able to use them in practice; the student should have the skills to analyze calculus problems and solve them independently* **To form competences in:** *- the ability to use, generalize and analyze information, set goals and find ways to achieve them in the conditions of the formation and development of the information society,* *- can use mathematical methods to solve practical problems, ability to think logically.*

Content	*Intoduction. The goals and tasks of subject. Concepts, definitions, goals and tasks.* *Sets. Operations on sets. Concept of set, types, union, intersection, some, symmetric some.* *Sequences. Concept, representation, properties, numerical sequence, time series, laws.* *Functions. The concept of function, methods of determination and range of values, inverse function.* *Limits. Definition, types, calculation rules, sequence and function limit, great limits, uncertainties and their opening.* *Inverse function. Continuity of function. Infinite sub-functions. Concept, existence condition, properties, Continuity of function. Infinite sub-functions.* *Exponent and logarithm. Concept, expression, properties.* *Derivative and differential differentiation rules. Concept of derivative and differential, one-sided derivative, higher order derivative, gradient, rules of differentiation* *Application of the derivative. Special derivative.* *Integral. Multiple integral. The concept is definite and indefinite integral, multiple, linear and spatial integral* *Integral application. Application in mathematics, physics and technology* *Movement along the line. Definition, properties, methods of expression, speed, distribution and division into sectors* *The fundamental theorem of calculus. History, geometric meaning, physical expression, parts and their proof* *Making graphs. Min max problems. Graph concept, asymptote, properties, inflection points, convexity and concavity, max-min problems.* *Complex numbers and operations on them. Complex number concept, representation, addition, subtraction, multiplication, root.* *Matrices and operations on them. Matrix concept, matrix multiplication, addition, inverse matrix, minors, solving matrix equations.* *Determinants. Concept, properties, calculation methods, criteria, Kramer's theorem, algorithm of elementary substitutions, substitutions.* *System of linear equations. System of homogeneous equations, solution methods, Kramer, Gauss and matrix methods, Kronecker-Capelli theorem, system of fundamental solutions.* *Vectors and operations on them. Concept of vector, operations on vectors, scalar, vector and mixed multiplication, properties of vectors, geometric and physical properties, representation* *Spread vectors by basis. Vector multiplication. Basis, expansion by basis, double vector multiplication, conditions of collinearity and orthogonality, length, angle between.* *Linear relationship of vectors. Linear dependence of vectors*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *The maximum points to be summed will consist of the final exam (50%), the interval control (25%), the sum of the points to be separated. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Marvin L. Bittinger, David J. Ellenbogen, Scott A. Surgent Calculus and its applications, Addison-Wesley, Boston 2012, 729 p.* *2. Gilbert Strang Calcus, Massachusetts institute of Technology, 2020, 617 p.* *3. John M. Erdman Exercises and Problems in Calculus, Portland State University, 2013, 374 p.* *4. Демидович Б.П. Сборник задач и упражнений по математическому анализу. М.: Наука, 1997* *5. Зимина О. В. и др. Высшая математика. Решебник. М., 2001.* *6. Проскуряков И. В. Сборник задач по линейной алгебре. СПб.: Лань, 2007.* *7. Самовол В. С. Основы математического анализа для политологов. Ч. I, II.* *8. Учебное пособие. М.: ГУ-ВШЭ, 2001.* *9. To'rayev X. Matematik mantiq va diskret matematika. T.: "O'qituvchi", 2003.* *10. Шипачев В.С.Высшая математика. - М.: Высшая школа, 2003. - 479 с.* *11. Черненко В. Д. Высшая математика в примерах и задачах : в 3-х т. Т. 3: учебное пособие - Политехника, 2011, 510 с.* *12. Лакерник А. Р. Высшая математика: учебное пособие -Логос, 2008, 271 с.* *13. Копылова, Н.Т. Математический анализ: учебно-методическое пособие /Н.Т.Копылова, М.Л. Поддубная, Е.Г. Свердлова. - 2-е изд., стер. - Москва; Берлин: Директ- Медиа, 2017. - 94 с.: URL: http://biblioclub.ru/index.php?page=book&id=4776282.* *14. Веретенников, В.Н. Высшая математика. Аналитическая геометрия: учебнометодическое пособие / В.Н. Веретенников. - Москва; Берлин: Директ-Медиа, 2018. - 193 с.: URL: http://biblioclub.ru/index.php?page=book&id=482727*

Faculty of Ecology and Law
The direction of education: 60610700 – Artificial intellegence

Name of the module/subject and password in the curriculum	*WD 2205- WEB programming*
Semester in which science is taught	*5th semester*
Responsible teacher of the module/subject F.I.Sh, degree and title	*Khamidov Elnur Khamidovich, assistant*
In which language to be taught	*Uzbek,*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Study load (by types of classroom hours and independent study hours)	*Total load: 150* *Auditorium Hours:* *Lecture - 20 hours;* *Practical training 40 hours* *Independent education 90 hours*
Number of credits allocated to science	*5 credits*
This is a list of prerequisite subjects	*Programming, Computer Organization, Discrete Structure, Database, Algorithm Design, Data Structure and Algorithms.*
Expected Learning Objectives	***Know and understand:*** *- to provide students with systematic knowledge of the main models, methods, tools and languages used in the development of WEB systems;* *- introducing students to the main methods of finding algorithmic solutions used in Internet systems;* *- development of analytical skills that allow students to consciously choose the methods, tools and languages being studied in solving problems in the problem area they specialize in.* ***Having the skills to:*** *- the theoretical foundations of web programming, their structure and the creation and processing of frontend (HTML5, CSS, JavaScript, BootStrap) and backend (PHP, MySQL, YII2 framework) technologies, the formation of the site architecture, the creation of the user interface and environment, and the teaching of its management and their apply* **Formation of competences:** *- justifying the choice of models and means of comparative analysis and knowledge representation;* *- building a model of a certain field of science using means of expressing the studied knowledge;* *- use of new methods of solving problems in the problem area;* *- do a comparative analysis and justify the choice of an artificial intelligence language to solve your problem.* *- use of learned methods and tools;* *- Using methods of finding solutions used on the WEB;* *- Application of new methods and approaches to solving traditional problems developed within the framework of site creation.*

The content of science	Introduction to WEB Programming. Basic concepts. Stages of WWW development. Introduction to HTML. The general structure of an HTML document and its main tags. HTML5 new standards and their functions. HTML document structure. Basic HTML tags, tag attributes. Tags for working with images and tables in HTML. Tags for working with links and lists. Working with HTML forms. New tags in HTML5. Tags for handling audio, video and graphics in HTML5. Selectors in CSS. CSS properties. Effects, transformation, animation in CSS3. *Difficulty level: 2* Introduction to CSS. Methods of linking to HTML. Types of selectors. CSS properties. CSS pagination. CSS3 Basics. Effects, transformation, animation. JavaScript functions and objects. Constant expressions in JavaScript. Working with JavaScript browser and web document object model (BOM, DOM). Using JavaScript APIs in HTML5. jQuery selectors, events. JQUERY UI. Animations in Angular JS. Working with form elements in Angular JS *Difficulty level: 3* Basics of JavaScript. Features of the JavaScript scripting language. JavaScript functions and objects. Connecting the Bootstrap4 framework, configuring base templates. Working with strings, arrays and files in PHP. Working with forms in PHP. Working with PHPa COOKIE, SESSION Working with database in PHP. Database manipulation (CRUD) operations in PHP. Application of AJAX technology in PHP. How to implement authorization and authentication in PHP. *Difficulty level: 4* Working with the JavaScript browser and the Web Document Object Model. Introduction to JQUERY. Basic concepts. Using AngularJs on Backend side of website development. Development of web applications in YII2 framework. Managing "Model, View, Controller". Working with database in YII2 framework. Ways to manage user roles in the YII2 framework. *Difficulty level: 5*
Exams and assessment format	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Students who will study and take the exam	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*

Literature	1. Dronov AND PHP, MySQL, HTML5 and CSS 3. Razrabotka sovremennyx dinamicheskix Web-saytov (pdf+epub) – SPb.: BXB Petersburg 2016. 688 str . 2. Martishin SA Baz y from y x Prakticheskoye apply SUBD SQL – i NoSQL – type for projection informationn y x system : ucheb . Posobiye // - Moscow: ID "FORUM" - INFRA-M, 2019, – 368 p. 3. Rahul Batra . SQL Primer An Accelerated introduction to SQL Basics./ / Gurgaon, India. 2019. -P 194. 4. Chris Aquino, Todd Gandy HTML and CSS, JavaScript. Izd. Peter. 2018 Str. 512 5. Nazirova E.Sh., Sadullaeva Sh.A., Abidova Sh.B., Tajiev JA Creating web applications / T.: "Alokachi", 2018, 356 p. 6. Niederst , Jennifer. Learning Web Design. A Beginner's Guide to HTML, Graphics, and Beyond / J. Niederst . - Beijing; Mumbai: O'reilly , SPD, 2006. - 454 p. 7. Bayross , Ivan . Web Enabled Commercial Applications Development Using Java 2. New Delhi : BPB Publications , 2013. - 646 p. 8. Bayross , Ivan . Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP: - New Delhi : BPB Publications, 2013. - 539 p.

Faculty of Ecology and Law
The direction of education: 60610700 – Artificial intellegence

Name of the module/subject and password in the curriculum	*WDK 2 1 05- Introduction to WEB programming*
Semester in which science is taught	*5th semester*
Responsible teacher of the module/subject F.I.Sh, degree and title	*Khamidov Elnur Khamidovich, assistant*
In which language to be taught	*Uzbek,*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Study load (by types of classroom hours and independent study hours)	*Total load: 150* *Auditorium Hours:* *Lecture - 20 hours;* *Practical training 40 hours* *Independent education 90 hours*
Number of credits allocated to science	*5 credits*
This is a list of prerequisite subjects	*Programming, Computer Organization, Discrete Structure, Database, Algorithm Design, Data Structure and Algorithms.*
Expected Learning Objectives	***Know and understand:*** *- to provide students with systematic knowledge of the main models, methods, tools and languages used in the development of WEB systems;* *- introducing students to the main methods of finding algorithmic solutions used in Internet systems;* *- development of analytical skills that allow students to consciously choose the methods, tools and languages being studied in solving problems in the problem area they specialize in.* ***Having the skills to:*** *- the theoretical foundations of web programming, their structure and the creation and processing of frontend (HTML5, CSS, JavaScript, BootStrap) and backend (PHP, MySQL, YII2 framework) technologies, the formation of the site architecture, the creation of the user interface and environment, and the teaching of its management and their apply* **Formation of competences:** *- justifying the choice of models and means of comparative analysis and knowledge representation;* *- building a model of a certain field of science using means of expressing the studied knowledge;* *- use of new methods of solving problems in the problem area;* *- do a comparative analysis and justify the choice of an artificial intelligence language to solve your problem.* *- use of learned methods and tools;* *- Using methods of finding solutions used on the WEB;* *- Application of new methods and approaches to solving traditional problems developed within the framework of site creation.*

The content of science	Introduction to WEB Programming. Basic concepts. Stages of WWW development. Introduction to HTML. The general structure of an HTML document and its main tags. HTML5 new standards and their functions. HTML document structure. Basic HTML tags, tag attributes. Tags for working with images and tables in HTML. Tags for working with links and lists. Working with HTML forms. New tags in HTML5. Tags for handling audio, video and graphics in HTML5. Selectors in CSS. CSS properties. Effects, transformation, animation in CSS3. *Difficulty level: 2* Introduction to CSS. Methods of linking to HTML. Types of selectors. CSS properties. CSS pagination. CSS3 Basics. Effects, transformation, animation. JavaScript functions and objects. Constant expressions in JavaScript. Working with JavaScript browser and web document object model (BOM, DOM). Using JavaScript APIs in HTML5. jQuery selectors, events. JQUERY UI. Animations in Angular JS. Working with form elements in Angular JS *Difficulty level: 3* Basics of JavaScript. Features of the JavaScript scripting language. JavaScript functions and objects. Connecting the Bootstrap4 framework, configuring base templates. Working with strings, arrays and files in PHP. Working with forms in PHP. Working with PHPa COOKIE, SESSION Working with database in PHP. Database manipulation (CRUD) operations in PHP. Application of AJAX technology in PHP. How to implement authorization and authentication in PHP. *Difficulty level: 4* Working with the JavaScript browser and the Web Document Object Model. Introduction to JQUERY. Basic concepts. Using AngularJs on Backend side of website development. Development of web applications in YII2 framework. Managing "Model, View, Controller". Working with database in YII2 framework. Ways to manage user roles in the YII2 framework. *Difficulty level: 5*
Exams and assessment format	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Students who will study and take the exam	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*

Literature	1. Dronov AND PHP, MySQL, HTML5 and CSS 3. Razrabotka sovremennyx dinamicheskix Web-saytov (pdf+epub) – SPb.: BXB Petersburg 2016. 688 str . 2. Martishin SA Baz y from y x Prakticheskoye apply SUBD SQL – i NoSQL – type for projection informationn y x system : ucheb . Posobiye // - Moscow: ID "FORUM" - INFRA-M, 2019, – 368 p. 3. Rahul Batra . SQL Primer An Accelerated introduction to SQL Basics./ / Gurgaon, India. 2019. -P 194. 4. Chris Aquino, Todd Gandy HTML and CSS, JavaScript. Izd. Peter. 2018 Str. 512 5. Nazirova E.Sh., Sadullaeva Sh.A., Abidova Sh.B., Tajiev JA Creating web applications / T.: "Alokachi", 2018, 356 p. 6. Niederst , Jennifer. Learning Web Design. A Beginner's Guide to HTML, Graphics, and Beyond / J. Niederst . - Beijing; Mumbai: O'reilly , SPD, 2006. - 454 p. 7. Bayross , Ivan . Web Enabled Commercial Applications Development Using Java 2. New Delhi : BPB Publications , 2013. - 646 p. 8. Bayross , Ivan . Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP: - New Delhi : BPB Publications, 2013. - 539 p.

Faculty of Ecology and Law
The direction of education: 60610700 – Artificial intellegence

Name of the module/subject and password in the curriculum	*WSYA 2205- Basics of website creation*
Semester in which science is taught	*5th semester*
Responsible teacher of the module/subject F.I.Sh, degree and title	*Khamidov Elnur Khamidovich, assistant*
In which language to be taught	*Uzbek,*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Study load (by types of classroom hours and independent study hours)	*Total load: 150* *Auditorium Hours:* *Lecture - 20 hours;* *Practical training 40 hours* *Independent education 90 hours*
Number of credits allocated to science	*5 credits*
This is a list of prerequisite subjects	*Programming, Computer Organization, Discrete Structure, Database, Algorithm Design, Data Structure and Algorithms.*

Expected Learning Objectives	***Know and understand:*** *- to provide students with systematic knowledge of the main models, methods, tools and languages used in the development of WEB systems;* *- introducing students to the main methods of finding algorithmic solutions used in Internet systems;* *- development of analytical skills that allow students to consciously choose the methods, tools and languages being studied in solving problems in the problem area they specialize in.* ***Having the skills to:*** *- the theoretical foundations of web programming, their structure and the creation and processing of frontend (HTML5, CSS, JavaScript, BootStrap) and backend (PHP, MySQL, YII2 framework) technologies, the formation of the site architecture, the creation of the user interface and environment, and the teaching of its management and their apply* **Formation of competences:** *- justifying the choice of models and means of comparative analysis and knowledge representation;* *- building a model of a certain field of science using means of expressing the studied knowledge;* *- use of new methods of solving problems in the problem area;* *- do a comparative analysis and justify the choice of an artificial intelligence language to solve your problem.* *- use of learned methods and tools;* *- Using methods of finding solutions used on the WEB;* *- Application of new methods and approaches to solving traditional problems developed within the framework of site creation.*

The content of science	Introduction to WEB Programming. Basic concepts. Stages of WWW development. Introduction to HTML. The general structure of an HTML document and its main tags. HTML5 new standards and their functions. HTML document structure. Basic HTML tags, tag attributes. Tags for working with images and tables in HTML. Tags for working with links and lists. Working with HTML forms. New tags in HTML5. Tags for handling audio, video and graphics in HTML5. Selectors in CSS. CSS properties. Effects, transformation, animation in CSS3. *Difficulty level: 2* Introduction to CSS. Methods of linking to HTML. Types of selectors. CSS properties. CSS pagination. CSS3 Basics. Effects, transformation, animation. JavaScript functions and objects. Constant expressions in JavaScript. Working with JavaScript browser and web document object model (BOM, DOM). Using JavaScript APIs in HTML5. jQuery selectors, events. JQUERY UI. Animations in Angular JS. Working with form elements in Angular JS *Difficulty level: 3* Basics of JavaScript. Features of the JavaScript scripting language. JavaScript functions and objects. Connecting the Bootstrap4 framework, configuring base templates. Working with strings, arrays and files in PHP. Working with forms in PHP. Working with PHPa COOKIE, SESSION Working with database in PHP. Database manipulation (CRUD) operations in PHP. Application of AJAX technology in PHP. How to implement authorization and authentication in PHP. *Difficulty level: 4* Working with the JavaScript browser and the Web Document Object Model. Introduction to JQUERY. Basic concepts. Using AngularJs on Backend side of website development. Development of web applications in YII2 framework. Managing "Model, View, Controller". Working with database in YII2 framework. Ways to manage user roles in the YII2 framework. *Difficulty level: 5*
Exams and assessment format	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Students who will study and take the exam	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*

Literature	1. Dronov AND PHP, MySQL, HTML5 and CSS 3. Razrabotka sovremennyx dinamicheskix Web-saytov (pdf+epub) – SPb.: BXB Petersburg 2016. 688 str . 2. Martishin SA Baz y from y x Prakticheskoye apply SUBD SQL – i NoSQL – type for projection informationn y x system : ucheb . Posobiye // - Moscow: ID "FORUM" - INFRA-M, 2019, – 368 p. 3. Rahul Batra . SQL Primer An Accelerated introduction to SQL Basics./ / Gurgaon, India. 2019. -P 194. 4. Chris Aquino, Todd Gandy HTML and CSS, JavaScript. Izd. Peter. 2018 Str. 512 5. Nazirova E.Sh., Sadullaeva Sh.A., Abidova Sh.B., Tajiev JA Creating web applications / T.: "Alokachi", 2018, 356 p. 6. Niederst , Jennifer. Learning Web Design. A Beginner's Guide to HTML, Graphics, and Beyond / J. Niederst . - Beijing; Mumbai: O'reilly , SPD, 2006. - 454 p. 7. Bayross , Ivan . Web Enabled Commercial Applications Development Using Java 2. New Delhi : BPB Publications , 2013. - 646 p. 8. Bayross , Ivan . Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP: - New Delhi : BPB Publications, 2013. - 539 p.

Faculty of Ecology and Law
The direction of education: 60610700 – Artificial intellegence

Name of the module/subject and password in the curriculum	*AL 2105-Algorithm design*
Semester in which science is taught	*5th semester*
Responsible teacher of the module/subject F.I.Sh, degree and title	*Khamidov Elnur Khamidovich, assistant*
In which language to be taught	*Uzbek,*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Study load (by types of classroom hours and independent study hours)	*Total load: 150* *Auditorium Hours:* *Lecture - 20 hours;* *Practical training 40 hours* *Independent education 90 hours*
Number of credits allocated to science	*5 credits*
This is a list of prerequisite subjects	*Calculus, Programming, Computer organization, Discrete structure, Database.*
Expected Learning Objectives	***Know and understand:*** *- to provide students with systematic knowledge of the main models, methods, tools and languages used in the development of algorithmic systems;* *- introducing students to the basic methods of finding algorithmic solutions used in software systems;* *- development of analytical skills that allow students to consciously choose the methods, tools and languages being studied in solving problems in the problem area they specialize in.* ***Having the skills to:*** *- Familiarity with fundamental algorithms and their analysis* *- To acquire skills about data processing, sorting and search algorithms* *- Solving problems about complex data structures, algorithms for working with graphs, multi-disciplinary algorithms* **Formation of competences:** *- justifying the choice of models and means of comparative analysis and knowledge representation;* *- building a model of a certain field of science using means of expressing the studied knowledge;* *- use of new methods of solving problems in the problem area;* *- do a comparative analysis and justify the choice of an artificial intelligence language to solve your problem.* *- use of learned methods and tools;* *- Using methods of finding solutions used in the algorithm;* *- Application of new methods and approaches to solving traditional problems developed within the algorithm.*

The content of science	Introduction to Algorithm Design Analysis of algorithms Recursive algorithms Steps to fully build the algorithm Algorithm description methods Establishing a performance evaluation program Creating a program on logarithms and their application Creating a program for recursive algorithms *Difficulty level: 2* Optimization of sorting algorithms Optimization of search algorithms Creating a program for recursive algorithms Creating a program for sorting algorithms Creating a program for sorting algorithms Creating a program for search algorithms Creating a program for search algorithms *Difficulty level: 3* Graph algorithms Greedy algorithms A connection in a graph Implement a list in a graph Creating a program for short path search algorithms Creating a program for short path search algorithms Optimal Caching: An Algorithm and Programming for the Complex Permutation Problem *Difficulty level: 4* Divide and conquer algorithm Dynamic programming Information compression. Hoffman code Algorithm and program creation for unification of sorting Search for the nearest point Weight interval planning: Algorithm and programming of recursive processes Principles of Dynamic Programming: Memorable Algorithms and Programming *Difficulty level : 5*
Exams and assessment format	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Students who will study and take the exam	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Literature	1. Joh Kleinberg, Eva Tardos - "Algorithm design", Cornell University, 2006, 854 p., 1 edition. 2. Steven S. Skiena - "The Algorithm Design Manual" Springer, New York, USA, 2008, 739 p. 3. Адитья Бхаргава – «Грокаем алгоритмы» «Питер» Санкт-Петербургю 2017 г. 290 с.

Name of the module/subject and password in the curriculum	*KXA 2 1 05-Basics of cyber security*
Semester in which science is taught	*4th semester*
Responsible teacher of the module/subject F.I.Sh, degree and title	*Khamidov Elnur Khamidovich, assistant* *Fayziev Vokhid Orzumurad ogli assistant*
In which language to be taught	*Uzbek,*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Study load (by types of classroom hours and independent study hours)	*Total load: 150* *Auditorium Hours:* *Lecture - 20 hours;* *Practical training 40 hours* *Independent education 90 hours*
Number of credits allocated to science	*5 credits*
This is a list of prerequisite subjects	*Calculus, Programming, Computer organization, Discrete structure.*
Expected Learning Objectives	***Know and understand:*** *- to provide students with systematic knowledge of the main models, methods, tools and languages used in the development of cyber security systems;* *- introduce students to the main methods of finding solutions used in cyber security systems;* *- development of analytical skills that allow students to consciously choose the methods, tools and languages being studied in solving problems in the problem area they specialize in.* ***Having the skills to:*** *- Basic models and means of knowledge representation.* *- Organization of testing and certification of information security tools;* *- Creation of departmental and network coordination structures for information protection.* **Formation of competences:** *- justifying the choice of models and means of comparative analysis and knowledge representation;* *- building a model of a certain field of science using means of expressing the studied knowledge;* *- use of new methods of solving problems in the problem area;* *- do a comparative analysis and justify the choice of an artificial intelligence language to solve your problem.* *- use of learned methods and tools;* *- Using methods of finding solutions used in cyber security;* *- Application of new methods and approaches to solving traditional problems developed in the framework of cyber security.*

The content of science	Sign in . Cryptography main concepts and history Symmetrical cryptosystems . Asymmetric cryptosystems . Classic encryption algorithms work order study _ _ Classic encryption algorithms work order study _ _ Operation systems and practical in programs to the password based on authentication mechanism installation _ and to adjust learning *Difficulty level: 2* Authentication . Passwords storage and to passwords will be attacks . Computer networks basics . Cryptographic protect _ Cryptographic protect _ To the data relatively permissions makes sense management _ *Difficulty level: 3* Network safety weaknesses and to them has been threats . Wireless networks safety . To the data relatively permissions makes sense management _ Reserved copy and recovery policy . Reserved copy and recovery policy . Personal on computers to viruses against protection installation . _ *Difficulty level: 4* A pest software supplies Safe network Create and setup Secure Wi-Fi wireless network _ build _ Social to engineering against protection _ *Difficulty level: 5*
Exams and assessment format	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Students who will study and take the exam	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*

Literature	1. *Cybersecurity Curricula 2017 – Curriculum Guidelines for Post-Secondary Degree Programs in Cybersecurity (ACM, IEEE-CS, AIS SIGSEC, IFIP WG 11.8) (Crosscutting concepts).* 2. *ISO/IEC 27000 Information technology. Security techniques. Information security management systems. Overview and vocabulary.* 3. *Ganiyev SK, Karimov MM, Tashev KA "Information security", "Science and technology" publishing house, Tashkent 2016* 4. *Mark Stamp. Information security. Principles and Practice. Second edition. A John Wiley& Sons, Inc., publication. Printed in the United States of America. 2011 584 p.* 5. *Shangin V.F. "Informatsionnaya bezopasnost computer system and networks", Uchebnoe posobie. Izdatelsky Dom "FORUM" INFRA-M.:2018 g*

Faculty of Ecology and Law

The direction of education: 60610700 – Artificial intellegence

Module designation	*MBA2110 Artificial intellegence*
Semester(s) in which the module is taught	*4,5- semester*
Person responsible for the module	*PhD Toirov Shuhkrat*
Language	*Uzbek*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 300* *Contact hours: lecture - 40, practical lessons – 80, self-learning – 180, hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Informatics and information technologies, calculus*
Module objectives/intended learning outcomes	***To know and understand:*** *- The imagination, knowledge, skills and qualifications of students in science are given to the following students. Student:* *- to have an idea about dividing the subject area and creating its model;* *- methods of describing the subject field model;* *- choosing database management systems and knowing and being able to use them to create databases on computers.* ***To be able to:*** *- selection of database management systems to solve the problem;* *- database design based on the developed model;* *- to maintain and create a database, to have the skills to create information search programs in the database;* *- analysis of existing information systems and database characteristics;* *- to be able to determine the optimal parameters of information systems working with a database;* *- it is important to have the skills of designing databases of distributed systems..* **To form competences in:** *- ability to use, summarize and analyze information, set goals and find ways to achieve them in the conditions of the formation and development of the information society* *- ability to apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, program and test programs,* *- ability to apply application domain analysis methods at the conceptual, logical, mathematical and algorithmic levels.*

Content	*Introduction. Purpose, tasks and basic concepts of the database. The concept of information systems. Database. Basic concepts and definitions.Database architecture and three-tier architecture. Classification of the database into classes. Physical and logical description of data. Three-level database architecture. Organizers of the database management system. Level of difficulty: 2* *Database models and entity-relational model. Concept of information model. Hierarchical (family tree) information model. Network information model. Essential communication model.Relational model and relations in the database. Basic concepts of the relational model. Using tables to describe data. Relationships in MB. Level of difficulty: 2* *Elements of relational algebra and relational calculus. Relational algebra languages. Relational computing languages. Basic concepts of the relational data model. Database planning, design and administration. Database planning. Database design. Database management. Level of difficulty: 3* *Database normalization and 1NF, 2NF, 3NF and Codd normal forms. The concept of functional connection. 1 NF, 2NF, 3NF, Boyce-Kod normal forms. Writing SQL language and SQL operators. Internal languages of SQL. SQL data categories. SQL SELECT operators and their parameters. Level of difficulty: 3* *Create simple queries for data manipulation. Creating complex requests. Using group functions in queries. Simple requests. Data description using SQL. Description of data. Making changes to objects. Actions on objects. Level of difficulty: 3.* *Procedures and standard functions in SQL. Mathematical standard functions. Standard functions. Create and process requests in transaction management. Create imaginations. Transaction management. Distributed data processing. Distributed data processing. Modern distributed database architecture. Level of difficulty: 4.* *Distributed database and the Internet. Web environment database application platform. Creating a database for WEB applications. Distributed database and the Internet. Requirements and methods for the integration of distributed MB and WEB environments. Level of difficulty: 4.* *Administration and security of the resource base. Database administration. Ensuring data security.Use of ODBC and various programs to organize access to the database. The main components in programming are ADOConnection and ADO Query components. Level of difficulty: 5.*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *The maximum points to be summed will consist of the final exam (50%), the interval control (25%), the sum of the points to be separated. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Mirziyoev Sh.M. O'zbekiston Respublikasi prezidentining "O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'g'risida"gi farmoni 2017 yil.* *2. Mirziyoev Sh.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. Toshkent. «O'zbekiston», NMIU, 2017. – 488 b.* *3. Т.А.Хўжакулов. Маълумотлар базаси. Дарслик. Т.:TATU, 2022. - 260 б.* *4. Т.А.Хужакулов. База данных. Учебник. Т.:TATU, 2022. - 260 с.* *5. Xo'jaqulov T.A. Usmonov J.T. Ma'lumotlar bazasini boshqarish tizimi// o'quv qo'llanma. - T.: Aloqachi, 2018. - 96 b.* *6. Xo'jaqulov T. A., Usmonov J. T. Ma'lumotlar bazasini boshqarish tizimi fanidan laboratoriya ishlarini bajarish bo'yicha uslubiy ko'rsatma - T. : TATU, 2016. - 55 b.* *7. Т.А.Хужакулов. Система управления базами данных. Учебник. Т.:TATU, 2020. - 280 с.* *8. Голешина Л. Базы данных: учеб. Пособие // – 4-э изд., перераб. и доп. – М.: ФОРУМ: ИНФРА-М, 2018. – 400 с.* *9. Мартишин С.А. Базы данных. Практическое применение СУБД SQL – NoSQL – типа для проектирования информатсионных систем: учеб. Пособие // - Москва: ИД «ФОРУМ» - ИНФРА-М, 2019, – 368 с.* *10. Rahul Batra. SQL Primer An Accelerated introduction to SQL Basics.// Gurgaon, India. 2019. –p 194.* *11. Роликов А.М. Безопасност ORACLE глазами аудитории: Нападение и защита. –Москва. 2017. –336 с.* *12. Эric Redmond, Jim R. Wilson. A Guide to Modern Databases and the NoSQL Movement. USA, 2015. – p. 347.* *13. Elmasri, R., S. B. Navathe: Fundamentals of Database Systems (5th Ed.)// Addison Wesley, 2015. – 671p.*

Name of the module/subject and password in the curriculum	*SI3205-Artificial Intelligence*

Semester in which science is taught	*5th semester*
Responsible teacher of the module/subject F.I.Sh, degree and title	*Bekmuratov Dilshod Kasimovich, associate professor, PhD*
In which language to be taught	*Uzbek, Russian*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, laboratory training, independent education*
Study load (by types of classroom hours and independent study hours)	*Total load: 150* *Auditorium Hours:* *Lecture - 20 hours;* *Practical training 20 hours* *Laboratory training 20 hours* *Independent education 90 hours*
Number of credits allocated to science	*5 credits*
This is a list of prerequisite subjects	*Linear Algebra, Programming, Data Structures and Algorithms, Algorithm Design*
Expected Learning Objectives	***Know and understand:*** *- to provide students with systematic knowledge of the main models, methods, tools and languages used in the development of artificial intelligence systems;* *- introduce students to the main methods of finding solutions used in artificial intelligence systems;* *- development of analytical skills that allow students to consciously choose the methods, tools and languages being studied in solving problems in the problem area they specialize in.* ***Having the skills to:*** *- basic models and means of knowledge representation.* *- the syntax and semantics of the main artificial intelligence languages and the basic programming techniques in them.* *- new methods for solving traditional problems developed in the framework of the constraint programming paradigm, as well as evolutionary and neural network approaches.* **Formation of competences:** *- justifying the choice of models and means of comparative analysis and knowledge representation;* *- building a model of a certain field of science using means of expressing the studied knowledge;* *- use of new methods of solving problems in the problem area;* *- do a comparative analysis and justify the choice of an artificial intelligence language to solve your problem.* *- use of learned methods and tools;* *- use of methods of finding solutions used in artificial intelligence systems; - use of new methods and approaches in solving traditional problems developed within the framework of artificial intelligence.*

The content of science	*Artificial intelligence concept, problems and solutions. Basic concepts and definitions, directions. The purpose, task and subject of the course. Stages of development of artificial intelligence. Practical systems of artificial intelligence. The main directions of artificial intelligence modeling. Neurobionic direction. Information direction. Examples of different classification of artificial intelligence systems.* *Difficulty level: 2* *Knowledge and its organization. Information and knowledge . Main concepts . Types of knowledge and classification of knowledge. Of knowledge features . Levels of knowledge understanding. Methods and aspects of knowledge acquisition. Knowledge extraction methods from the database. Knowledge representation models. Knowledge representation models. Formal models of knowledge representation. Informal (semantic) models of knowledge representation.* *Difficulty level: 2* *Expert systems and their organization technologies. Historical information. Features and benefits of expert systems. Types of knowledge in expert systems. Composition of expert systems. Aspects of knowledge organization problems. Work with the knowledge base. Stages of creating an expert system. Classification of expert systems. Difficulties in creating expert systems. Examples of expert systems* .**Error! Reference source not found.** *Difficulty level: 2* *Neural networks. Neuron and its models. Single and multilayer perceptrons. Backpropagation Algorithm.* *Difficulty level: 3* *Training neural networks. Methods of solving industry problems with the help of artificial intelligence. A recurrent method of training neural networks. Learning algorithms. Artificial Intelligence Tools: Software Tools and Programming Languages. Biometric systems. Robotics in the field. Smart programming. Python programming language .* *Difficulty level: 4* *Application of artificial intelligence in the field. Field issues. Methods of solving industry problems with the help of artificial intelligence. Artificial intelligence systems in the field. Software in the field Prospects for the development of artificial intelligence. Artificial intelligence. Current and Future Fields of Artificial Intelligence. Emotional calculations. Artificial intelligence evolution and development prospects. Artificial intelligence. Fields of application and issues. Models and methods of solving field problems. Classification, design, planning, monitoring and control of artificial intelligence. Emotional calculations.* *Difficulty level: 5*

Exams and assessment format	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Students who will study and take the exam	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Literature	1. Stuart Russell and Peter Norvig, (2002), Artificial Intelligence: A Modern Approach//Prentice Hall, Chapter 1-27, page 1-1057. 2. Nilsson, NJ (2009). The Quest for Artificial Intelligence: A History of Ideas and Achievements . Cambridge University Press, Cambridge, England. 3. Bashmakov A.I., Bashmakov I.A. Intellectual information technology: Ucheb. posobie. - M.: Izd-vo MGTU im. N.E. Baumana, 2005. - 304 p. - (Informatics and technical university). ISBN 5-7038-2544-X. 4. Iskusstvennyy intellect: v 3 kn. / pod ed. D. A. Popova. -M.: Radioi svyaz, 1990. -Kn. 1: Systemic public and expert system. -461 p. 5. Pavlov S. N. Sistemy iskusstvennogo intellecta: ucheb.posobie. V 2-x chastyakh. / S. N. Pavlov. - Tomsk: El Content, 2011. - Ch. 1. - 176 c. ISBN 978-5-4332-0013-5. 6. Bekmuratov QA Artificial intelligence and neural networks. Study guide for graduate students of a higher educational institution. - Samarkand.: "Published in the editorial-publishing department of SamDU, 2021.-352 p. UDK : 004.8. ISBN 978-9943-7276-0-1. 7. Bekmuratov QA Artificial intelligence. Study guide. -T.: "Alokachi, 2019.-312 p. UOK:004.8. KBK:32.973.2. ISBN 978-9943-5804-8-0.

Module Handbook

Specialty of Smart measuring systems and devices

The direction of education: 70810502 – Smart (intelligent) measuring systems and devices

Module designation	IO‘T6103- Intelligent measurement systems
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	*Associate professor, PhD Djalilov Anvar*
Language	*Uzbek*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, practical lesson, lab works, independent education*
Workload (incl. contact hours, self-study hours)	*Total workload: 90 hours* *Contact hours:* *lecture – 20 hours* *practical lessons – 15 hours* *laboratory – 10 soat* *ndependent education – 45 hours*
Credit points	*3 credits*
Required and recommended prerequisites for joining the module	Theoretical foundations of electrical engineering, electrical measurement and instruments, informatics

Module objectives/intended learning outcomes	***To know and understand:*** *- Must have knowledge of reading electrical schematics and measuring basic electrical and non-electrical quantities;* *- Must have knowledge of knowledge base model description, expert systems management mechanism, intelligent measurement systems;* *- Knowledge of solving specific problems in the field of artificial intelligence in algorithmic or logic programming languages is a must;* *- It is necessary to have knowledge on generalization of lectures and practical training.* ***To be able to:*** *- He knows how to make schemes and drawings in accordance with State standards;* *- Knows and can apply the analysis of the elements of intelligent measurement systems;* *- He knows how to create computer programs by choosing the necessary instrumental tools based on the essence of the problem being solved;* *- He knows how to apply the basic rules of choosing technical equipment for working mechanisms.* ***To form competences in:*** *- He knows how to process experimental results based on theoretical knowledge;* *- He knows how to analyze and can apply it;* *- knows how to independently solve short- and medium-term cases;* *- He knows how to apply the basic rules of choosing technical equipment for working mechanisms.*

Content	***Introduction to the science of "intelligent measurement systems"***. *The purpose and tasks of science. Basic concepts and definitions. Artificial intelligence systems.* *Level of difficulty:2* ***The history of the development of artificial intelligence systems and its main features.*** *History of development of artificial intelligence systems. The main features of artificial intelligence and the issues it solves.* *Level of difficulty:2* ***The structure of expert systems.*** *Expert systems are one of the areas of artificial intelligence. Composition of expert systems. Stages of creating an expert system.* *Level of difficulty:2* ***Knowledge base and knowledge structuring in expert systems.*** *Knowledge base. Structuring knowledge. Expert system classification.* *Level of difficulty:3* ***Knowledge presentation models.*** *Knowledge presentation models. Semantic networks. Frame models and control in them. Representation of knowledge using logical predicates. Product (Production) systems. Formal models of knowledge representation.* *Level of difficulty:4* ***Productive and logical systems of knowledge presentation.*** *Production systems. Logical approach. Depicting simple facts in logical systems. Examples of applying logic to describe knowledge.* *Level of difficulty:4* ***Presentation of knowledge and its levels.*** *Demonstration of knowledge in expert systems. Display levels and levels of detail.* *Level of difficulty:4* ***Presentation of knowledge in working memory and database.*** *Organization of knowledge in working systems. Organization of knowledge in the database. Methods of searching for solutions in expert systems.* *Level of difficulty:5* ***Correct and reverse chains of thinking in the presentation of knowledge.*** *The correct chain of thought is the working mechanism. The mechanism of the reverse chain of thinking. Developing a knowledge base: a solution tree. Level of difficulty:4* ***Work with the knowledge base in the presentation of knowledge.*** *Transforming a decision tree into a rule. Work with the knowledge base. Algorithm of the general operation of systems implementing the reverse chain of thinking. Level of difficulty:4*
Exams and assessment formats	*Full mastery of theoretical and practical concepts related to science, ability to accurately reflect the results of analysis, independently observe the studied processes and complete the tasks given in the interim control forms, final control test, written or oral taking the exam in a good way.*

Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. N. R. Yusupbekov. Intellectual systems of management and decision-making / N. R. Yusupbekov. - Tashkent: «National encyclopedia of Uzbekistan» State Scientific Publishing House, 2015. p. 572.* *2. Ernest O.D. Measurement Systems: Application and design. McGraw - Hill. Higher Education.- New York, 2004 – pp.1078.* *3. Romanov, V.P. Intellectual information systems and economics: Teaching aids.-.: "Examen", 2003. - 496 p.* *4. Gavrilova, T.A., Khoroshevsky, S.V. Bazy znaniy intellectualnykh system: uchebnoe posobie. - SPb.: Peter, 2006. -382 p.* *5. Gaskarov, D.V. Intellectual information systems: Textbook for universities. - M.: VSh, 2005. – 432 p.* *6. Paklin, N.B., Oreshkov, V.I. Business analytics: ot dannyx k znaniyam: Ucheb. posobie .2-e izd. - SPb.: Peter, 2010. - 704 p. , pr. CD.* *7. Telnov, Yu.F. Intellectual information systems and economics. Uchebnoe posobie. -M.: Syntheg. 2001. – 316 p.* *8. Gavrilov A.V. Sistemy iskusstvennogo intellecta. Ch.1. - Uchebnoe posobie, Novosibirsk: NGTU, 2000.* *9. Jackson P. Introduction to expert systems. - M., SpB., Kiev: "Williams", 2001.* *10. Gavrilov A.V. Laboratory practice on neural networks. Ch.1. - Methodicheskoe posobie. /, NGTU, 1999.*

Module Handbook

Faculty of Energy

The direction of education: 5313200(60722900) - Bachelor of Science in Electrical and Electronic Engineering Technology and Marketing,

Module designation	*TES4108* *Engineering experiments and experimental statistics in technical expertise*
Semester(s) in which the module is taught	*10- semester*
Person responsible for the module	*Denmukhammadiev Aktam, associate professor., candidate of technical sciences, PhD*
Language	*Uzbek*
Relation to curriculum	*Basic*
Teaching methods	*Lecture, practical lesson, lab works, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 240* *Contact hours: lecture – 60, practical lessons – 20, laboratory – 40, self-learning – 120, hours*
Credit points	*8 credits*
Required and recommended prerequisites for joining the module	*Mathematics, physics, Circuit theory, Electrical measurements and instruments*

Module objectives/intended learning outcomes	***To know and understand:*** *- method of scientific research in engineering fields, in particular in the field of technical expertise and marketing of equipment and technologies (electrical and electronic equipment),* *- the use of statistical analysis in the fields of mechanical engineering, in particular in the field of technical expertise and marketing of equipment and technologies (electrical and electronic equipment),* *- Basics of statistical analysis in Excel,* *- use the law of normal distribution, the standard deviation method when analyzing variables of the general population and sample,* ***To be able to:*** *- development of a research method and statistical analysis system for intelligent measuring systems;* *- evaluate information obtained in modern measuring systems;* *- processing of received data in modern measuring systems;* *- use of information transmission and reflection in modern measuring systems;* **To form competences in:** *- ability to conduct scientific research and statistical analysis in intelligent measuring systems and devices,* *- methods of publishing scientific articles based on the results obtained, knowledge of patent searches,* *- Statistical analysis in the Excel package program;* *- making appropriate solutions to technical problems.*

Content:	**Lectures** ***Applications of engineering experiments and measurements and its current status.*** *Purpose and overview, quantities (dimensions) and units, basic terms of metrology.* *Level of difficulty: 3* ***General descriptions of measurement systems.*** *Generalized measurement systems. Measurement reliability, guarantee of measurement results. Dynamic measurements. Guarantee of measurement results.* ***Fundamentals of electrical signal measurement systems. Electrical signal measurement systems, signal processing. Signal shapers. Recording and indicating devices. Indicating and recording devices. Transmission of electrical signals between components.*** *Level of difficulty: 3* ***Computerized data collection systems.*** *Computer systems for data collection. Enter. Computer systems. Data collection components. Configuration of the data collection system. Software for data collection systems. Level of difficulty: 3* ***Discretization and analysis of time-varying signals.*** *Discrete sampling. Discretization and analysis of time-varying signals. Discrete representation theorem. The sampling rate theorem. Sampling rate selection and filtering. Spectral analysis of time-varying signals. Spectral analysis using Fourier substitution. Level of difficulty: 4* ***Experimental statistics. Statistical analysis of experimental data.*** *Basic concepts and definitions. Probabilities. Parameter estimation. Criterion for rejecting suspicious data points. Level of difficulty: 4* ***Correlation of experimental data. Linear functions of random variables.*** *Application of computer programs for statistical analysis of experimental data.* ***The measure of central tendency.*** *Dispersion. Probability. The probability distribution function. Selection. Polygon, histogram, change interval.Level of difficulty: 4* ***Correlation of experimental data.*** *Correlation coefficient. The method of least squares. Linear regression. Complex structural and multinomial regression. Level of difficulty: 4* ***Experimental uncertainty analysis.*** *Experimental uncertainty analysis. General information about the distribution*

	Elementary sources of error. Uncertainty in the final results of multivariate experiments. Uncertainty in the final results of single-measurement experiments. Analysis of random and systematic types of error. A step-by-step procedure for uncertainty analysis. Interpretation of manufacturer uncertainty data. Applying Uncertainty Analysis to Digital Data Acquisition Systems. *Level of difficulty: 5* ***Correspondence of experimental data to mathematical expression. Least squares method of experimental data processing. A straight line fit to the experimental data. Interpolation methods. Linear interpolation, Newton's interpolation expression, finite difference method, Lagrange polynomial (interpolation polynomial). Approximation methods.*** *Level of difficulty: 5* ***Measurement of mechanical values of a solid body. Deformation measurement, displacement measurement. Linear velocity measurement, angular velocity measurement. Measurement of acceleration and vibration. Measuring force. Measuring the torque of a rotating shaft. Pressure gauge. Temperature measurement. Measuring humidity. Measurement of liquid flow, liquid velocity, liquid level and combustion pollutants. Liquid flow measurement systems. Fluid speed measurement systems. Liquid level measurement. Measurement of air pollutants. Best practices for planning and documenting experiments. Overview of the pilot program. General work in test projects. Conclusions.*** *Level of difficulty: 5*

	Practical training *1. General characteristics of measurement systems and their calculation. Level of difficulty: 3* *2. 2.Calculation of electrical signal measurement systems and their technical characteristics.Level of difficulty: 3* *3.Computerized data collection* *solving systems and examples related to them.* *Level of difficulty: 3* *4.Solving examples of methods of discretization and analysis of time-varying signals.* *Level of difficulty: 4* *5. Solving examples of statistical analysis of experimental data. Level of difficulty: 4* *6. Solving examples of mathematical variance interval estimation. Level of difficulty: 4* *7. Solving examples of the method of least squares.* *Level of difficulty: 5* *8. Solve examples using linear regression.Level of difficulty: 5* *9. Solve examples using multistructural and multinomial regression. Level of difficulty: 5* *10. Solving examples of using computer programs in statistical analysis of experimental data. Level of difficulty: 5*

	Laboratory work *1. Collection of statistical data. Using statistical functions in MS EXCEL spreadsheet. Level of difficulty: 3* *2. Summary and grouping of statistical data. Level of difficulty: 3* *3. Statistical data processing based on MS EXCEL application Level of difficulty: 3* *4. Calculation of average values, absolute and relative indicators of character change. Level of difficulty: 3* *5. One-factor correlation and regression analysis. Level of difficulty: 4* *6. Multivariate Correlation and Regression Analysis in the Statistica Package. Level of difficulty: 4* *7. Identification and characterization of the main development trend in dynamic series. Level of difficulty: 5* *8. Use of indices in economic and statistical research. Level of difficulty: 5* *9. Statistical processing of temperature measurement results. Level of difficulty: 5* *10. Statistical processing of moisture measurement results. Level of difficulty: 5*
	Independent education and self-learning *1. Performing a calculation and graphic work on the topic Variation series and their properties (CGW-1). Level of difficulty: 3* *2. Performing calculation and graphic work on the topic Elements of regression analysis (CGW-2). Level of difficulty: 4* *3. Using the EXCEL Solver function to find the optimal solution. Performing calculation and graphic work on the topic of experiment planning (CGW-3). Level of difficulty: 5*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *Wheeler, Anthony J. Introduction to engineering experimentation.©2004 by Pearson Education, Inc. Upper Saddle River, New Jersey 07458, - 452 p.* 2. *A.M. Denmukhammadiev, A.U. Djalilov. Engineering experiments and experimental statistics. Study guide. 24.09.2021, TIQXMMI printing house, 222 p.* 3. *A. Radjabov. Fundamentals of scientific research. Textbook-Tashkent, TashDAU printing house, 2010.* 4. *R.J. Baratov, A.M. Denmukhammadiev. Electrical measurements and instruments. Study guide. Registration number No. 359-359. Tashkent, TIQXMMI, 2020, 157 p.*

Faculty of Energy

The direction of education: 60722900 - Bachelor of Science in Electrical and Electronic Engineering Technology and Marketing,
60711500 - Bachelor of Science in Mechatronics and Robotics Engineering

Module designation	*MEMS4206 – Microelectromechanical systems design*
Semester(s) in which the module is taught	*Semester 11*
Person responsible for the module	*Associate professor, Rustam J.Baratov*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical session and self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 180* *Contact hours: lecture - 30, practical sessons – 60, self-learning – 90 hours*
Credit points	*6 credits*
Required and recommended prerequisites for joining the module	*C++programming, Mathematics, Physics, Circuit theory, Instrumentation and Measurement, Microelectronics, Digital Basics and Digital systems*
Module objectives/intended learning outcomes	***To know and understand:*** *- modern MEMS basics and their design and manufacturing technologies;* *- materials used in the manufacture of microsensors and micromachines;* *- fundamentals of MEMS design, software tools for their 3D design;* *- MEMS packaging technologies, system integration and packaging, assembly of details;* *- to know how to design micromachines and microsensors.* ***To be able to:*** *- to be able to choose MEMS elements and their materials;* *- to know the fundamentals of operation of microsensors and micromachines and to be able to read circuits;* *- able to design microelectromechanical systems in three-dimensional format (3D);* *- to be able to use modern software tools used in design and to create and develop three-dimensional projects of various MEMS.* ***To form competences in:*** *-to be able to design MEMS, use the most advanced software packages used in their design, apply them to agriculture and water recourses areas, perform competent calculations, modeling, design and experimental research.*

Content	*Basic concepts of microelectromechanical systems, the basis of their design and the subject and tasks of science. The development of this science in the countries of the world and in Uzbekistan. Structure and content of science. The objectives of science. Level of difficulty: 2* *Manufacturing of MEMS and basic materials used in it. Photolithography method. Materials for microsensors and micromachines. Printed circuit boards and tape (film) materials. Chemical treatment of the plate surface (travlenie). Connecting and welding elements. Laser processing of the plate surface. Level of difficulty: 2* *Microsensors used in MEMS. Microsensors and actuators controlling mechanical quantities. Radiation microsensors and optical performance mechanisms. Thermal microsensors and executive mechanisms. Level of difficulty: 2* *Magnetic sensors and actuators. Integrated circuits and their design. Chemical and biological sensors and actuators. Level of difficulty: 3* *Software tools for designing. 3D design software tools. SolidWorks 2015 – 2018 package program. SolidWorks 2018 package user interface. Level of difficulty:3* *SolidWorks 2018 tools. Command panel. Creating a workspace in SolidWorks 2018. Graphics and drawing functions in SolidWorks 2018. Level of difficulty:3* *Drawing of geometric figures in SolidWorks 2018. Making circular shapes and converting them into 3D. Square geometric figures and their transformation into 3D. Sizing figures. Level of difficulty:3* *Working with metals in SolidWorks 2018. Designing and sizing metal sheets. Development of projects of metal bending and bending and welding processes. Preparation of complex details in SolidWorks 2018. Level of difficulty:3* *ISIS Proteus 8 package program. ISIS Proteus 8 package overview. ISIS Proteus 8 user interface, instruments and command panel. Level of difficulty:4* *Using the ISIS Proteus 8 package program library. Selection of elements for the electric circuit, selection of the source type, their connection and preparation of the project. Level of difficulty:4* *Using the ISIS Proteus 8 package program library. Naming elements and choosing sizes. Edit objects. Printing projects. Level of difficulty:4* *Preparation of printed circuit boards in the ISIS Proteus 8 package program. Design of printed circuit boards. The main editing window necessary for designing boards and working in it. Level of difficulty:5* *Preparation of printed circuit boards in the ISIS Proteus 8 package program. Adjust the screen. Placing components and connecting them. Installation of electrical circuits. Level of difficulty:5* *Interactive simulation in ISIS Proteus 8 package. Level of difficulty:5*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1.An Introduction to MEMS. PRIME Faraday Partnership, Loughborough, UK, 2002. – 56 pages.* *2.Olivier Sentieys. VLSI Integrated Circuits and Systems: Principles and Design. INRIA/IRISA ENSSAT, France, 2015. – 141 pages.* *3.David C. Planchard. SOLIDWORKS 2018 Tutorial. A Step by Step Project Based Approach Utilizing 3D Solid Modeling, SDC Publications, USA, 2018. – 93 pages.* *4.Proteus design suite. Labcenter electronics, USA, 2019. – 252 pages.* *5.Intelligent Schematic Input System (ISIS). Labcenter Electronics, User Manual, 2002. – 477 pages.* *6.Engineering Design with SOLIDWORKS 2016. A Step-by-Step Project Based Approach Utilizing 3D Solid Modeling. SDC Publications, USA, 2016. – 93 pages.*

Faculty of Energy

The direction of education: 60722900 - Bachelor of Science in Electrical and Electronic Engineering Technology and Marketing,
60711500 - Bachelor of Science in Mechatronics and Robotics Engineering

Module designation	*BS4206 – Embedded systems*
Semester(s) in which the module is taught	*Semester 11*
Person responsible for the module	*Associate professor, Rustam J.Baratov*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical session, laboratory and self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 180* *Contact hours: lecture - 30, practical sessons – 20,laboratory-40, self-learning – 90 hours*
Credit points	*6 credits*
Required and recommended prerequisites for joining the module	*C++programming, Mathematics, Physics, Circuit theory, Instrumentation and Measurement, Microelectronics, Digital Basics and Digital systems*
Module objectives/intended learning outcomes	***To know and understand:*** *- architecture of modern integrated systems, microprocessors and microcontrollers;* *- to be able to use the elements, programs and other tools;* *- to be able to use them in the control of the relevant object and large systems;* *- it is necessary to know how to use microcontrollers, their structure, programming tools, timers, registers and other external devices in industrial processes.* ***To be able to:*** *- be able to use microprocessors and microcontrollers in measuring and controlling the parameters of relevant production facilities;* *- to be able to identify the inaccuracies in them, to be able to configure and use their modern software tools.* ***To form competences in:*** *- to be able to analyze, read, conduct research on the schemes of microprocessors and microcontrollers, be able to evaluate their technical characteristics, make reasonable conclusions about their use in the field, identify existing defects in them.*

Content	*Basic information about Embedded systems. Microcomputers and embedded systems. Basic information about microcontrollers and microprocessors and memory devices. Level of difficulty:2* *Structure and technical characteristics of microcontrollers and their types. Memory device. Central processor. ROMs and RAMs. Input - output ports. Level of difficulty:2* *Structure and technical characteristics of microprocessors and their types. Architecture of microprocessors. Level of difficulty:3* *Basic peripherals. Input - output ports. Input - output ports. Parallel ports. Sources. Pulse generator. Level of difficulty:3* *Programming tools.Machine language. Assembly language. Compilers. C programming language. Basic functions of the C programming language. Structure of the C programming language. Level of difficulty:4* *Embedded system of measurement and control of water level and water flows. Water level and flow measurement methods and their combined systems. Level of difficulty:4* *Temperature and humidity sensors developed on the basis of embedded systems. Embedded systems of temperature and humidity measurement and control. Level of difficulty:4* *Stepper motors and embedded system of their control. Stepper motors and their types, principle of operation and schemes. Combined schemes of remote control of stepper motors. Level of difficulty:5* *Embedded sound control system and its elements. Sound sensors. Sound control of technical means. Level of difficulty:5* *Embedded system of control through photo sensors. Photo sensors. Control of technical equipment through photo sensors. Embedded system of control through photo sensors and its elements. Level of difficulty:5*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1.Steve Heath. Embedded Systems Design, Newnes. Burlington, MA, USA, 2003. - 451 pages.* *2.Tim Wilmshurst. Designing Embedded Systems with PIC Microcontrollers. Principles and Applications, Newnes, Burlington, MA, USA, 2010. - 651 pages.* *3.Byte Craft Limited. First Steps with Embedded Systems. Waterloo, Ontario Canada. 2002.- 228 pages.* *4.Dogan Ibrahim. Advanced PIC microcontroller projects in C. Newnes. Burlington, MA, USA, 2008. – 560 pages.* *5.David C. Kuncicky. Introduction to Excel. Motana State Universit, Bozeman, MT, USA. 2012 – 337 pages.*

The direction of education: 70810502 - Intelligent measuring systems and tools (by networks)

Module designation	OYP5104- Object-oriented programming languages
Semester(s) in which the module is taught	*1- semester*
Person responsible for the module	*Associate professor, Akbar U Gapparov*
Language	*Uzbek, Russian*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, practical lesson, laboratory, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours: lecture -30, practical lessons – 15, laboratory – 15, self-learning – 60, hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Mathematics, Physics.*
Module objectives/intended learning outcomes	***To know and understand:*** *- Methods of creating complex algorithms;* *- knowledge of the modern state of object-oriented programming;* *- to know the principles of object-oriented programming, the structure and features of object-oriented programming languages;* *- operating codes of modern microprocessors and microcontrollers;* *- Understanding of programming. Computer programs. The process of creating a program. Machine language. Steps of solving problems on a computer;* ***To be able to:*** *- theoretical foundations of object-oriented programming principles and languages, as well as data types, standard functions, object-oriented programming languages;* *- know how to make corrections and adjustments to program tools and be able to use them;* *- being able to read operating codes of modern microprocessors and microcontrollers;* *- being able to write programs for microprocessors and microcontrollers in the C++ programming language;* *- To be able to read electrical circuits of microprocessors and microcontrollers and write programs for them, load them into memory, check and conduct experiments;* **To form competences in:** *- knowledge of object-oriented programming languages, virtual functions and abstract classes, dynamic class templates;* *- methods of creating effective programs for solving practical problems in object-oriented programming languages and applying them to educational processes;* *- Making corrections and corrections to programs, checking;* *- Ability to conduct experiments, analyze and make appropriate decisions on technical problems;* *- ability to conduct tests and experiments, analyze and make appropriate decisions on technical problems*

Content	*Fundamentals of object-oriented programming languages and data types, standard functions, object-oriented programming languages, virtual functions and abstract classes, dynamic class patterns, skill development Difficulty level: 2* *Understanding of programming. Computer programs. The process of creating a program. Machine language. Steps of solving problems on a computer. Code Blocks integrated environment. Using the Code Blocks integrated environment and its main functions. Introduction to the C++ programming language. C++ programming language structure. Difficulty level: 2* *Declaring variables in the C++ programming language. They don't change. Special characters. Operations on variables. Data types in C++. Boolean data types. Char class data types. A whole host of other data types. Real numbers are other data types.Constants and literals in C++.Difficulty level: 3* *Fundamentals of object-oriented programming. Program structure in C++. Types of data. Difficulty level:3* *Types of complex data. Introduction of new data types. Structures and aggregates. Structures and arrays. Structures and functions. Level of difficulty: 4* *Object-oriented programming languages. Object-oriented programming. Concept of class and object. Inheritance, encapsulation, polymorphism. Object-oriented programming systems and languages. Difficulty level: 5* *Systematic OOPL C++, Builder 6, Delphi, Visual Basic programming systems. These are powerful visual object-oriented programming framework capabilities. The scope of solving their own problems. Popularization of object-oriented programming languages: C++, Visual C++, Visual Basic, Java. Methods of describing program objects and their properties (attributes) and classes combining them in object-oriented programming. Object-oriented programming capabilities of the S++ programming language. Difficulty level: 5*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. John R. Hubbard. Programming with C++. New York, US, Shaum's Outlines, 2000. – 422 pages.* *2. Baratov R.J. Algorithms and programming. Study guide. Tashkent, TIQXMMI, 2018. - 302 p.* *3. R. Laforet. Object-oriented programming in C++. St. Petersburg, Peter, 2004. – 922 pp.* *4. Ivanova G.S. Object-oriented programming. Textbook. MSTU named after Bauman. 320 pages, 2003* *5. Ya. Yorbekov, R.A. Yusupov. Educational-methodological complex of object-oriented programming languages. Samarkand, TATU Samarkand branch, 2010. - 116 pages.*

Faculty of Energy

The direction of education: 60722900 - Bachelor of Science in Electrical and Electronic Engineering Technology and Marketing,
60711500 - Bachelor of Science in Mechatronics and Robotics Engineering

Module designation	*EMMT2203-Electromagnetic fields and waves*
Semester(s) in which the module is taught	*5- semester*
Person responsible for the module	*Associate professor, Akbar U Gapparov*
Language	*Uzbek, Russian*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 90* *Contact hours: lecture -20, practical lessons – 20, self-learning – 60, hours*
Credit points	*3 credits*
Required and recommended prerequisites for joining the module	*Mathematics, Physics.*
Module objectives/intended learning outcomes	***To know and understand:*** *- description of electromagnetic fields;* *- theoretical foundations of electromagnetic fields and waves;* *- electromagnetic field energy and strength;* *- methods of calculating field strength, radiation power, resistance;* *- Study of vector characteristics of electromagnetic fields;* ***To be able to:*** *- to have theoretical and practical knowledge of physical processes occurring in electric and magnetic circuits;* *- formation of skills of calculation of electric, electromagnetic field and waves of electrotechnical and electronic devices, equipment and appliances;* *- to be able to analyze the theoretical foundations of electromagnetic fields and waves, electromagnetic field vectors, Maxwell's equations, environmental parameters, boundary conditions, electromagnetic field energy and power;;* **To form competences in:** *- Know and apply analysis;* *- Ability to conduct experiments, analyze and make appropriate decisions on technical problems;* *- ability to conduct tests and experiments, analyze and make appropriate decisions on technical problems*

Content	*"Electromagnetic field is a special appearance of matter, external electromagnetic field is a distinctive feature, electromagnetic wave of electromagnetic field, vector characteristics of electromagnetic fields Level of difficulty: 2* *Electromagnetic field energy. Basic hypotheses, energy balance, Poiting's theorem for instantaneous values of EMM vectors. Difficulty level: 2* *Electromagnetic waves, Electromagnetic wave bands, International classification of electromagnetic waves by frequency. Level of difficulty: 2* *Electrodynamic parameters of the environment, classification of environments, "Electromagnetic field is a special appearance of matter, external electromagnetic field is a special feature, electromagnetic wave of electromagnetic field, vector characteristics of electromagnetic fields Difficulty level: 3* *Electromagnetic field energy. Basic hypotheses, energy balance, Poiting's theorem for instantaneous values of EMM vectors. Difficulty level: 3* *Electromagnetic waves, Electromagnetic wave bands, International classification of electromagnetic waves by frequency. Level of difficulty: 4* *vectors are connected with divergence and rotor operators. Difficulty level: 4* *Optical broadband transmission lines* *Advantages, types of light conductors, properties of transverse field structures in optical fibers Level of difficulty: 5* *Theoretical calculations of light conductors. Studying the properties of transverse field structures in optical fibers Difficulty level: 5*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Gabzalilov G.F., Kan V.S. Electromagnetic fields and waves. Lecture notes. Tashkent: TATU, 2008.* *2. Vitevsky V.B., Pavlovskaya E.A. Electromagnetic waves in communication technology. - M: Radio and Communications, 1995.-121 p.* *3. Vitevsky V.B., Maslov O.N., Pavlovskaya E.A. Collection of exercises and problems in electrodynamic disciplines. - M.: Radio and communication, 1996.* *4. Nikolsky V.V., Nikolskaya T.N. Electrodynamics and radio wave propagation. - M.: Nauka, 1989. - 554 p.*

Faculty of Energy

The direction of education: 60722900 - Bachelor of Science in Electrical and Electronic Engineering Technology and Marketing,
60711500 - Bachelor of Science in Mechatronics and Robotics Engineering

Module designation	*ENA 2115- Circuit Theory*
Semester(s) in which the module is taught	*5,6 and 7 - semesters*
Person responsible for the module	*Associate professor, Rustam J.Baratov*
Language	*Uzbek, Russian*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, practical session,laboratory and self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 480* *Contact hours: lecture - 60, practical sessons – 80, laboratory – 60, self-learning – 280 hours*
Credit points	*15 credits*
Required and recommended prerequisites for joining the module	*Algorithms and programming, Mathematics, Physics.*
Module objectives/intended learning outcomes	***To know and understand:*** *- to be able to correctly imagine the elements of electrical circuits and the physical phenomena occurring in them, as well as their fundamental laws;* *- to measure the energy characteristics of the elements of electrical circuits and the voltage and current in the elements;* *- to be able to analytically express the forms of signals in electric circuits and the reaction of circuits consisting of RLC elements in steady and dynamic modes;* *- methods of analysis and synthesis of direct and alternative current circuits;* *- to be able to use the Fourier and Laplace substitution methods to solve the differential equations of the electric circuit in the dynamic mode from the mathematics course.* ***To be able to:*** *- use the basic laws of electromagnetism and methods of calculating to calculate electric and magnetic circuits;* *-competently calculate electric and magnetic circuits of electrotechnical devices, equipment and appliances;* *- use fundamental laws in the analysis and synthesis of electrical circuits;* *- use computer technologies in the analysis and synthesis of electrical circuits.* **To form competences in:** *- be able to analyze electric and magnetic circuits of electrotechnical and electronic devices, equipment and appliances, be able to conduct competent calculations, modeling, design and experimental research.*

Content	*Basic definitions and Law's. Electric charge. Coulomb's law. Electric force and work. Potential. Potential difference. Electric current. Power. Energy. Resistance. Resistivity. Power conservation.* *Ohm's law. Kirchoff's law (KVL and KCL). Branch. Node. Mesh. Circuit elements in series. Circuit elements in parallel. Equivalent circuits. Redrawing Circuits in equivalent form.Network Theorems and Circuit analysis techniques. The independent voltage and current sources. The linear resistor and Ohm's law. Single -Loop and single - Node pair circuits. Resistors in series and parallel. Circuit solution by circuit reduction. Voltage and current division. Level of difficulty: 2* *Additional circuit analyses techniques. The principle of superposition. The Thevenin equivalent circuit. The branch current method. The Node- voltage method. Circuits containing voltage sources. The – Mesh current method. The energy storage elements. The capacitor. Capacitors in series and in parallel. Continuity of capacitor voltages. The inductor. Inductors in in series and in parallel. Continuity of inductor current. Level of difficulty: 2* *Mutual inductance. The ideal transformers. Response of the energy storage elements to DC sources. The differential equations of a Circuit. The Thevenin equivalent circuit. The Norton equivalent circuit. Maximum power transfer. Millman theorem. Sinusoidal excitation of Circuits. The sinusoidal source. Representation of General Waveforms via the Fourier Series. Response of Circuits to Sinusoidal sources. Complex Numbers, Complex Algebra, and Euler's Identity. The phasor (Frequency - Domain) circuit. Representation of sinusoidal sources with Euler's Identity. The phasor circuit. Applications of Resistive – circuit Analysis Techniques in the Phasor Circuit. Circuits containing more than one sinusoidal source. Sources of the same frequency. Power. Power relations for the Elements. Power factor. Maximum Power transfer. Superposition of Average Power. Effective (RMS) values of Periodic Waveforms. Phasor Diagrams. Frequency Response of Circuits. Transfer functions. Resonance. Elementary electrical Filters. Level of difficulty: 3* *Mutual Inductance and Transformers. Mutual Inductance. Coupling coefficient. Analysis of coupling coils. Dot Rule. Energy in a pair of coupled coils.Conductively Coupled Equivalent circuits. Linear transformer. Ideal Transformer. Autotransformer. Reflected impedance.* *Two – port networks. Terminals and ports. Z – parameters. T – equivalent reciprocal networks. Y – parameters. Application of Terminal Characteristics. Conversion Between Z and Y – parameters. h – parameters. g –parameters. Transmission parameters. Interconnecting two – port networks. Level of difficulty: 3* *Frequency response, filters and resonance. Frequency response. High – Pass and Low – Pass networks. Half – Power frequencies. The frequency response and Network Functions. Ideal and Practical filters. Passive and active filters. Bandpass filters and resonance. Natural frequency and damping ratio. Quality factor. RLC series circuits (series resonance). RLC parallel circuit (parallel resonance). The Operational Amplifier (Op-Amp). The actual Op – amp versus the ideal Op- amp. The inverting Amplifier. Negative Feedback and saturation. Other useful Op- amp circuits. The noninverting Amplifier. The Difference Amplifier. The Op - amp Differentiator and Integrator. The summer. The buffer. The voltage follower. The comparator. Level of difficulty: 3* *Polyphase circuits. Two phase system. Three phase system. Wye and Delta Systems. Phasor voltages. Balanced Delta – Connected Loads. Balanced Four- wire, Wye – connected loads. Equivalent Y and Δ - connections. Unbalanced Delta – Connected Load. Unbalanced Wye – Connected Load. Three phase Power. Power measurement and the Two- Wattmeter methods. Unbalanced Three phase system. Problem solving. Rotational magnetic field and principles of electric machines Rotational magnetic field and principles of electric machines. Level of difficulty:4*

	None periodic linear circuits. Coefficients characterizing the form of none periodic functions. Calculation of none periodic linear electric circuits. Level of difficulty:5 *General excitation of circuits. Capacitor discharge in a resistor. Establishing a DC voltage across a capacitor. The RL – circuit. The RC – circuit. Response of First – Order circuits to a Pulse. Impulse response od RC and RL circuits. High order and second order circuits. The series RLC circuit. The parallel circuit. The Laplace transform. Important properties of the Laplace transform. The Laplace transforms of the R, L and C elements. Level of difficulty:5* *None linear DC circuits. Series and parallel none linear DC circuits. Level of difficulty:5* *Electric circuits with distributed parameters. Waste-free transmission line. A line with intact transmission capability. Lossless transmission line modes. Standing waves. A line with intact transmission capability. Magnetic circuits and transformers. Basic Laws for calculating magnetic field and circuits. Magnetic circuit analysis. Losses in magnetic circuits. Application of magnetic circuits. Rotating magnetic fields and it's applications. AC machines. Level of difficulty:5*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Clayton R.Paul. Fundamentals of Elecrtic Circuit Analysis. John Wiley & Sons. Inc., New York, 2001. – 519 pages.* *2. Mahmood Nahvi, Joseph Edminister. Electric Circuits. Schaum's outlines series. McGRAW – HILL, USA, 2003 – 461 pages.* *3. Amirov S.F, Jabbarov N.G, Yakubov M.S. Circuit Theory. Part 1,2,3. – T.: TRTEI, 2007.- 430 pages. (Cyrillic and Latin).* *4. Bessonov L.A. Circuit Theory. (Part 1,2 and 3).- M.: Visshaya shkola, 2006.* *5.Demirchiyan K.S, Neyman L.R, Korovkin N.V and others. Circuit Theory. Part 1,2.3 – Piter, Rossia., 2006.- 415 pages.* *6.Pryanishnikov V.A. Problems collection on Circuit theory with solutions, Sankt Pitersburg. - Korona, 2001.* *7.Korovkin N.V, Semina E.E, Chechurin V.A. Problems collection on Circuit theory. - Sankt Pitersburg. Piter,2004.- 511 pages.* *8.Zeveke G.V and others.- M.: Circuit Theory. Energoatomizdat,1989. – 525pages.* *9.Shebes M.R.Circuit Theory.Problemas and Exercises. - M.: Visshaya shkola,1990.- 300 pages.*

Faculty of Electrical Energy

The direction of education is “Electrical and electronic engineering”.

5313200 - Technical expertise and marketing of equipment and technologies.

Module designation	HIGH VOLTAGE ELECTRONICS
Semester(s) in which the module is taught	7- semester
Person responsible for the module	Associate professor, Adilov Yalkin Tuchievich
Language	Uzbek, Russian,English
Relation to curriculum	Compulsory
Teaching methods	Lecture, practical and laboratory lessons, self-learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: lecture - 30, practical lessons – 30,laboratory lessons-30 self-learning – 60, hours
Credit points	9 credits
Required and recommended prerequisites for joining the module	Electrical engineering, electrical measurements, power electronics , renewable energy, Hibrid Power Systems

Module objectives/intended learning outcomes	**To know and understand:** -Energy system of the Republic of Uzbekistan, its features related to the inclusion of renewable energy sources; Hybrid Energy System (HES) concept -Composition of hybrid energy sources - renewable energy sources photovoltaic and wind power generation with direct (DC) and alternating current (AC) power supplies. - The role and place of power electronics circuits in a Hybrid Energy System; power electronics circuit; the role and significance of semiconductor circuits for controlling the operation of the power system. - Application of power diodes; diode design, basic operating parameters and switching circuits; the role of diode circuits in control systems - Power thyristors; The principle of operation of a thyristor and the control circuit for its operation; Regulation of the amplitude voltage value using a control electrode. - Thyristor operation control circuits (SIFU) Determination of 2 moments in time by the value of the control voltage Uu at the PWM input **To be able to:** **-** Transistors. Types of transistors, operating principle and circuit of starting transistors; power transistors - IGBT - operating principle and device; MOSFET transistor - operating principle and device. -Use of power electronic Circuits are considered that make it possible to control the process of energy transfer, where the conversion of voltages and currents should be achieved with the greatest energy efficiency and high power density. - Power converters such as inverters use rectified direct current which can be used to convert to alternating current. This is the operating principle of an inverter. In addition, another application of a power converter is to compensate for high and unpredictable changes in power consumption. Power converters can be used to regulate the amount of energy supplied to a circuit. -DC/DC converters only use a specific voltage and current for the power converter,provides density (depending on load). The converter must regulate the voltage of the photovoltaic cell to a level high enough to drive the load. , a boost DC\DC converter is used for this purpose - Hybrid Energy Systems providing the production of constant and variable energy is a new technology for providing regions with energy. They can take advantage of the convenience of converting AC power to higher voltage to minimize power loss - The two main areas of power electronics to consider when using renewable energy sources are power management. Electricity from fuel cells, solar panels and wind turbines is not constant. The power source voltage is usually regulated by voltage regulators, DC-DC converters, and special voltage regulation circuits such as MPP.

Content	**To form competences in:** - VFD system The topic presents material on the problem of saving electricity used to power large pumping stations of irrigation systems in Uzbekistan. The energy saving effect is based on the law of "similarity", on which the working process of a centrifugal pump is built; -Connecting a high voltage direct current (HVDC) line to an AC network requires the HVDC line to have converter stations (often at each end of the line). These transformer substations are traditional, but with converters (inverters) at the end of the line. requiring additional capital investments, largely independent of the length of the power transmission line. **Level of difficulty: 2** - Inverter transformer substations. In this section, we will discuss the principles of operation of a 2-transformer converter substation, check the equipment and discuss the location of this equipment in the circuit of the converter substation.L**evel of difficulty: 2** - Connecting a HVDC substation to an AC system is an integral part of power transmission in the modern world.**Level of difficulty: 3** -converter substations that convert alternating current into DC rectifier terminals. Scheme, principle of operation and scope of application;Management of the operation of renewable energy sources in the general energy system. WGS and PV Power Output Control System for Power Plants. **Level of difficulty: 5**
Exams and assessment formats	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.
Study and examination requirements	Students of successful transition from science 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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.

Reading list	1.Duncan Glover, Mulukulta Sarma, Thomes Overbye. Power system. Analysis and Design Fifht Edition, IEE Press, Power system Engineering Series, NY 2011. 2.Mohamed. E EI-Hawari, Power systems IEE Press, Power system Engineering Series, NY 2004. 3.ESRI: http://www.esri-swansea.org/en/ 4.Swansea University: http://www.swansea.ac.uk/ 5.Rice University: https://www.rice.edu/ 6. Benjamin R. Cotts, ... Kevin L. Graf, in The Power Grid, 2001.High-voltage direct current system for integrating renewable energy sources into the overall power grid. 7. Alireza Nami, Hamed Nademi Modular multilevel converter (MMC) for control of power electronic converters and systems, 2018. 8.С. Зи. Физика полупроводниковых приборов. В 2-х тт. 2-е изд. М., Мир, 1984. 9.М. С. Шур. Физика полупроводниковых приборов. В 2-х тт. М., Мир, 1992. 10.Лебедев А. И. Физика полупроводниковых приборов. — М.: Физматлит, 2008. 11..Пасынков В. В., Чиркин Л. К. Полупроводниковые приборы: Учебник для вузов. — 8-е издание, исправленное.. — М.: Лань, 2006. — 480 с.

Module Handbook

Faculty of Hydrotechnical construction

The direction of education: 60812700 – Hydropower facilities in irrigation systems

Module designation	*EEA2106* *Fundamentals of electrical engineering and electronics*
Semester(s) in which the module is taught	*6- semester*
Person responsible for the module	*Denmukhammadiev Aktam, associate professor., candidate of technical sciences, PhD*
Language	*Uzbek, Russian*
Relation to curriculum	*Choice*
Teaching methods	*Lecture, practical lesson, lab works, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 180* *Contact hours: lecture – 20, practical lessons – 20, laboratory – 20, self-learning – 90, hours*
Credit points	*6 credits*
Required and recommended prerequisites for joining the module	*Mathematics, physics*

Module objectives/intended learning outcomes	***To know and understand:*** *- physical processes occurring in electrical, electronic and magnetic circuits,* *- competent design and calculation of electrical, electronic and magnetic circuits of various electrical and electronic devices, equipment and devices,* *- basics of measuring electrical and non-electrical quantities in electrical circuits of direct and alternating current,* *- operating principle of DC and AC machines,* ***To be able to:*** *- selection of elements of electrical, electronic and magnetic circuits;* *- calculation of single- and three-phase current circuits;* *- measurement of electrical and non-electrical quantities in electrical circuits;* *- correct selection of DC and AC machines;* *- making decisions on the design of electrical devices* **To form competences in:** *- ability to perform engineering calculations for single- and three-phase circuits,* *- control of electrical and non-electrical quantities in electrical circuits in order to save electricity,* *- selection of DC and AC machines depending on the load and operating mode of the consumer;* - *- design of economical electrical devices.*

Content:	*A general understanding of the science "Basics of electrical engineering and electronics". Level of difficulty: 2* *Linear DC circuits. Definition of constant current. Elements of a constant current circuit, an alternative scheme of the circuit and conventional signs of elements. Series, parallel and mixed connection of current sources and electric resistances.* *Level of difficulty: 3* *Single-phase sinusoidal current circuits and their calculation. Sinusoidal alternating current electric circuits and its elements. Sinusoidal variable functions and their main parameters. Vector representations of sinusoidal quantities and their importance. Sinusoidal current circuits and their importance. Level of difficulty: 4* *Three-phase sinusoidal current circuits. Advantages of three-phase current devices and systems. Three-phase EEC and current collector and its operation. Connection of a three-phase generator and consumers in a star scheme. Descriptions of the star scheme. Triangle scheme and its descriptions. Level of difficulty: 4* *Semiconductor devices. Operation of simple electrovacuum and semiconductor devices. Multi-electrode electrovacuum and semiconductor devices. Level of difficulty: 5* *Electronic amplifiers. Electronic voltmeters. Impulse and digital technique. Logical functions and elements. Microprocessors. Optical and radio electronic measuring methods and measuring tools. Level of difficulty: 5* *Electromechanical measuring devices. General concepts. Conventional signs and main characteristics of electrical measuring devices. Mechanisms of electrical measuring devices. Level of difficulty: 5* *Electrical measurements of electric and non-electric quantities. Electrical measurement of electrical and non-electric quantities in water management and land reclamation. Measurement of power and electricity. Measurement of resistance, capacitance and inductance. Electrical measurement of non-electric quantities in water management and reclamation.* *Level of difficulty: 5* *Transformers. The structure of the transformer and its main elements. Working principles of the transformer. Transformer magnetizing force and electromotive force equation. Switching scheme of the transformerю.Level of difficulty: 5.* *Direct current electric machines. The main types of DC machines. Structure and main elements of DC machines. Nominal sizes. Magnetic circuit of DC machines. Classification of DC. Level of difficulty: 5* *Alternating current electric machines. Classification of AC motors. Energetic processes and schemes in AC machines. Electrical and mechanical specifications of the engine.Level of difficulty: 5.*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Fundamentals of Electrical Engineering by Giorgio Rizzoni Textbook, eBook, and other options. McGraw-Hill Education https://www.mheducation.com › highered › product ISBN 9780073380568. Copyright 2022.* *2. Electrical engineering: principles and applications, 5/ehelps students learn electrical-engineering ... Allan R. Hambley. Prentice Hall, 2011 - 893 pages.* *3. Mahmood Nahvi, Joseph Edminister. Electric Circuits. Schaum's outlines series. McGRAW – HILL, USA, 2013 – 461 pages.* *4. Иванов И.И., Г.И.Соловьев, В.Я.Фролов. Электротехника и основы электроники. М.: "Лань", 2012. – 736 с..* *5. Bokiev A.A., Denmuxammadiev A.M. Elektrotexnika va elektronika asoslari. O'quv qo'llanma. Toshkent.2018 y.,215b.*

Module Handbook

Faculty of Energy

The direction of education: 70810502 - Smart (intelligent) measuring systems and devices in irrigation,

Module designation	*IEES5104* *Engineering experiments and experimental statistics*
Semester(s) in which the module is taught	*2- semester*
Person responsible for the module	*Denmukhammadiev Aktam, associate professor., candidate of technical sciences, PhD*
Language	*Uzbek*
Relation to curriculum	*Basic*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours: lecture – 30, practical lessons – 20, laboratory – 10, self-learning – 60, hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Mathematics, physics, Circuit theory, Electrical measurements and instruments*

Module objectives/intended learning outcomes	***To know and understand:*** *- method of scientific research in engineering fields, in particular in the field of technical expertise and marketing of equipment and technologies (electrical and electronic equipment),* *- the use of statistical analysis in the fields of mechanical engineering, in particular in the field of technical expertise and marketing of equipment and technologies (electrical and electronic equipment),* *- Basics of statistical analysis in Excel,* *- use the law of normal distribution, the standard deviation method when analyzing variables of the general population and sample,* ***To be able to:*** *- development of a research method and statistical analysis system for intelligent measuring systems;* *- evaluate information obtained in modern measuring systems;* *- processing of received data in modern measuring systems;* *- use of information transmission and reflection in modern measuring systems;* **To form competences in:** *- ability to conduct scientific research and statistical analysis in intelligent measuring systems and devices,* *- methods of publishing scientific articles based on the results obtained, knowledge of patent searches,* *- Statistical analysis in the Excel package program;* *- making appropriate solutions to technical problems.*

Content:	**Lectures** ***Applications of engineering experiments and measurements and its current status.*** *Purpose and overview, quantities (dimensions) and units, basic terms of metrology.* *Level of difficulty: 3* ***General descriptions of measurement systems.*** *Generalized measurement systems. Measurement reliability, guarantee of measurement results. Dynamic measurements. Guarantee of measurement results.* ***Fundamentals of electrical signal measurement systems.*** *Electrical signal measurement systems, signal processing.* ***Signal shapers.*** *Recording and indicating devices. Indicating and recording devices. Transmission of electrical signals between components.* *Level of difficulty: 3* ***Computerized data collection systems.*** *Computer systems for data collection. Enter. Computer systems. Data collection components. Configuration of the data collection system. Software for data collection systems. Level of difficulty: 3* ***Discretization and analysis of time-varying signals.*** *Discrete sampling. Discretization and analysis of time-varying signals. Discrete representation theorem. The sampling rate theorem. Sampling rate selection and filtering. Spectral analysis of time-varying signals. Spectral analysis using Fourier substitution. Level of difficulty: 4* ***Experimental statistics. Statistical analysis of experimental data.*** *Basic concepts and definitions. Probabilities. Parameter estimation. Criterion for rejecting suspicious data points. Level of difficulty: 4* ***Correlation of experimental data. Linear functions of random variables.*** *Application of computer programs for statistical analysis of experimental data.* ***The measure of central tendency.*** *Dispersion. Probability. The probability distribution function. Selection. Polygon, histogram, change interval.Level of difficulty: 4* ***Correlation of experimental data.*** *Correlation coefficient. The method of least squares. Linear regression. Complex structural and multinomial regression. Level of difficulty: 4* ***Experimental uncertainty analysis.*** *Experimental*

	Elementary sources of error. *Uncertainty in the final results of multivariate experiments. Uncertainty in the final results of single-measurement experiments.* ***Analysis of random and systematic types of error.*** *A step-by-step procedure for uncertainty analysis. Interpretation of manufacturer uncertainty data. Applying Uncertainty Analysis to Digital Data Acquisition Systems.* *Level of difficulty: 5* ***Correspondence of experimental data to mathematical expression.*** *Least squares method of experimental data processing. A straight line fit to the experimental data.* ***Interpolation methods.*** *Linear interpolation, Newton's interpolation expression, finite difference method, Lagrange polynomial (interpolation polynomial). Approximation methods.* *Level of difficulty: 5* ***Measurement of mechanical values of a solid body.*** *Deformation measurement, displacement measurement. Linear velocity measurement, angular velocity measurement. Measurement of acceleration and vibration. Measuring force. Measuring the torque of a rotating shaft. Pressure gauge. Temperature measurement. Measuring humidity.* ***Measurement of liquid flow, liquid velocity, liquid level and combustion pollutants.*** *Liquid flow measurement systems. Fluid speed measurement systems. Liquid level measurement. Measurement of air pollutants. Best practices for planning and documenting experiments. Overview of the pilot program. General work in test projects. Conclusions.* *Level of difficulty: 5*

	Practical training *3. General characteristics of measurement systems and their calculation. Level of difficulty: 3* *4. 2.Calculation of electrical signal measurement systems and their technical characteristics.Level of difficulty: 3* *3.Computerized data collection* *solving systems and examples related to them.* *Level of difficulty: 3* *4.Solving examples of methods of discretization and analysis of time-varying signals.* *Level of difficulty: 4* *5. Solving examples of statistical analysis of experimental data. Level of difficulty: 4* *6. Solving examples of mathematical variance interval estimation. Level of difficulty: 4* *7. Solving examples of the method of least squares.* *Level of difficulty: 5* *8. Solve examples using linear regression.Level of difficulty: 5* *9. Solve examples using multistructural and multinomial regression. Level of difficulty: 5* *10. Solving examples of using computer programs in statistical analysis of experimental data. Level of difficulty: 5*

	Independent education and self-learning *3. Performing a calculation and graphic work on the topic Variation series and their properties (CGW-1). Level of difficulty: 3* *4. Performing calculation and graphic work on the topic Elements of regression analysis (CGW-2). Level of difficulty: 4* *3. Using the EXCEL Solver function to find the optimal solution. Performing calculation and graphic work on the topic of experiment planning (CGW-3). Level of difficulty: 5*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Wheeler, Anthony J. Introduction to engineering experimentation.©2004 by Pearson Education, Inc. Upper Saddle River, New Jersey 07458, - 452 p.* *2. A.M. Denmukhammadiev, A.U. Djalilov. Engineering experiments and experimental statistics. Study guide. 24.09.2021, TIQXMMI printing house, 222 p.* *3. A. Radjabov. Fundamentals of scientific research. Textbook-Tashkent, TashDAU printing house, 2010.* *4. R.J. Baratov, A.M. Denmukhammadiev. Electrical measurements and instruments. Study guide. Registration number No. 359-359. Tashkent, TIQXMMI, 2020, 157 p.*

Module Handbook

Faculty of Hydromelioration
The direction of education: 60812300 – Water resours and melioration

Module designation	*EEA2105* *Fundamentals of electrical engineering and electronics*
Semester(s) in which the module is taught	*6- semester*
Person responsible for the module	*Denmukhammadiev Aktam, associate professor., candidate of technical sciences, PhD*
Language	*Uzbek, Russian*
Relation to curriculum	*Choice*
Teaching methods	*Lecture, practical lesson, lab works, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture – 20, practical lessons – 20, laboratory – 20, self-learning – 90, hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Mathematics, physics*

Module objectives/intended learning outcomes	***To know and understand:*** *- physical processes occurring in electrical, electronic and magnetic circuits,* *- competent design and calculation of electrical, electronic and magnetic circuits of various electrical and electronic devices, equipment and devices,* *- basics of measuring electrical and non-electrical quantities in electrical circuits of direct and alternating current,* *- operating principle of DC and AC machines,* ***To be able to:*** *- selection of elements of electrical, electronic and magnetic circuits;* *- calculation of single- and three-phase current circuits;* *- measurement of electrical and non-electrical quantities in electrical circuits;* *- correct selection of DC and AC machines;* *- making decisions on the design of electrical devices* **To form competences in:** *- ability to perform engineering calculations for single- and three-phase circuits,* *- control of electrical and non-electrical quantities in electrical circuits in order to save electricity,* *- selection of DC and AC machines depending on the load and operating mode of the consumer;* *- design of economical electrical devices.*

Content:	*A general understanding of the science "Basics of electrical engineering and electronics". Level of difficulty: 2* *Linear DC circuits. Definition of constant current. Elements of a constant current circuit, an alternative scheme of the circuit and conventional signs of elements. Series, parallel and mixed connection of current sources and electric resistances.* *Level of difficulty: 3* *Single-phase sinusoidal current circuits and their calculation. Sinusoidal alternating current electric circuits and its elements. Sinusoidal variable functions and their main parameters. Vector representations of sinusoidal quantities and their importance. Sinusoidal current circuits and their importance. Level of difficulty: 4* *Three-phase sinusoidal current circuits. Advantages of three-phase current devices and systems. Three-phase EEC and current collector and its operation. Connection of a three-phase generator and consumers in a star scheme. Descriptions of the star scheme. Triangle scheme and its descriptions. Level of difficulty: 4* *Semiconductor devices. Operation of simple electrovacuum and semiconductor devices. Multi-electrode electrovacuum and semiconductor devices. Level of difficulty: 5* *Electronic amplifiers. Electronic voltmeters. Impulse and digital technique. Logical functions and elements. Microprocessors. Optical and radio electronic measuring methods and measuring tools. Level of difficulty: 5* *Electromechanical measuring devices. General concepts. Conventional signs and main characteristics of electrical measuring devices. Mechanisms of electrical measuring devices. Level of difficulty: 5* *Electrical measurements of electric and non-electric quantities. Electrical measurement of electrical and non-electric quantities in water management and land reclamation. Measurement of power and electricity. Measurement of resistance, capacitance and inductance. Electrical measurement of non-electric quantities in water management and reclamation.* *Level of difficulty: 5* *Transformers. The structure of the transformer and its main elements. Working principles of the transformer. Transformer magnetizing force and electromotive force equation. Switching scheme of the transformerю.Level of difficulty: 5.* *Direct current electric machines. The main types of DC machines. Structure and main elements of DC machines. Nominal sizes. Magnetic circuit of DC machines. Classification of DC. Level of difficulty: 5* *Alternating current electric machines. Classification of AC motors. Energetic processes and schemes in AC machines. Electrical and mechanical specifications of the engine.Level of difficulty: 5.*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Fundamentals of Electrical Engineering by Giorgio Rizzoni Textbook, eBook, and other options. McGraw-Hill Education https://www.mheducation.com › highered › product ISBN 9780073380568. Copyright 2022.* *2. Electrical engineering: principles and applications, 5/ehelps students learn electrical-engineering ... Allan R. Hambley. Prentice Hall, 2011 - 893 pages.* *3. Mahmood Nahvi, Joseph Edminister. Electric Circuits. Schaum's outlines series. McGRAW – HILL, USA, 2013 – 461 pages.* *4. Иванов И.И., Г.И.Соловьев, В.Я.Фролов. Электротехника и основы электроники. М.: "Лань", 2012. – 736 с..* *5. Bokiev A.A., Denmuxammadiev A.M. Elektrotexnika va elektronika asoslari. O'quv qo'llanma. Toshkent.2018 y.,215b.*

Module Handbook

Faculty of Energy

The direction of education: 5313200(60722900) - Bachelor of Science in Electrical and Electronic Engineering Technology and Marketing,

Module designation	*TES4108* *Engineering experiments and experimental statistics in technical expertise*
Semester(s) in which the module is taught	*10- semester*
Person responsible for the module	*Denmukhammadiev Aktam, associate professor., candidate of technical sciences, PhD*
Language	*Uzbek*
Relation to curriculum	*Basic*
Teaching methods	*Lecture, practical lesson, lab works, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 240* *Contact hours: lecture – 60, practical lessons – 20, laboratory – 40, self-learning – 120, hours*
Credit points	*8 credits*
Required and recommended prerequisites for joining the module	*Mathematics, physics, Circuit theory, Electrical measurements and instruments*

Module objectives/intended learning outcomes	***To know and understand:*** *- method of scientific research in engineering fields, in particular in the field of technical expertise and marketing of equipment and technologies (electrical and electronic equipment),* *- the use of statistical analysis in the fields of mechanical engineering, in particular in the field of technical expertise and marketing of equipment and technologies (electrical and electronic equipment),* *- Basics of statistical analysis in Excel,* *- use the law of normal distribution, the standard deviation method when analyzing variables of the general population and sample,* ***To be able to:*** *- development of a research method and statistical analysis system for intelligent measuring systems;* *- evaluate information obtained in modern measuring systems;* *- processing of received data in modern measuring systems;* *- use of information transmission and reflection in modern measuring systems;* **To form competences in:** *- ability to conduct scientific research and statistical analysis in intelligent measuring systems and devices,* *- methods of publishing scientific articles based on the results obtained, knowledge of patent searches,* *- Statistical analysis in the Excel package program;* *- making appropriate solutions to technical problems.*

Content:	**Lectures** ***Applications of engineering experiments and measurements and its current status.*** *Purpose and overview, quantities (dimensions) and units, basic terms of metrology.* *Level of difficulty: 3* ***General descriptions of measurement systems.*** *Generalized measurement systems. Measurement reliability, guarantee of measurement results. Dynamic measurements. Guarantee of measurement results.* ***Fundamentals of electrical signal measurement systems. Electrical signal measurement systems, signal processing. Signal shapers. Recording and indicating devices. Indicating and recording devices. Transmission of electrical signals between components.*** *Level of difficulty: 3* ***Computerized data collection systems.*** *Computer systems for data collection. Enter. Computer systems. Data collection components. Configuration of the data collection system. Software for data collection systems.* *Level of difficulty: 3* ***Discretization and analysis of time-varying signals.*** *Discrete sampling. Discretization and analysis of time-varying signals. Discrete representation theorem. The sampling rate theorem. Sampling rate selection and filtering. Spectral analysis of time-varying signals. Spectral analysis using Fourier substitution.* *Level of difficulty: 4* ***Experimental statistics. Statistical analysis of experimental data.*** *Basic concepts and definitions. Probabilities. Parameter estimation. Criterion for rejecting suspicious data points.* *Level of difficulty: 4* ***Correlation of experimental data. Linear functions of random variables.*** *Application of computer programs for statistical analysis of experimental data.* ***The measure of central tendency.*** *Dispersion. Probability. The probability distribution function. Selection. Polygon, histogram, change interval.* *Level of difficulty: 4* ***Correlation of experimental data.*** *Correlation coefficient. The method of least squares. Linear regression. Complex structural and multinomial regression.* *Level of difficulty: 4* ***Experimental uncertainty analysis.*** *Experimental*

	Elementary sources of error. Uncertainty in the final results of multivariate experiments. Uncertainty in the final results of single-measurement experiments. Analysis of random and systematic types of error. A step-by-step procedure for uncertainty analysis. Interpretation of manufacturer uncertainty data. Applying Uncertainty Analysis to Digital Data Acquisition Systems. *Level of difficulty: 5* ***Correspondence of experimental data to mathematical expression. Least squares method of experimental data processing. A straight line fit to the experimental data. Interpolation methods. Linear interpolation, Newton's interpolation expression, finite difference method, Lagrange polynomial (interpolation polynomial). Approximation methods.*** *Level of difficulty: 5* ***Measurement of mechanical values of a solid body. Deformation measurement, displacement measurement. Linear velocity measurement, angular velocity measurement. Measurement of acceleration and vibration. Measuring force. Measuring the torque of a rotating shaft. Pressure gauge. Temperature measurement. Measuring humidity. Measurement of liquid flow, liquid velocity, liquid level and combustion pollutants. Liquid flow measurement systems. Fluid speed measurement systems. Liquid level measurement. Measurement of air pollutants. Best practices for planning and documenting experiments. Overview of the pilot program. General work in test projects. Conclusions.*** *Level of difficulty: 5*

	Practical training *5. General characteristics of measurement systems and their calculation. Level of difficulty: 3* *6. 2.Calculation of electrical signal measurement systems and their technical characteristics.Level of difficulty: 3* *3.Computerized data collection* *solving systems and examples related to them.* *Level of difficulty: 3* *4.Solving examples of methods of discretization and analysis of time-varying signals.* *Level of difficulty: 4* *5. Solving examples of statistical analysis of experimental data. Level of difficulty: 4* *6. Solving examples of mathematical variance interval estimation. Level of difficulty: 4* *7. Solving examples of the method of least squares.* *Level of difficulty: 5* *8. Solve examples using linear regression.Level of difficulty: 5* *9. Solve examples using multistructural and multinomial regression. Level of difficulty: 5* *10. Solving examples of using computer programs in statistical analysis of experimental data. Level of difficulty: 5*

	Laboratory work *1. Collection of statistical data. Using statistical functions in MS EXCEL spreadsheet. Level of difficulty: 3* *2. Summary and grouping of statistical data. Level of difficulty: 3* *3. Statistical data processing based on MS EXCEL application Level of difficulty: 3* *10. Calculation of average values, absolute and relative indicators of character change. Level of difficulty: 3* *11. One-factor correlation and regression analysis. Level of difficulty: 4* *12. Multivariate Correlation and Regression Analysis in the Statistica Package. Level of difficulty: 4* *13. Identification and characterization of the main development trend in dynamic series. Level of difficulty: 5* *14. Use of indices in economic and statistical research. Level of difficulty: 5* *15. Statistical processing of temperature measurement results. Level of difficulty: 5* *10. Statistical processing of moisture measurement results. Level of difficulty: 5*
	Independent education and self-learning *5. Performing a calculation and graphic work on the topic Variation series and their properties (CGW-1). Level of difficulty: 3* *6. Performing calculation and graphic work on the topic Elements of regression analysis (CGW-2). Level of difficulty: 4* *3. Using the EXCEL Solver function to find the optimal solution. Performing calculation and graphic work on the topic of experiment planning (CGW-3). Level of difficulty: 5*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	5. *Wheeler, Anthony J. Introduction to engineering experimentation.©2004 by Pearson Education, Inc. Upper Saddle River, New Jersey 07458, - 452 p.* 6. *A.M. Denmukhammadiev, A.U. Djalilov. Engineering experiments and experimental statistics. Study guide. 24.09.2021, TIQXMMI printing house, 222 p.* 7. *A. Radjabov. Fundamentals of scientific research. Textbook-Tashkent, TashDAU printing house, 2010.* 8. *R.J. Baratov, A.M. Denmukhammadiev. Electrical measurements and instruments. Study guide. Registration number No. 359-359. Tashkent, TIQXMMI, 2020, 157 p.*

Faculty of Electrical Energy

The direction of education is “Electrical and electronic engineering”.

5313200 - Technical expertise and marketing of equipment and technologies.

Module designation	Electrical energy quality management
Semester(s) in which the module is taught	5- semester
Person responsible for the module	Associate professor, Adilov Yalkin Tuchievich
Language	Uzbek, Russian,English
Relation to curriculum	Compulsory
Teaching methods	Lecture, practical and laboratory lessons, self-learning
Workload (incl. contact hours, self-study hours)	Total workload: 80 Contact hours: lecture - 20, practical lessons – 20, self-learning – 40, hours
Credit points	10 credits
Required and recommended prerequisites for joining the module	Electrical engineering, electrical measurements, power electronics , renewable energy, Hibrid Power Systems

Module objectives/intended learning outcomes	**To know and understand:** The purpose of studying the subject is to develop skills and train future bachelors to conduct expert research and assess the quality of Electrical Energy (EE) in terms of the suitability of its use in production. Studying the discipline will give students of energy specialties primary knowledge and concepts in determining the quality of electrical energy. The quality of EE is the most significant indicator of the possibility of its use for production purposes. An important feature of the discipline is taking into account the degree of influence of energy consumers included in the system on its quality, that is, in other words, we are talking about the electromagnetic compatibility of the network and the consumer. Analysis of the physical processes causing processes of change in EE quality parameters makes it possible to use methods for their regulation. Students receive theoretical knowledge and consolidate it by solving practical problems that determine the nature of the impact on the quality indicators of electrical energy, with a view to their regulation. Students consolidate the acquired theoretical and practical skills in practical classes. At all stages of studying the discipline, a prerequisite is the independent work of students with recommended literature, writing abstracts and participation in conferences with public reports. Successful mastery of the sections of this program is the basis for the formation of a scientific worldview. **To be able to:** Electric power quality is a set of EE properties that determine the impact on electrical equipment, instruments and devices and which are assessed by Electric Power Quality Indicators, which numerically characterize the levels of Electromagnetic Interference in the Power Supply System by frequency, effective voltage value, shape of its curve, symmetry and voltage pulses. The qualities of Electricity should be considered from two interrelated points of view: electricity, acting as a product, the quality of which must meet market requirements; electricity as the ability of an electromagnetic field to do work **To form competences in:** *- ability to carry out the construction supply facilities,* *- exploitation of systems and their automation, - the main directions and methods of scientific and technical development in the field of water supply and sewage,* *- to study the existing water pipelines in order to improve*

Content	**To form competences in:** Introduction to Science; Analysis and selection of the most important EE quality indicators. EE quality standards. The quality of supplied electricity is determined by international standards adopted in different countries and their local derivatives: GOST 13109-97 "Electricity. Compatibility of technical means is electromagnetic. Power quality standards in general purpose power supply systems.**Level of difficulty: 2** EN50160 is a European power quality standard that defines acceptable limits for AC voltage disturbances; IEEE-519 is a North American power system standard. IEC 61000-4-30 is a standard that specifies methods for monitoring power quality. 3rd Edition (2015) includes current measurements, unlike previous editions that dealt only with voltage measurements.L**evel of difficulty: 2** The nature of sudden changes in voltage in the electrical network, and methods of controlling their amplitude are considered. The causes of voltage drop are different and depend on the electrical network. This problem is solved very simply with the help of stabilization and control systems for the distribution of electricity between consumers. The basis of control systems is a program that provides optimal control of electricity flows in the energy system**Level of difficulty: 3** Analyzes the reasons for changing the parameters of the input voltage in the electrical network associated with voltage drop. GOST 32144-2013 is called a short-term voltage drop at a certain point of the electrical system, when it falls below the threshold value, the voltage drop is considered to be below 90% of the nominal voltage. In production conditions, electrical equipment can be turned off due to voltage drop, which leads to disruption of technological processes. A level not exceeding 10% voltage deviation is safe; methods of voltage drop prevention based on automatic control of the electric network are considered**.** **Level of difficulty: 5**
Exams and assessment formats	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.

Study and examination requirements	Students of successful transition from science 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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.
Reading List	1.2001 IEE Voltage quality on electrical power systems / Ьy J. Schlabbach, D. Blume and T. Stephanblome. IEE. 2001. V. 7. P. 178. 2.ГОСТ 32144-2013. Электрическая энергия. Совместимость технических средств электромагнитная. Нормы качества электрической энергии в системах электроснабжения общего назначения. М.: Стандартинформ, 2013 3.The papers of 17th Intemational Conference on Electricity Distribution: CIRED. Barcelona. 12-15 May 2003. 4.Angelo Bagglni. Handbook of Power Quality / Edited Ьy Angelo Baggini. University of Bergamo, Italy, 2008. P. 618. 5.US 7415370, Nisenblat, Pol; Amir M. Broshi & Ofir Efrati, "Power Quality Monitoring", published April 18, 2004, issued September 21, 2006 6."IEEE 519-2014 - IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems". standards.ieee.org. Retrieved 2020-11-16. 7.Dugan, Roger C.; Mark McGranaghan; Surya Santoso; H. Wayne Beaty (2003). Electrical Power Systems Quality. McGraw-Hill Companies, Inc. ISBN 978-0-07-138622-7. 8.Bollen, Math H.J. (2000). Understanding Power Quality Problems: Voltage Sags and Interruptions. New York: IEEE Press. ISBN 0-7803-4713-7. 9.Управление качеством электроэнергии Москва, Издательский дом МЭИ 2017г 10.Маслеников Г.К. Обеспечение качества электроэнергии в системах электро-снабжения общего назначения // Энергосбережение, 2002. № 1. С. 15-21.

Faculty of Energy

The direction of education: 5313200(60722900) - Bachelor of Science in Electrical and Electronic Engineering Technology and Marketing,

Module designation	*EEMM3104* *Modeling of electric energy issues*
Semester(s) in which the module is taught	*8- semester*
Person responsible for the module	*Denmukhammadiev Aktam, associate professor., candidate of technical sciences, PhD*
Language	*Uzbek*
Relation to curriculum	*Basic*
Teaching methods	*Lecture, practical lesson, lab works, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours: lecture – 30, practical lessons – 30, self-learning – 60, hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Mathematics, physics, Circuit theory, Electrical measurements and instruments*

Module objectives/intended learning outcomes	***To know and understand:*** *- method of mathematical modeling in the fields of technology, in particular in the field of electrical energy,* *- be able to formulate equations of nodal potentials and methods of loop current in the steady state of electrical circuits,* *- basics of creating charts and graphs in Excel,* *- methods for calculating balance equations in the dynamic mode of an electrical circuit, the probability of maintaining its reliability (Excel, MatLab, Simulink),* ***To be able to:*** *- can simulate steady-state and dynamic modes of electrical circuits;* *- ability to check results and conduct experiments;* *- processing of received data in modern electrical power systems;* *- use of transmission and reflection of the received data in the Excel package program;* **To form competences in:** *- modeling of steady-state and dynamic modes of electrical circuits,* *- know the work of publishing scientific articles based on the results obtained,* *- Analysis of graphs in Excel;* *- making appropriate solutions to technical problems.*

Content:	**Lectures** ***Introduction. Basics of mathematical modeling.*** *Engineering issues and modeling. Algebra of matrices in the calculation of electrical networks. Matrix form of Ohm's and Kirchhoff's laws.* *Level of difficulty: 3* ***Simulation of electrical circuits based on loop currents and nodal potential methods in steady state.*** *Modeling of electrical networks based on a four-terminal network. Equivalent circuits of four-terminal networks.* *Level of difficulty: 3* ***Modeling of electrical power systems.*** *Power lines. Structural structure and properties of power transmission lines. Mathematical model of electrical circuits with distributed parameters. Modeling of electrical networks based on graph theory. Basics of graph theory.* *Level of difficulty: 3* ***Modeling of the dynamic mode of electrical circuits based on classical and operator methods.*** *Equilibrium equations and their modeling in the classical method. Basics of the operator method and Laplace transform.* *Level of difficulty: 4* ***Construction of mathematical models.*** *Analytical method for constructing mathematical models. Methods for identifying technical objects. Model for predicting physical processes. Physical processes and their characteristics. Methodological foundations of forecasting. Exponential forecasting model.* *Level of difficulty: 4* ***Graphical data in Excel.*** *Creating graphs in Excel. Bar chart. Line graphs. Data analysis in Excel. Description of the data. Bar chart. Cumulative distribution.* *Level of difficulty: 4* ***Interpolation methods in Excel.*** *Linear interpolation. An interpolation method that uses the difference between the next and previous points. Other interpolation methods. How to solve equations with one unknown in Excel. Descriptions of nonlinear algebraic equations. Graphic solution. Solving equations using the "Goal Seek" function in Excel. Solving equations using the "Solver" function in Excel.* *Level of difficulty: 5* ***Operations with matrices in Excel.*** *Addition, subtraction, multiplication and division of matrices. Other operations on matrices. Inverse matrix. Calculating the integral in Excel. Trapezoidal method for calculating the integral. Simpson's method for calculating the integral. Finding the optimal solution in Excel. Basic description of optimization problems. A method for solving an optimization problem in Excel.* *Level of difficulty: 5*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	9. *Byron S.Gottfried. Spreadsheet Tools for Engineers using Excel. Mc Graw Hill, USA, 2006-469 p.* 10. *A. F. Shatalov, I. N. Vorotnikov, M. A. Mastepanenko, I. K. Sharipov and S. V. Anikuev. Modeling in the electric power industry. Stavropol, AGRUS, Stavropol State Agrarian University, 2014. – 140 p.* 11. *Yakubov M.S. Mathematical problems of energy. Tashkent, "Adad Plys" MChJ, 2018.* 12. *A.V.Lykin. Mathematical modeling of electrical systems and their elements. Tutorial. Novosibirsk, 2009. – 222 p..*

Example form for Module Handbook

A **Module Handbook or collection of module descriptions that is also available for students to consult** should contain the following information about the individual modules:

Module designation	*Hydrology*
Semester(s) in which the module is taught	*9 semester (15 weeks)*
Person responsible for the module	1. Gapparov Furkat Akhmatovich, Doctor of technical sciences, professor.
Language	*Uzbek and Russian*
Relation to curriculum	*Selection*
Teaching methods	*lecture, lesson*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 150* *Lecture and lessons:60* *lectures - 30* *lessons - 30* *self-study hours -90*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Algebra* *Physics* *Geography* *Chemistry* *hydrology* *Geomorphology* *Geodesy*

Module objectives/intended learning outcomes	*In terms of:* *- Knowledge: familiarity with information, theory and/or subject knowledge* *- Skills: cognitive and practical abilities for which knowledge is used* *- Competences: integration of knowledge, skills and social and methodological capacities in working or learning situations*1 *Students know that/know how to/are able to understand:* *- regulations of river flow formation, hydrological research methods, water reservoirs, their distribution and balance, natural and chemical properties of terrestrial waters, river basin and network, formation of river basin and network, river basin and network knowledge of influencing factors, sources and flow of saturation and hydrological regimes;* *- to determine and analyze the data on the form and size parameters of rivers, the factors influencing the formation of river flow volume, the methods of expressing the river flow, the classification of river saturation from the climatic point of view and according to the sources of saturation, to acquire the skills of types, equipment, structure of water gauging stations, water level observations, water flow rate measurement, water and turbidity discharge and volume determination, current and modern hydrometric tools;* *- organization of hydrological studies and observations, analysis and assessment of water sources shape and size indicators, analysis and assessment of the hydrological regime of water bodies, assessment of factors affecting water bodies, modern hydrological instruments and to have the competencies to use devices, apply hydrological methods, perform water management calculations, solve problems of efficient use of water resources.*
Content	*The goal of teaching the science - the main goal of the science of "Hydrological forecasting" - to teach students the laws of hydrological processes and, on the basis of this, to forecast the elements of the water regime of rivers, lakes and reservoirs, to study weather conditions and to forecast it in advance. is the formation of knowledge, skills and competences for the development, improvement and practical use of methods of reducing adverse consequences.* *The task of the science is to provide students with theoretical knowledge, practical skills, a methodical approach to phenomena and processes in the water reservoir and the formation of a scientific worldview, a methodical approach to the phenomena and processes in the reservoir and the formation of a scientific worldview, the hydrological regime of water reservoirs, influencing factors and changes, is to provide knowledge about the methods of determining the morphological and morphometric indicators and bathyography of reservoirs.*
Exams and assessment formats	*There are two midterms (40 minutes each) and a final oral exam (80 minutes) and written homework, short computer-based quizzes, take-home written assignments*

[1] Cf. European Commission: Proposal for a Recommendation of the European Parliament and the European Council on the establishment of the European Qualifications Framework for lifelong learning, COM(2006) 479 final, 2006/0163 (COD), Brussels 05/09(2006.

Study and examination requirements	*Requirements for successfully passing the module* *The final grade in the module is composed of 40% performance on exams, 10% quizzes, 10% take-home assignments, 10% in-class participation. Students must have a final grade of 60% or higher to pass Requirements for passing the course*
Reading list	*1. Orlov V G, Sikan AV 2003 Basics of engineering hydrology Tutorial For fields Ecology and Environment Specialty Geoecology (in Russian Saint-Petersburg) Publishing House of RSHU p 187* *2. Maidment David R 1993 editor in chief Handbook of hydrology* *3. Shultz V L 1965 the Rivers of the Central Asia (in Russian Leningrad) Publishing House of Hydrometeorology p 691*

Example form for Module Handbook

Faculty of Hydrotechnical construction
The direction of education: 60730900 - Hydrotechnical construction (in water management)
educational direction

Module designation	*Hydrology,* GL3205
Semester(s) in which the module is taught	*7 semester (10 weeks)*
Person responsible for the module	*1. Nazaraliyev Dilshod Validjanovich, a candidate of agricultural sciences, docent.* *2. Mansurov Safar Raxmankulovich PhD for technical sciences, senior teacher*
Language	*Uzbek and Russian*
Relation to curriculum	*elective*
Teaching methods	*lecture, lesso*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 150* *Lecture and lessons:60* *lectures - 30* *lessons - 30* *self-study hours -90*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Algebra* *Physics* *Geography* *Chemistry* *Biology* *Geomorphology* *Geodesy*

Module objectives/intended learning outcomes	***To know and understand:*** *- familiarity with information, theory and/or subject knowledge* *- Skills: cognitive and practical abilities for which knowledge is used* *- Competences: integration of knowledge, skills and social and methodological capacities in working or learning situations2* *Students know that/know how to/are able to understand:* *- regulations of river flow formation, hydrological research methods, water reservoirs, their distribution and balance, natural and chemical properties of terrestrial waters, river basin and network, formation of river basin and network, river basin and network knowledge of influencing factors, sources and flow of saturation and hydrological regimes;* ***To be able to:*** *- to determine and analyze the data on the form and size parameters of rivers, the factors influencing the formation of river flow volume, the methods of expressing the river flow, the classification of river saturation from the climatic point of view and according to the sources of saturation, to acquire the skills of types, equipment, structure of water gauging stations, water level observations, water flow rate measurement, water and turbidity discharge and volume determination, current and modern hydrometric tools;* ***To form competences in:*** *- organization of hydrological studies and observations, analysis and assessment of water sources shape and size indicators, analysis and assessment of the hydrological regime of water bodies, assessment of factors affecting water bodies, modern hydrological instruments and to have the competencies to use devices, apply hydrological methods, perform water management calculations, solve problems of efficient use of water resources.*

[2] Cf. European Commission: Proposal for a Recommendation of the European Parliament and the European Council on the establishment of the European Qualifications Framework for lifelong learning, COM(2006) 479 final, 2006/0163 (COD), Brussels 05/09(2006.

Content	*Basics of hydrology. Growing demand for water on Earth. Methods of hydrological research. Water cycle in nature. Level of difficulty: 1* *River basin and system. Natural-geographic descriptions of the river basin. The main shape and size indicators of the river system. Shape and size indicators of the river basin. Saturation of rivers. Formation of river flow and factors affecting it. Sources of saturation of rivers. Classification of rivers by sources of saturation. Classification of rivers of Central Asia by sources of saturation. Quantitative assessment of the contribution of river saturation sources. Basic characteristics of river flow. Ways of expressing river flow. Difficulty level: 2* *Basics of hydrometry. Elements of the water regime of rivers. Practical use of water level monitoring data. Water level, its monitoring and processing methods. Water level regime of rivers. Cycles of the water regime of rivers. Classification of rivers according to water periods. Water level. Hydrological monitoring site. Water level. Methods and means of measuring water levels at the water measurement site. Water level recording devices. Instruments and devices for increasing the accuracy of water level monitoring. Flow depth. Composition, content and tasks of work performed in depth measurement. Depth measurement methods and tools. Processing of measured data. Calculation of morphometric characteristics of the river based on depth measurement data. Difficulty level: 2* *Flow velocity. General information about water movement. Turbulent and laminar flows. Types of flow velocities. Distribution of velocities according to the depth and width of the river and channel. Speed chart. Methods and tools for measuring flow rate. Modern devices that measure the rate of water flow. Water consumption. Water consumption and the structure of work performed in its determination. Classification of methods for determining water consumption. Consumption model and its characteristics. Velocity-field. Calculation of water consumption. Consumption (flow) meters. The essence of the mixing method. Instruments and devices for measuring water consumption by mixing method. Measurement of water flow using the ultrasound measurement method. Standard water consumption measuring devices. Methods and means of determining water consumption in hydro melioration networks. Water consumption control, measuring devices and devices in hydro melioration networks. Level of difficulty: 3* *Study of stream discharges and sediments. An overview of solid water runoff. Sediments and their movement in streams. The main characteristics of solid water flow. Suspended sediment discharges. Tools for taking samples of suspended sediment water. Calculation of suspended sediment flow consumption. Riverbed bottom sediments. Calculating flow rate of river bottom sediments Difficulty level: 3* *Hydrological calculations. Hydrological descriptions. Justification of the use of statistical methods in hydrology. Estimated hydrological descriptions. Distribution curves of hydrological characteristics. Availability of hydrological characteristics. Supply curves. Parameters of distribution and supply curves and methods of their determination. Empirical and theoretical curves of supply. Probability grid. Correlation. The regression equation. Difficulty level: 4* *Adjusting the flow rate. Distribution of river flow during the year. Types of flow adjustment. Demand of water users and water consumers. Water management balance. Reservoirs. Types of reservoirs. Main indicators of reservoirs. Location and elements of reservoirs. Hydrological regime of reservoirs. Water level mode. Water balance. Temperature mode. Hydro chemical mode. Dynamics of reservoirs. Sedimentation balance of reservoirs. Calculation of the amount of turbidity settled in the reservoir. Turbidity of the reservoir press Measures to prevent and reduce water reservoir siltation. Water waste. Types of waste from the water reservoir, methods of calculation. Advantages and disadvantages of existing methods. Measures to reduce water wastage. . Difficulty level: 5*
Exams and assessment formats	*There are two midterms (40 minutes each) and a final oral exam (80 minutes) and written homework, short computer-based quizzes, take-home written assignments*

Study and examination requirements	*Requirements for successfully passing the module* *The final grade in the module is composed of 40% performance on exams, 10% quizzes, 10% take-home assignments, 10% in-class participation. Students must have a final grade of 60% or higher to pass Requirements for passing the course*
Reading list	*1. Nazaraliev D.V., Akmalov Sh.B. «Inland hydrology» tutorial book, Tashkent, 2019.111 p.* *2. Melnikova T.N. workbook of hydrlogy. Maykop – 2012. 153 p.* *3. A.V.Savkin, S.V.Fedorov. Hydrology. Tutorial. – Saint-Petersburg.: 2010.-102p.*

Example form for Module Handbook

Faculty of Hydromelioration

The direction of education: 60530800– Hydrology (hydrology of rivers and reservoirs)

Module designation	GME2110*,3110 ,Hydrometry*
Semester(s) in which the module is taught	*4,5 semester (8 weeks)*
Person responsible for the module	*1. Nazaraliyev Dilshod Validjanovich, a candidate of agricultural sciences, docent.* *2. Jumabayeva Gulnora Usmanbayevna,* assistant
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*lecture, lesson*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload:300* *Lecture and lessons:42* *lectures - 24* *lessons - 18* *self-study hours -258*
Credit points	*10 credits*
Required and recommended prerequisites for joining the module	*Higher mathematics* *Physics* *Engineering Geodesy* *Chemistry* *Geography* *Theoretical mechanics* *Hydraulics* *Hydrology*

Module objectives/intended learning outcomes	***To know and understand:*** *- familiarity with information, theory and/or subject knowledge* *- Skills: cognitive and practical abilities for which knowledge is used* *- Competences: integration of knowledge, skills and social and methodological capacities in working or learning situations*3 *Students know that/know how to/are able to understand:* *- regulations of river flow formation, hydrological research methods, water reservoirs, their distribution and balance, natural and chemical properties of terrestrial waters, river basin and network, formation of river basin and network, river basin and network knowledge of influencing factors, sources and flow of saturation and hydrological regimes;* ***To be able to:*** *- to determine and analyze the data on the form and size parameters of rivers, the factors influencing the formation of river flow volume, the methods of expressing the river flow, the classification of river saturation from the climatic point of view and according to the sources of saturation, to acquire the skills of types, equipment, structure of water gauging stations, water level observations, water flow rate measurement, water and turbidity discharge and volume determination, current and modern hydrometric tools;* **To form competences in:** *- assessment of the hydrological condition of the territory* *- solving various hydrological and water management issues* *- determining the amount of water sources* *- Analysis and evaluation.*

[3] Cf. European Commission: Proposal for a Recommendation of the European Parliament and the European Council on the establishment of the European Qualifications Framework for lifelong learning, COM(2006) 479 final, 2006/0163 (COD), Brussels 05/09(2006.

Content	*Basics of hydrometry. Types of hydrometry. Role and importance of science in the hydrological system. Hydrometeorological network. Classification of hydrometeorological network. Basic conditions for the organization and placement of a network of hydrometeorological stations and posts. Hygrometric research methods. Hydrometric monitoring network. Principles of organization of water measuring stations. Choosing a place for the construction of water measuring stations and the work to be there. Water metering stations. Types of water metering stations and their structure. Difficulty level: 2* *Hydrological regime. Water regime of rivers and canals. Water regime periods. Water regime elements Water level. Processing of water level monitoring materials. Instruments and devices that monitor and measure the water level. Instruments and devices to increase the accuracy of monitoring the water level. Safety measures when performing hydrometric work. Depth measurement work. Concept of water depth. Depth measurement tools and methods. Simple and mechanical tools. Ultrasonic tools. Processing of depth measurement data. Difficulty level: 3* *Water flow rate and consumption. Fundamentals of hydrometric measurement of water flow rate. General information about water movement. Turbulent and laminar flows. Distribution of water flow rate. Velocity graph. Vertical speed distribution. Methods of measuring water flow rate. Difficulty level: 4* *Water consumption. General conditions for determining water consumption. Features of consumption model v au. Classification of methods for determining water consumption. Calculation of water consumption. Determination of water consumption according to live cross-sectional area and average flow rate using empirical expressions. Determination of water consumption using hydrometric rods or drops. Consumption (flow) meters. Measurement of water flow using the ultrasonic measurement method. Difficulty level: 5* *Water consumption curve. Basic concepts. Determining the relationship between water consumption and water level and calculating water flow. Draw a water consumption curve. Calculation of water flow. Difficulty level: 4* *Study of stream discharges and sediments. An overview of solid water runoff. Sediments and their movement in currents. The main characteristics of solid water flow. Suspended sediment discharges. Tools for taking samples of suspended sediment water. Calculation of suspended sediment flow consumption. Riverbed bottom sediments. Calculating flow rate of river bottom sediments Difficulty level: 3*
Exams and assessment formats	*two oral Midterm assessments (20 minutes each) and one final oral exam (40 minutes), short computer-based quizzes, take-home written assignments*
Study and examination requirements	*Requirements for successfully passing the module* *The final grade in the module is composed of 40% performance on exams, 10% quizzes, 10% take-home assignments, 10% in-class participation. Students must have a final grade of 60% or higher to pass*
Reading list	*1. Akbarov A.A., Nazaraliev D.V., Xikmatov F.Kh. «Hydrometrics» manual,,Tashkent, 2015,154 p.* *2. Hydrology: tutorial book for higher education / V. H. Mikhailov, S. A. Dobrolyubov. – M.; Berlin: Direct-Media Publishing House, 2017. – 752 p.* *3. Melnikova T.N. workbook. Maykop – 2012. 153 p.*

Example form for Module Handbook

Faculty of Ecology and Law

The direction of education: 60710400 – Ecology and Environmental protection (water sector option)

Module designation	*GME 3205 Hydrometry,*
Semester(s) in which the module is taught	*10 semester (10 weeks)*
Person responsible for the module	1. Nazaraliyev Dilshod Validjanovich, a candidate of agricultural sciences, docent. 2. Mansurov Safar Raxmankulovich PhD for technical sciences, senior teacher 3. Kodirov Sobir Mamadiyorovich, senior teacher
Language	*Uzbek, russian*
Relation to curriculum	*elective*
Teaching methods	*lecture, lesson, lab works*
Workload (incl. contact hours, self-study hours)	*((Estimated) Total workload:150* *Lecture and lessons:60* *lectures - 30* *lessons - 30* *self-study hours -90*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Computer graphics and engineering* *Chemistry* *Algebra* *Physics* *Geodesy* *Hydraulics* *Hydrology and hydrogeology* *Hydrology, meteorology and basic climatology*

Module objectives/intended learning outcomes	***To know and understand:*** *familiarity with information, theory and/or subject knowledge* *- Skills: cognitive and practical abilities for which knowledge is used* *- Competences: integration of knowledge, skills and social and methodological capacities in working or learning situation.* ***To be able to:*** *- regulations of river flow formation, hydrological research methods, water reservoirs, their distribution and balance, natural and chemical properties of terrestrial waters, river basin and network, formation of river basin and network, river basin and network knowledge of influencing factors, sources and flow of saturation and hydrological regimes;* ***To form competences in:*** *- determine and analyze the data on the form and size parameters of rivers, the factors influencing the formation of river flow volume, the methods of expressing the river flow, the classification of river saturation from the climatic point of view and according to the sources of saturation, to acquire the skills of types, equipment, structure of water gauging stations, water level observations, water flow rate measurement, water and turbidity discharge and volume determination, current and modern hydrometric tools;*

Content	*Basics of hydrometry. Types of hydrometry. Role and importance of science in the hydrological system. Hydro meteorological network. Classification of hydro meteorological network. Basic conditions for the organization and placement of a network of hydro meteorological stations and posts. Hygrometric research methods. Hydrometric monitoring network. Principles of organization of water measuring stations. Choosing a place for the construction of water measuring stations and equipment. Water metering stations. Types of water metering stations and their structure. Difficulty level: 2* *Hydrological regime. Water regime of rivers and canals. Water regime periods. Water regime elements Water level. Processing of water level monitoring materials. Instruments and devices that monitor and measure the water level. Instruments and devices to increase the accuracy of monitoring the water level. Safety measures when performing hydrometric work. Depth measurement work. Concept of water depth. Depth measurement tools and methods. Simple and mechanical tools. Ultrasonic tools. Processing of depth measurement data. Difficulty level: 3* *Water flow rate and consumption. Fundamentals of hydrometric measurement of water flow rate. General information about water movement. Turbulent and laminar flows. Distribution of water flow rate. Velocity graph. Vertical speed distribution. Methods of measuring water flow rate. Difficulty level: 4* *Water consumption. General conditions for determining water consumption. Features of consumption model v au. Classification of methods for determining water consumption. Calculation of water consumption. Determination of water consumption according to live cross-sectional area and average flow rate using empirical expressions. Determination of water consumption using hydrometric rods or drops. Consumption (flow) meters. Measurement of water flow using the ultrasonic measurement method. Difficulty level: 5* *Water consumption curve. Basic concepts. Determining the relationship between water consumption and water level and calculating water flow. Draw a water consumption curve. Calculation of water flow. Difficulty level: 4* *Study of stream discharges and sediments. An overview of solid water runoff. Sediments and their movement in currents. The main characteristics of solid water flow. Suspended sediment discharges. Tools for taking samples of suspended sediment water. Calculation of suspended sediment flow consumption. River bottom sediments. Calculating flow rate of river bottom sediments Difficulty level: 3*
Exams and assessment formats	*Two oral Midterm assessments (40 minutes each) and one final oral exam (80 minutes), short computer-based quizzes, take-home written assignments*
Study and examination requirements	*Requirements for successfully passing the module:* *The final* grade *in the module is composed of 60% performance on exams, 10% quizzes, 10% take-home assignments, 10% in-class participation. Students must have a final grade of 60% or higher to pass*

Reading list	*1. Akbarov A.A., Nazaraliev D.V., Xikmatov F.Kh. «Hydrometrics» manual,,Tashkent, 2015,154 p.* *2. Hydrology: tutorial book for higher education / V. H. Mikhailov, S. A. Dobrolyubov. – M.; Berlin: Direct-Media Publishing House, 2017. – 752 p.* *3. Melnikova T.N. workbook. Maykop – 2012. 153 p.*

Example form for Module Handbook

A **Module Handbook or collection of module descriptions that is also available for students to consult** should contain the following information about the individual modules:

Module designation	*Engineering Geology, Hydrology IGI2105*
Semester(s) in which the module is taught	*4 semester (15 weeks).*
Person responsible for the module	1. *Kattakulov Farrukh, Docent* 2. *Mansurov Safar rakhmonkulovich PhD* 3. *Yakhshiev Shohzod Sheraliyevich, assistant*
Language	*uzbek*
Relation to curriculum	*compulsory*
Teaching methods	*Lecture, practical lessons, laboratory, self-study,*
Workload (incl. contact hours, self-study hours)	*Total work load: - 150* *Total classroom hours: - 60* *lecture - 30* *lessons - 30* *self-study - 90*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Higher mathematics* *Physics* *Engineering geodesy* *Hydrology and hydrogeology* *Hydraulics* *Hydrography of Central Asia* *Hydrology* *Hydrometrics*

Module objectives/intended learning outcomes	***To know and understand:*** *- - It is necessary to have knowledge about the structure of the earth;* *- It is necessary to have knowledge about rocks and their formation;* *- It is necessary to have knowledge about the composition, structure and condition of minerals;* ***To be able to:*** *- - Independently learns additional literature;* *- Can use methods of predicting changes in engineering-geological and hydrogeological conditions;* *- Can use engineering-geological and hydrogeological maps and research results;* *- Able to observe, process and analyze the results of the hydrological order elements* *- Can use and use equipment and devices independently;* *- Can use and use hydrological information materials independently;* *- Can use water level and other hydrometric information materials;* *- Can process and analyze the results of observation, measurement of geological and hydrological elements* *- Organization of geological and hydrological studies and observations, assessment of factors affecting objects, use of modern geological and hydrological tools and devices, application of geological and hydrological methods, execution of water management calculations, solving problems of efficient use of water resources knows*

Content	*- Basics of geology. General information about land. Difficulty level - 2* *- Contents and sections of the science of engineering geology. Connection of science with other sciences. General information about land. The shape and size of the land. The structure of the earth. Geospheres, their composition, state and properties. Electrical, magnetic properties, density, pressure and temperature regime of earth bodies. The main hypotheses about the appearance of the earth in the universe (I. Kant, F. Laplace, O. Yu. Schmidt, V. G. Fesenkov, etc.). Difficulty level - 2* *- Basic information about rocks and minerals Difficulty level - 2* *- The concept of rocks and their formation. Structure and texture of rocks, genetic classes. Physico-mechanical properties of rocks. Concept of minerals and processes of their formation. Composition, structure and condition of minerals. Properties and classification of minerals. Difficulty level - 2* *- Geological processes and their importance in the development of the earth's crust Level of difficulty - 3* *- Endogenous geological processes. Magmatism and its types. Tectonic movements. Action types. Tectonic structures - geosynclines, platforms, chalcones, syneclises, anteclises, slope depressions. Earthquakes. Causes of earthquake Difficulty level - 3* *- The main types and composition of underground water. Groundwater regime. Laws of movement of underground water Level of difficulty - 3* *- Classification of underground waters according to the conditions of lying, distribution of Sizot waters according to the laws of natural regions according to climate, hydrodynamics, chemical composition and level. Conditions of formation, laying and distribution of interlayer waters. Artesian waters and basins. Groundwater is chemical and gas. Regime-forming factors. Mode types and elements. The main types and laws of underground water movement. Filtration and infiltration. Difficulty level - 4* *- Physical-geological and engineering-geological processes and events. Gravitational, hydrodynamic processes and phenomena* *- Level of difficulty - 4* *- Nurash. Physical decay. Organic weathering. Chemical weathering. Formed relief and deposits. Norush shell. Drowning incident. Study of sedimentation and dangerous phenomena related to it. Biochemical process and phenomena. A sliding event. Types. Overturns, spills, landslides, flowing soils. Hydrodynamic process and phenomena. Erosion. Aerodynamic process and phenomena. Difficulty level - 3* *- Structure and volume of engineering-geological prospecting works. Peculiarities of engineering-geological prospecting in various constructions Difficulty level - 4* *- General circumstances. Engineer - types and composition of geological works. Project stages. Structure classes. Analysis of natural conditions and research of engineered geological conditions. Engineer geological surveyor. Excavation of rocks. Experimental hydrogeological works. Experimental water extraction method. Experimental water injection into the shurfs. Methods of pouring water into boreholes. Laboratory studies. Engineer-geological prospecting works for the design of hydrotechnical structures. Technical assignments. Project work and stages. Engineering-geomorphological studies. Difficulty level - 5* *- Drilling methods Difficulty level - 5* *- The main elements of the drill well. Types of drills according to the purpose of drilling wells. Drilling and additional equipment. Drilling. Difficulty level - 5* *- Pipes and auxiliary equipment for drilling boreholes Difficulty level - 5* *- Drill pipes and their dimensions. Reinforcing pipes, their dimensions. Cementing of boreholes. Types of cements. Methods of cementing boreholes. Calculation and preparation of cementation. Fins and their*

Exams and assessment formats	*Two midterms (40 minutes each, written and oral) and a final oral exam (80 minutes) and written homework.*
Study and examination requirements	*Requirements for successful graduation:* *The total maximum score will be the sum of the points allocated to the final exam (60%), Midterm (20%), homework (10%) and classroom activity (10%). For successfully pass the subject, a student must gather 60% or more of the allotted points.*
Reading list	*References 1. F.G. Bell – Engineering Geology 2nd edition, 2007* *2. T. Davie. Fundamentals of hydrology. Second edition. Madison Avenue, New York, 2008. 221 p* *3. Elizabeth M. Shaw Hydrology in Practice.Third Edition.2005.-145p* *4. Yusupov G.U., Holbaev B.M. Fundamentals of geology and hydrogeology. - T.: The new generation, 2003. - 301 p.* *5. Yusupov G.U., Holboev B.M. Fundamentals of geology and hydrogeology. 2nd edition. - T.: New age generation, 2005. - 380 p.* *6. Irgashev Yu., Ergashev R. Geology and geomorphology. Tashkent, Science and Technology 2013.* *7. Yusupov G.U., Nurzhanov S.E. Geology, hydrogeology and geomorphology. - T.: TIMI., 2008. - 240b.* *8. Akbarov A., Nazaraliyev D., Hikmatov F. Hydrometry. Study guide, TIMI, Tashkent, 2015.129.* *9. Akbarov A.A., Nazaraliev D.V., Khikmatov F.Kh. "Hydrometry" study guide, TIMI, Tashkent, 2008, 154 pages.* *10. Karimov S., Akbarov A., Jonqobilov U.; Correction of hydrology, hydrometry and flow volume. Textbook. - T.: Teacher, 2004.-230 p.* *11. Savkin A.V., Fedorov S.V. Hydrology. Study guide. - St. Petersburg.: 2010.-102b* *12. H.A. Viles Synergistic Weathering Processes Reference Module in Earth Systems and Environmental Sciences 2021 Journal / Available online 16 October 2021, 127065 In Press, Journal Pre-proof.* *13. Gylfi Páll Hersir, Egill Árni Guðnason and Ólafur G. Flóvenz Geophysical Exploration Techniques Reference Module in Earth Systems and Environmental Sciences Journal / Available online 7 October 2021*

Example form for Module Handbook

A **Module Handbook or collection of module descriptions that is also available for students to consult** should contain the following information about the individual modules:

Module designation	*Engineering Geology and Hydrogeology IGG2105*
Semester(s) in which the module is taught	*5 semester (15 weeks).*
Person responsible for the module	1. *1. Nurjanov Satbay Eshjanovich, candidate of technical science, docent* 2. *2. Ruziev Ilhom Makhmudovich, PhD, docent*
Language	*uzbek*
Relation to curriculum	*compulsory*
Teaching methods	*Lecture, practical lessons, laboratory, self-study,*
Workload (incl. contact hours, self-study hours)	*Total work load: - 150* *Total classroom hours: - 60* *lecture - 30* *lessons – 20* *laboratory - 10* *self-study - 90*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Higher mathematics* *Physics* *Engineering geodesy* *Hydrology and hydrogeology* *Hydraulics* *Hydrography of Central Asia* *Hydrology* *Hydrometrics*

Module objectives/intended learning outcomes	***To know and understand:*** *- - It is necessary to have knowledge about the structure of the earth;* *- It is necessary to have knowledge about rocks and their formation;* *- It is necessary to have knowledge about the composition, structure and condition of minerals;* ***To be able to:*** *- - Independently learns additional literature;* *- Can use methods of predicting changes in engineering-geological and hydrogeological conditions;* *- Can use engineering-geological and hydrogeological maps and research results;* *- Able to observe, process and analyze the results of the hydrological order elements* *- Can use and use equipment and devices independently;* *- Can use and use hydrological information materials independently;* *- Can use water level and other hydrometric information materials;* *- Can process and analyze the results of observation, measurement of geological and hydrological elements* *- Organization of geological and hydrological studies and observations, assessment of factors affecting objects, use of modern geological and hydrological tools and devices, application of geological and hydrological methods, execution of water management calculations, solving problems of efficient use of water resources knows*

Content	*- Basics of geology. General information about land. Difficulty level - 2* *- Contents and sections of the science of engineering geology. Connection of science with other sciences. General information about land. The shape and size of the land. The structure of the earth. Geospheres, their composition, state and properties. Electrical, magnetic properties, density, pressure and temperature regime of earth bodies. The main hypotheses about the appearance of the earth in the universe (I. Kant, F. Laplace, O. Yu. Schmidt, V. G. Fesenkov, etc.). Difficulty level - 2* *- Basic information about rocks and minerals Difficulty level - 2* *- The concept of rocks and their formation. Structure and texture of rocks, genetic classes. Physico-mechanical properties of rocks. Concept of minerals and processes of their formation. Composition, structure and condition of minerals. Properties and classification of minerals. Difficulty level - 2* *- Geological processes and their importance in the development of the earth's crust Level of difficulty - 3* *- Endogenous geological processes. Magmatism and its types. Tectonic movements. Action types. Tectonic structures - geosynclines, platforms, chalcones, syneclises, anteclises, slope depressions. Earthquakes. Causes of earthquake Difficulty level - 3* *- The main types and composition of underground water. Groundwater regime. Laws of movement of underground water Level of difficulty - 3* *- Classification of underground waters according to the conditions of lying, distribution of Sizot waters according to the laws of natural regions according to climate, hydrodynamics, chemical composition and level. Conditions of formation, laying and distribution of interlayer waters. Artesian waters and basins. Groundwater is chemical and gas. Regime-forming factors. Mode types and elements. The main types and laws of underground water movement. Filtration and infiltration. Difficulty level - 4* *- Physical-geological and engineering-geological processes and events. Gravitational, hydrodynamic processes and phenomena Level of difficulty - 4* *- Nurash. Physical decay. Organic weathering. Chemical weathering. Formed relief and deposits. Norush shell. Drowning incident. Study of sedimentation and dangerous phenomena related to it. Biochemical process and phenomena. A sliding event. Types. Overturns, spills, landslides, flowing soils. Hydrodynamic process and phenomena. Erosion. Aerodynamic process and phenomena. Difficulty level - 3* *- Structure and volume of engineering-geological prospecting works. Peculiarities of engineering-geological prospecting in various constructions Difficulty level - 4* *- General circumstances. Engineer - types and composition of geological works. Project stages. Structure classes. Analysis of natural conditions and research of engineered geological conditions. Engineer geological surveyor. Excavation of rocks. Experimental hydrogeological works. Experimental water extraction method. Experimental water injection into the shurfs. Methods of pouring water into boreholes. Laboratory studies. Engineer-geological prospecting works for the design of hydrotechnical structures. Technical assignments. Project work and stages. Engineering-geomorphological studies. Difficulty level - 5* *- Drilling methods Difficulty level - 5* *- The main elements of the drill well. Types of drills according to the purpose of drilling wells. Drilling and additional equipment. Drilling. Difficulty level - 5* *- Pipes and auxiliary equipment for drilling boreholes Difficulty level - 5* *- Drill pipes and their dimensions. Reinforcing pipes, their dimensions. Cementing of boreholes. Types of cements. Methods of cementing boreholes. Calculation and preparation of cementation. Fins and their types. Selection and calculation of floats. Rules for prevention of*

Exams and assessment formats	*Two midterms (40 minutes each, written and oral) and a final oral exam (80 minutes) and written homework.*
Study and examination requirements	*Requirements for successful graduation:* *The total maximum score will be the sum of the points allocated to the final exam (60%), Midterm (20%), homework (10%) and classroom activity (10%). For successfully pass the subject, a student must gather 60% or more of the allotted points.*
Reading list	*References 1. F.G. Bell – Engineering Geology 2nd edition, 2007* *2. T. Davie. Fundamentals of hydrology. Second edition. Madison Avenue, New York, 2008. 221 p* *3. Elizabeth M. Shaw Hydrology in Practice.Third Edition.2005.-145p* *4. Yusupov G.U., Holbaev B.M. Fundamentals of geology and hydrogeology. - T.: The new generation, 2003. - 301 p.* *5. Yusupov G.U., Holboev B.M. Fundamentals of geology and hydrogeology. 2nd edition. - T.: New age generation, 2005. - 380 p.* *6. Irgashev Yu., Ergashev R. Geology and geomorphology. Tashkent, Science and Technology 2013.* *7. Yusupov G.U., Nurzhanov S.E. Geology, hydrogeology and geomorphology. - T.: TIMI., 2008. - 240b.* *8. Akbarov A., Nazaraliyev D., Hikmatov F. Hydrometry. Study guide, TIMI, Tashkent, 2015.129.* *9. Akbarov A.A., Nazaraliev D.V., Khikmatov F.Kh. "Hydrometry" study guide, TIMI, Tashkent, 2008, 154 pages.* *10. Karimov S., Akbarov A., Jonqobilov U.; Correction of hydrology, hydrometry and flow volume. Textbook. - T.: Teacher, 2004.-230 p.* *11. Savkin A.V., Fedorov S.V. Hydrology. Study guide. - St. Petersburg.: 2010.-102b* *12. H.A. Viles Synergistic Weathering Processes Reference Module in Earth Systems and Environmental Sciences 2021 Journal / Available online 16 October 2021, 127065 In Press, Journal Pre-proof.* *13. Gylfi Páll Hersir, Egill Árni Guðnason and Ólafur G. Flóvenz Geophysical Exploration Techniques Reference Module in Earth Systems and Environmental Sciences Journal / Available online 7 October 2021*

Faculty of hydromelioration
60812600 - meliorative hydrogeology.

Module designation	*GMK4105- construction and operation of water intake wells*
Semester(s) in which the module is taught	*10- semester*
Person responsible for the module	*Docent, assistant professor Ruziev Ilxom, assistant Nortaev Shavkat*
Language	*Uzbek*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload:150.* *Contact hours: lecture – 20.* *practical lessons – 40.* *self-learning – 90, hours*
Credit points	*5 credit*
Required and recommended prerequisites for joining the module	*Higher mathematics, physics, chemistry, hydraulics*
Module objectives/intended learning outcomes	*To know and understand:* *It is necessary to have knowledge about the water resources of the underground crust or layer and the laws of their movement, the peculiarity of the regime and balance of underground water in irrigated lands;* *It is necessary to have knowledge about the structure of the borehole, the organization and design of drilling operations, the operational layer of water withdrawal;* *Must have knowledge on strengthening the walls of the well;* *It is necessary to have knowledge on the selection of pumping equipment for a well, the use of drilling techniques and technologies used in geological and hydrogeological research; should have an idea about drilling equipment, drilling methods;* *Must have an idea about the design and organization of drilling operations;* To be able to: *Can perform well construction, drilling organization and design.* *learns how to select well pumping equipment, use drilling techniques and technologies used in geological-hydrogeological explorations.* *He learns to drill a well by washing it with water.* *Performs hydrogeological observations during drilling.* *Learns how to prepare a well for operation.* *To form competences in:* *specific aspects of geological and hydrogeological conditions, drilling methods, numerical methods of groundwater flow assessment, prediction of changes in hydrogeological conditions, geological and hydrogeological maps and research results, hydrogeological dimensions of aquifers and underground water flows, must have the skills of conducting hydrogeological and engineering, geological research, analyzing the results of research and using it..*

Content	*The content, parts and significance of the science in the economy The content, fields, history of development of the science "Hydrogeological-ameliorative observations and meliorative cadastre", its connection with other ameliorative, hydrogeological, engineering-geological, hydrological, soil sciences. Importance of science in production. Directions of science. The importance of the factors of our country and world scientists in the development of this science is difficulty level 2;* *Hydrogeological conditions of irrigated and cultivated lands. Factors and indicators of hydrogeological-reclamation conditions. Climatic conditions. Natural drainage. Distribution of hydrogeological and reclamation regions. Classification of the hydrogeological conditions of the lands under reclamation into types. The regime and balance of scattered water in the lands under reclamation is difficulty level 3;* *The main issue of the reclamation service in irrigated areas is the control of the reclamation condition of irrigated lands. Natural and irrigation economic factors affecting the meliorative state. Effect of irrigation on hydrogeological and meliorational conditions. Kulay melioration regimes and methods of their provision. 4 Objects and methods of meliorative control. Assessment of the reclamation status of irrigated lands. Difficulty level 3;*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*F.G. Bell – Engineering Geology 2nd edition, 2007* *T. Davie. Fundamentals of hydrology. Second edition. Madison Avenue, New York, 2008. 221 p* *Yusupov G.U., Holbaev B.M. Fundamentals of geology and hydrogeology. - T.: The new generation, 2003. - 301 p.* *Yusupov G.U., Holboev B.M. Fundamentals of geology and hydrogeology. 2nd edition. - T.: New age generation, 2005. - 380 p.* *Irgashev Yu., Ergashev R. Geology and geomorphology. Tashkent, Science and Technology 2013.* *Yusupov G.U., Nurzhanov S.E. Geology, hydrogeology and geomorphology. - T.: TIMI., 2008. - 240b.*

Example form for Module Handbook

A **Module Handbook or collection of module descriptions that is also available for students to consult** should contain the following information about the individual modules:

Module designation	*Hydrology of water reservoirs SOG-3110, SOG-4110*
Semester(s) in which the module is taught	*9 semester (15 weeks), 10 semester (15 weeks)*
Person responsible for the module	*1. Gapparov Furqat Axmatovich, (doctor of technical sciences) Professor* *2. Hamroqulov Jasurjon Sayli oglu, assistant*
Language	*uzbek*
Relation to curriculum	*compulsory*
Teaching methods	*Lecture, practical lessons, self-study, course work*
Workload (incl. contact hours, self-study hours)	*Total work load: - 150* *Total classroom hours: - 60* *lecture - 30* *lessons - 30* *self-study - 90*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Higher mathematics* *Physics* *Engineering geodesy* *Hydrology and hydrogeology* *Hydraulics* *Hydrography of Central Asia* *Hydrology* *Hydrometrics*

Module objectives/intended learning outcomes	***To know and understand:*** *- it is necessary to have knowledge of hydrological problems of reservoir hydrology, research methods, water sources of hydrography and laws of distribution of water in nature;* *- should know the methods of hydrological data analysis;* *- forming a methodical approach to events and processes in the water reservoir and a scientific outlook* *- to know how to determine the morphometric indicators and bathygraphy of reservoirs;* *- should have knowledge about the hydrological regime of reservoirs, influencing factors and changes, methods of determining morphological and morphometric indicators and bathygraphy of reservoirs.* ***To be able to:*** *- knows the hydrological problems of reservoir hydrology, research methods, water sources of hydrography and laws of distribution of water in nature;* *- can analyse hydrological data;* *- can conduct a methodical approach and scientific reasoning to events and processes in the water reservoir;* *- determines the morphometric indicators and bathygraphy of reservoirs;* *- has knowledge of the hydrological regime of reservoirs, influencing factors and changes, methods of determining morphological and morphometric indicators and bathygraphy of reservoirs.* *Formation of competences:* *- characteristics of reservoirs, laws, construction of reservoirs, reservoirs with dams and their elements, morphometric indicators of reservoirs, bathygraphy, hydrological regime, siltation, water wastage, reservoir basin, etc. to have an idea about the effective working mode of the filtration and reservoirs in the field;* *- to know the hydrological characteristics of reservoirs, the hydrological regime of reservoirs, influencing factors and changes, filtration in the reservoir basin and dam, and the effective working regime of reservoirs, the theoretical basis of observations and research on reservoirs, and be able to use them;* *- Student should have the skills to apply the methods of analysis of events and processes in water reservoirs, to accept solutions to problems of use, to evaluate their technical and economic indicators.*

Content	*- The science of hydrology of water reservoirs, subject, object of research, purpose, tasks, development. Level of difficulty: 1* *- Hydrological characteristics of rivers. Using the flow of rivers. Adjusting the flow rate. Construction of reservoirs. Difficulty level: 2* *- Reservoirs. The main characteristics of reservoirs, hydrography of reservoirs, reservoirs in Uzbekistan, the main structures that are part of reservoirs. Difficulty level: 2* *- Basic characteristics of reservoirs. Categorization and classification of reservoirs. Description of the water reservoir according to the purpose of its creation. Description of water reservoirs according to the adjustment of the flow volume of rivers. Difficulty level: 2* *- Dam reservoirs and their elements. Components of dam reservoirs, calculation of dam elements, upper and lower level, their identification, characteristics Level of difficulty: 3* *- Morphometric indicators of reservoirs. Bathygraphy of reservoirs. Difficulty level: 3* *- Hydrological regime of reservoirs, water level regime. Reservoirs water temperature, freezing regimes. Wind regime in the area of reservoirs. Wave mode of reservoirs. Hydro chemical regime of reservoirs. Difficulty level: 3* *- Assessment of hydro chemical composition of reservoir water. Difficulty level: 3* *- Clouding of reservoirs Difficulty level: 3* *- Formation of shores. Factors affecting the formation of coasts, erosion and erosion of coasts and their displacement, methods of calculation, measures to prevent the formation of coasts. Difficulty level: 3* *- Methods of calculating the volume and duration of silting of water reservoirs. Difficulty level: 4* *- Sedimentation balance equation of water reservoirs, measures to prevent and reduce siltation of water reservoirs. Cleaning of reservoirs from muddy sediments. Difficulty level: 4* *- Waste of water in the reservoir. Evaporation, diffusion and condensation processes from the water surface, lack of moisture, methods of determining evaporation: evaporators, water balance, methods of turbulence, diffusion and heat balance, devices for measuring evaporation. Filtrations in the reservoir basin and dam. Difficulty level: 4* *- Losses due to failure of reservoir management and facilities. Difficulty level: 4* *- Reservoirs water balance. Water management accounts in the reservoir. Difficulty level: 4* *- Use of reservoir water sources. Mode of operation of reservoirs, seasonal adjustment of flow, one-stroke reservoir operation mode, two-stroke reservoir operation mode and calculation methods. Difficulty level: 5* *- Reservoir mode in seasonal water flow management. Reservoir mode in annual water flow management. Difficulty level: 5* *- Spreading of flood in water reservoirs. Difficulty level: 5* *- Efficient operation of reservoirs. Boundary lines of water release from the reservoir. Difficulty level: 5* *- Impact of the reservoir on the ecological situation. Impact of reservoirs on the ecosystem. Effects on air, surface water, underground water, soil, flora and fauna, landscape, cultural value and monuments, socio-economic environment. Difficulty level: 5* *- Determining the zone of water protection of water reservoirs and the coastal region. Conducted economic activities, restrictions. Difficulty level: 5*

Exams and assessment formats	*Two midterms (40 minutes each, written and oral) and a final oral exam (80 minutes) and written homework.*
Study and examination requirements	*Requirements for successful graduation:* *The total maximum score will be the sum of the points allocated to the final exam (60%), Midterm (20%), homework (10%) and classroom activity (10%). For successfully pass the subject, a student must gather 60% or more of the allotted points.*
Reading list	*1. Ikramova M.R. Hydrology of water reservoirs. Tutorial book. Bactria Press. Tashkent, 2019 - 178 p.* *2. Gapparov F.A., Nazaraliyev D.V., Yangiev A.A. Exploitation of water reservoirs. Tashkent, 2019.-350 p.* *3. Ikramova M.R. Hydrology of water reservoirs. Textbook. Print Media. Tashkent, 2021 - 188 p.*

Example form for Module Handbook

A **Module Handbook or collection of module descriptions that is also available for students to consult** should contain the following information about the individual modules:

Module designation	*Construction and operation of water wells SQE3105*
Semester(s) in which the module is taught	*7 semester (15 weeks).*
Person responsible for the module	1. *Nurjanov Satbay Eshjanovich, candidate of technical sciences. docent*
Language	*uzbek*
Relation to curriculum	*compulsory*
Teaching methods	*Lecture, practical lessons, laboratory, self-study,*
Workload (incl. contact hours, self-study hours)	*Total work load: - 150* *Total classroom hours: - 60* *lecture - 20* *lessons - 40* *self-study - 90*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Higher mathematics* *Physics* *Engineering geodesy* *Hydrology and hydrogeology* *Hydraulics* *Hydrography of Central Asia* *Hydrology* *Hydrometrics*

Module objectives/intended learning outcomes	***To know and understand:*** *- "Construction and operation of water wells" specific aspects of geological and hydrogeological conditions, drilling methods, organization and design of drilling works, several methods of assessment of underground water flows, prediction of changes in hydrogeological conditions, drill Causes of failure and poor performance of the well, hydrogeological dimensions of aquifers and underground water flows, standards of reinforcing pipes and their main dimensions, hydrogeological observations during drilling, conducting research and geological research, analysis of research results should have the skills to make and use it.* ***To be able to:*** *- It is necessary to have knowledge about the water resources of the underground crust or layer and the laws of their movement, the peculiarity of the regime and balance of underground water in irrigated lands;* *- It is necessary to have knowledge about the structure of the borehole, the organization and design of drilling works, the operational layer of water withdrawal;* *- Must have knowledge on strengthening the walls of the well;* *- It is necessary to have knowledge on the selection of the pumping equipment for the well, the use of drilling techniques and technologies used in geological-hydrogeological research;* *- should have an idea about drilling equipment, drilling methods;* *- Must have an idea about the design and organization of drilling works;*
Content	*- The content and essence of the science of construction and operation of water intake wells in irrigation and water supply systems. Concepts of drilling wells and their main elements. Difficulty level - 2* *- Rocks and their characteristics. Types of rock by drilling. Difficulty level - 2* *- Information about underground water. Their depth, quality, consumption. Difficulty level - 3* *- The main factors determining the design of the borehole. Difficulty level - 3* *- Justification of the choice of the water-absorbing exploitation layer. Types of borehole strainers. Filter selection and their calculation. Structure of salniks. Difficulty level - 4* *- Preparation of drilling sites. Strengthening the walls of the well. Drilling shallow wells. Difficulty level - 4* *- Percussion-rope drilling. Technology and regime of shock-rope drilling in different hydrogeological conditions. Difficulty level - 4* *- Rotary drilling tools. Washing the well. Washing liquids and their appointment. Auger drilling. Breakdown and extraction of rocks. Hydrogeological observations during drilling. Difficulty level - 5* *- Column drilling and their types. General information about well pumping devices. Preparing the drill well for operation. Difficulty level - 5*
Exams and assessment formats	*Two midterms (40 minutes each, written and oral) and a final oral exam (80 minutes) and written homework.*
Study and examination requirements	*Requirements for successful graduation:* *The total maximum score will be the sum of the points allocated to the final exam (60%), Midterm (20%), homework (10%) and classroom activity (10%). For successfully pass the subject, a student must gather 60% or more of the allotted points.*

Reading list	*References 1. F.G. Bell – Engineering Geology 2nd edition, 2007* *2. T. Davie. Fundamentals of hydrology. Second edition. Madison Avenue, New York, 2008. 221 p* *3. Elizabeth M. Shaw Hydrology in Practice.Third Edition.2005.-145p* *4. Yusupov G.U., Holbaev B.M. Fundamentals of geology and hydrogeology. - T.: The new generation, 2003. - 301 p.* *5. Yusupov G.U., Holboev B.M. Fundamentals of geology and hydrogeology. 2nd edition. - T.: New age generation, 2005. - 380 p.* *6. Irgashev Yu., Ergashev R. Geology and geomorphology. Tashkent, Science and Technology 2013.* *7. Yusupov G.U., Nurzhanov S.E. Geology, hydrogeology and geomorphology. - T.: TIMI., 2008. - 240b.* *8. Akbarov A., Nazaraliyev D., Hikmatov F. Hydrometry. Study guide, TIMI, Tashkent, 2015.129.* *9. Akbarov A.A., Nazaraliev D.V., Khikmatov F.Kh. "Hydrometry" study guide, TIMI, Tashkent, 2008, 154 pages.* *10. Karimov S., Akbarov A., Jonqobilov U.; Correction of hydrology, hydrometry and flow volume. Textbook. - T.: Teacher, 2004.-230 p.* *11. Savkin A.V., Fedorov S.V. Hydrology. Study guide. - St. Petersburg.: 2010.-102b* *12. H.A. Viles Synergistic Weathering Processes Reference Module in Earth Systems and Environmental Sciences 2021 Journal / Available online 16 October 2021, 127065 In Press, Journal Pre-proof.* *13. Gylfi Páll Hersir, Egill Árni Guðnason and Ólafur G. Flóvenz Geophysical Exploration Techniques Reference Module in Earth Systems and Environmental Sciences Journal / Available online 7 October 2021*

Example form for Module Handbook

Faculty of Hydromelioration
The direction of education: 60710400 – Ecology and Environmental protection (water sector option).

Module designation	GG2104 Geology and Hydrogeology
Semester(s) in which the module is taught	4- semester
Person responsible for the module	Associate professor Kattakulov Farrukh Sayfullaevich, Associate professor, Ph.D Nurjanov Satbay Eshjanovich Assistant Nortaev Shavkat Ghulam ugli
Language	Uzbek, Russian
Relation to curriculum	Mandatory
Teaching methods	Lecture, practical lesson, laboratory lesson, self-learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: lecture - 20, practical lessons – 20, laboratory lesson – 20, self-learning – 90 hours
Credit points	5 credits
Required and recommended prerequisites for joining the module	Physics, Chemistry, Geodesy
Module objectives/intended learning outcomes	**To know and understand:** - about the shape and dimensions of the land, - composition and structure of the earth's crust, geological processes and events, - chemical composition, physical properties and movement laws of groundwater, - the peculiarity of the regime and balance of underground water in irrigated lands, - on geological and engineering - geological phenomena and processes spread in irrigated areas and construction sites **To be able to:** - specificity of geological and hydrogeological conditions, quantitative methods of assessment of underground water flows , - methods of predicting changes in hydrogeological conditions, geological and hydrogeological maps and research results, -hydrogeological indicators of underground water flows and aquifers and their use in solving reclamation issues, - negative events and processes related to the implementation of water management and reclamation measures, their prevention and prediction, - the basic physical and physical-mechanical parameters of soils necessary for calculating the structural and hydraulic parameters of hydromelioration networks **To form competences in:** - organization of observations on deformation and displacement of engineering structures; - methods of creating maps and sections, conducting hydrogeological and engineering geological explorations;

	-methods of processing and using research results, soil-hydrogeological-reclamation conditions of irrigated areas; - working with soil, hydrogeological and engineering-geological tools to assess the melioration condition of land reclamation and water management facilities; -geological and hydrogeological maps and research results; -hydrogeological indicators of underground water flows and aquifers and their use in solving reclamation issues; - negative events and processes related to the implementation of melioration and water supply activities; - basic physical and physical-mechanical parameters of soils, equipment of wells; -opening of water horizons, water horizons, construction of wells, filters, preparation of filters, calculation of basic parameters.
Content	Contents and sections of geology, hydrogeology and engineering geology. Services and contributions of scientists of our country and world scientists in the development of these sciences, the relationship of geology and hydrogeology with other sciences: 2 The shape and size of the land. The structure of the earth. Geospheres, their composition, state and properties. Electric, magnetic properties, density and temperature regime of earth bodies: composition, structure and condition of minerals. Rock-forming minerals and their identification (study) methods. The concept of rocks and their formation. Structure and texture of rocks, genetic classes. Classification of igneous rocks. Sedimentary rocks. Metamorphic rocks: 2 Endogenous geological processes: Magmatism and its types. Tectonic movements. Tectonic structures-geosynclines, platforms, shields, syneclises, anteclises, slope depressions. Earthquakes. Estimating the strength and power of earthquakes. Distribution of earthquakes in the territory of the Republic of Uzbekistan, their nature, consequences and importance in the construction and operation of hydrotechnical structures:3 Exogenous (terrestrial) geological processes and phenomena: Weathering process. Importance of wind activity in human production activities. Geological activity of running water on the surface of the earth. Geological activity of rain and melted snow water. Flood flows and their consequences. Geological activity of permanent flowing waters-rivers. River valleys, tributaries and deltas. Alluvial deposits, their types, composition and characteristics. Karst and suffocation. The influence of human production activities on the direction and consequences of geological processes: 3 Main geological units and rock complexes. Eras (groups), periods (systems), epochs (systems), centuries (floors). The main types of relief and their relationship with the tectonic conditions, geological history and structure of the regions. The concept of geological map and sections. Types of geological maps by content and scale:3

	The science of hydrogeology and its tasks The circulation of water in nature, the hydrosphere. Concept of aeration and water-saturated zones. Rock porosity and its quantitative assessment. Moisture capacity and types of rocks. Classification of rocks according to water permeability: 4 Classifications of underground water according to the condition of the bed. Aeration zone waters. Ground water and suspended seepage water. Ground and suspended seepage waters. The connection of systolic waters with climate, surface and interlayer pressure waters. Feeding, spreading and consumption of systolic waters. Map of hydroisogypsum and its designation. Water level, mineralization, etc. Interstratified waters Bed conditions, conditions of formation and distribution. Interlayer water basins: 4 Physical and other properties of underground water (color, taste, smell, density, clarity, electrical conductivity, radioactivity, etc.). The main components of groundwater. Assessment of Dissociated Compounds, Colloids, Gases, Microconstituents and Organic Compounds in Groundwater as Drinking Water for Water Supply and Irrigation Purposes:5 The main types and laws of groundwater movement. Filtration and infiltration. Calculation of consumption of water collecting facilities. Debit and comparative debit. Hydrogeological characteristics of rocks and their determination methods:5 Groundwater regime and its main elements. Mode-forming conditions and factors. Objectives and tasks of placing regime monitoring branches. Calculation of general and private water-salt balance of irrigated lands. Forecasting of the water and salt regime of lands undergoing land reclamation, forecasting methods. Classes of underground water reserves and resources. Natural and artificial reserves and resources. Operational reserves and resources of underground water:5 Grunt concept. The main engineering-geological properties of rocks: density and bulk density, natural slope angle, flexibility, expansion, compression, water resistance, compressibility, resistance to shear and shear:4 Geological processes (weathering, earthquakes, erosion, etc.) that are taken into account in the design, construction and operation of reclamation activities and structures. Pushes, rollovers, weaves and fluidity. Recommendations and countermeasures. Types of suffosis and forms of manifestation. Mechanical and chemical suffosis. Irrigation suffocation and erosion, manifestation and control measures: 5 Processes and events that occur as a result of long-term withdrawal of water from wells and various reclamation activities. The importance of geological and engineering-geological processes and phenomena in the design, construction and operation of hydromelioration systems

	and their consideration:5 The main tasks of hydromelioration system, engineering structures and agricultural water supply structures design, and engineering-geological research works. Types of research works, the main factors determining their content and size. Search (reconnaissance) work. Geophysical research works. Field hydrogeological and engineering-geological experimental works:
Exams and assessment formats	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.
Study and examination requirements	Students of successful transition from science 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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.
Reading list	1. Yusupov G.U., Gapparov F.A., Nurzhanov S.E., Ruziev I.M. Textbook of engineering geology and hydrogeology - Tashkent "TIQXMMI" MTU 2021-340 b 2. Ruziev I.M., Nurzhanov S.E. Engineering geology and hydrogeology textbook Tashkent "TIQXMMI" MTU 2022-220 p . 3 . Yusupov G.U., Kattakulov F.S., Methodical instructions for practical training in geology and hydrogeology Tashkent-2011 30 b

Example form for Module Handbook

A **Module Handbook or collection of module descriptions that is also available for students to consult** should contain the following information about the individual modules:

Module designation	*M M R 4 205 Ameliorative monitoring*
Semester(s) in which the module is taught	*7 semesters (15 weeks)*
Person responsible for the module	*Ph.D., Associate Professor Nurjanov Satbay Eshjanovich* *Ph.D. associate professor Ruziev Ilkhom Makhmudovich* *Assistant Nortaev is the son of Shavkat Ghulam*
Language	*(Uzbek, Russian)*
Relation to curriculum	*Choice*
Teaching methods	*Report, practical training*
Workload (incl. contact hours, self-study hours)	*Total load : 150* *Auditorium hours: 60* *Report - 30 hours;* *30 hours of practical training* *Independent education 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Physics, Chemistry, Hydrology*
Module objectives/intended learning outcomes	*To analyze the hydrogeological conditions of the areas where C is used; to calculate the regime and balance of seepage waters; knowledge of geological and hydrogeological conditions of land, assessment of underground water flows, their prediction, creation of hydrogeological maps, drilling techniques and technologies used in geological and hydrogeological explorations, drilling equipment, drilling methods ;* *To use the created hydrogeological-ameliorative maps; knowledge of negative processes and events that occur when reclamation activities are carried out, and their prediction; prevent possible negative processes; assessment of hydrogeological reclamation conditions of irrigated lands, results of geological and hydrogeological maps and studies, hydrogeological indicators of groundwater flows and aquifers and their use in solving reclamation issues, related to the implementation of reclamation and water supply measures negative events and processes, basic physical and physical-mechanical parameters of soils, well equipment, opening of water horizons, water horizons, construction of wells, filters, preparation of filters, basic parameter calculation skills;* *Peculiarities of geological and hydrogeological conditions, drilling methods, several methods of assessment of underground water flows, prediction of changes in hydrogeological conditions, geological and hydrogeological maps and research results, hydrogeological dimensions of aquifers and underground water flows, Competences on the ability to clearly state their opinions and conclusions on the methods of drawing up the water balance of the area, hydrogeological data of observations, conducting hydrogeological and engineering, geological research, analyzing the results of research and using it. to have*

Content	*The science of ameliorative monitoring is to provide specialists with the ability to assess hydrogeological and ameliorative conditions in areas where reclamation works are carried out, and to apply the acquired theoretical and practical knowledge in practice.*
Exams and assessment formats	*One midterm control (20 minutes) and final oral exam (40 minutes).*
Study and examination requirements	*Students who successfully pass the science* *The total maximum points awarded will be the sum of the points allocated to the final exam (60%), Midterm (20%), homework (10%) and classroom activity (10%). In order to successfully pass the subject, a student must score 60% or more of the allotted points.*
Reading list	*1.Yusupov G.U Hydrogeological-ameliorative observations and a study guide on the science of ameliorative cadastre - Tashkent "TIQXMMI" MTU 2021-166 b* *2.Yusupov G.U., Guvvatov D.A. Methodical instructions for conducting practical training in the science of reclamation hydrogeology - Tashkent 2015-100 b*

Example form for Module Handbook

Faculty of Hydromelioration

The direction of education: 60812300 - Water management and land reclamation.

Module designation	MG2105 Meliorative hydrogeology
Semester(s) in which the module is taught	4- semester
Person responsible for the module	Associate professor, Ph.D Nurjanov Satbay Eshjanovich Associate professor, Ph.D Ruziyev Ilkhom Maxmudovich Assistant Nortaev Shavkat Ghulam ugli
Language	Uzbek, Russian
Relation to curriculum	Elective
Teaching methods	Lecture, practical lesson, self-learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 Contact hours: lecture - 30, practical lessons – 30, self-learning – 90, hours
Credit points	5 credits
Required and recommended prerequisites for joining the module	Physics, Chemistry, Hydrology

Module objectives/intended learning outcomes	**To know and understand:** *- analysis of hydrogeological conditions of irrigated areas;* *- calculate the regime and balance of seepage waters;* *- assessment of geological and hydrogeological conditions of land, underground water flows, their prediction;* *- making hydrogeological maps,* *- drilling techniques and technologies used in geological and hydrogeological research, drilling equipment, drilling methods* **To be able to:** *- to use the created hydrogeological-ameliorative maps;* *- to know the negative processes and events that occur when meliorative measures are implemented, and to predict them; - to prevent possible negative processes; assessment of hydrogeological improvement conditions of irrigated lands, results of geological and hydrogeological maps and studies,* *-hydrogeological indicators of underground water flows and aquifers and their use in solving reclamation issues,* *- negative events and processes related to the implementation of melioration and water supply measures,* *- basic physical and physical-mechanical indicators of soils, equipment of wells,* *- open aquifers, aquifers, construction of wells, filters, preparation of filters, calculation of basic parameters* **To form competences in:** - organization of observations on deformation and - *specific aspects of geological and hydrogeological conditions* *-drilling methods, several methods of assessment of underground water flows,* *- prediction of changes in hydrogeological conditions,* *-geological and hydrogeological maps and research results, hydrogeological dimensions of aquifers and underground water flows,* *- methods of establishing the water balance of the region, hydrogeological data of observations, conducting hydrogeological and engineering, geological research,* *- to be able to clearly express one's opinions and conclusions regarding the analysis and use of research results,* *- assessment of hydrogeological-ameliorative conditions.*

Content	*The tasks and content of reclamation hydrogeology in the reclamation of agricultural lands, urban and industrial areas. General information about irrigation and drainage. Elements of hydromelioration systems. Irrigation methods and water injection technology. Tasks of studying the hydrogeological-ameliorative conditions. Factors of hydrogeological-ameliorative conditions: 2* *General concepts and definition of hydrogeological process stages. Development laws of hydrogeological processes and their analysis in land reclamation. Factors determining hydrogeological processes (climate, relief, geomorphological, geological factors) and their description. Hydrogeological regions and their hydrodynamic description, regions of feeding and transit, consumption, re-reduction and spread of streams:2* *Mode types. Natural and disturbed modes. Syzot water regime genetic types. Characteristics of seepage water regime distributed in different natural regions and irrigation areas. Regime of mineralization and chemical composition of Sizot waters. Principles of management of seepage water regime. Water balance in land under reclamation. Balance types. Total water balance, aeration zone balance, seepage water balance. Balance components. Study of the balance sheet and research of balance sections. Analysis of the balance sheet: 2* *Factors of formation of irrigation nutrition during irrigation and salt washing. Specificity of irrigation nutrition in different climatic regions. Basing irrigation nutrition on the basis of modeling moisture transport in the aeration zone. Damping of seepage water in newly irrigated lands: 3* *Hydrodynamic indicators and boundary conditions necessary for land reclamation assessment, forecasting, and design of reclamation structures. Hydrodynamic indicators - definition of their concepts. Methods of determining hydrodynamic parameters. Hydrogeological - division into reclamation districts. Definition of concepts; division into regional and local districts, taking into account the specificity of the hydrogeological process in the arid climate region and the distribution of stormwater in the regions. Geofiltration schemes of reclamation lands, general concepts about filtration schemes, a brief history of the issue. Geofiltration sections: 3* *The role and importance of boreholes in irrigation and water supply systems. Concepts of drilling wells and their main elements. A brief history of drilling techniques and technology in Uzbekistan and abroad. Development of drilling science. The connection of this science with other sciences. Basic requirements for a borehole. Types of rocks by drilling, sedimentary, igneous, metamorphic rocks and their properties. Types of rock damage during drilling: 4* *The main factors that determine the design of the borehole. Elements of the construction of a wellbore: wellhead, conductor, guide, technical, operational and strainer pipe set. Justification of the choice of water-absorbing operational layer. Basic information on the hydrogeological calculation of the borehole. Determination of borehole indicators based on*

	experimental water withdrawal results. Consideration of wellbore interactions: 4 *Borehole strainers. The main elements of strainer strings. Reasons for strainer failure. Perforated filters for catching small particles: perforated, various, wire, gravel, etc. Filter selection and their calculation. Structure of salniks. Strainer wells. Conditions of use, specific features of the device. Perforated filters for catching small particles: perforated, various, wire, gravel, etc. Filter selection and their calculation. Structure of salniks. Strainer wells. Conditions of use, specific features of the device: 5* *Technology and regime of shock-rope drilling in various hydrogeological conditions: in loose rocks, clay, sand, large gravels. Determining the weight of the required drilling projectile. The ratio of the height of the boom and the number of strokes. Optimum mode of drilling Determination of the weight of the required drilling projectile. The ratio of the height of the boom and the number of strokes. Optimal mode of drilling: 5* *Rotary drilling tools. Operating conditions of drill pipes and their calculation. Complete sets of drilling columns. Auxiliary devices used in an accident. Tools for lifting and lowering drilling and reinforcing pipes. Operating conditions of drill pipes and their calculation. Complete sets of drilling columns. Auxiliary devices used in an accident. Tools for lifting and lowering drilling and reinforcing pipes:5* *Washing the well. Detergents and their appointment. Clay mixtures, their main properties. Special compounds for drilling in complex geological conditions. Cleaning clay mixtures. Clay mixtures and equipment for washing them and necessary tools. Washing fluid for aquifer drilling. Special compounds for drilling in complex geological conditions. Cleaning clay mixtures. Clay mixtures and equipment for washing them and necessary tools. Flushing fluid for drilling the aquifer:5*
Exams and assessment	To fully master the theoretical and methodological concepts

formats	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.
Study and examination requirements	Students of successful transition from science 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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.
Reading list	*Yusupov G.U., Guvvatov D.A. Study guide on reclamation hydrogeology - Tashkent "TIQXMMI" MTU 2015-250 b* *Yusupov G.U., Guvvatov D.A. Methodical instructions for conducting practical training in the science of reclamation hydrogeology - Tashkent 2015-100 b*

Module designation	*DKA 2105 Introduction to state cadastres*
Semester(s) in which the module is taught	*3- semester*
Person responsible for the module	*Associate professor, PhD Mukhtorov Uzbekkhan*
Language	*Uzbek, Russian*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture - 30, practical lessons – 30, self-learning – 90, hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Geodesy, cartography, cartographic design*

Module objectives/intended	*After mastering the discipline, the student* *– knows and can explain the procedure for creating and*

learning outcomes	*maintaining state cadastres, the procedure for dividing the territories of the Republic of Uzbekistan into cadastral units and forming cadastral numbers, creating and maintaining the unified system of state cadastres (USSC);* *– understands the creation and maintenance of state cadastres belonging to the group of real estates, that is, state land cadastre, buildings and structures, state urban planning, objects of cultural heritage, hydrotechnical facilities;* *– understands state cadastres belonging to the series of linear state cadastres, i.e. highways, railways, communication facilities, energy facilities, supply pipelines, cartography-geodesy, and the features of their management;* *– knows the state registers belonging to the group of natural resources, i.e. mines, mineral deposits and man-made products, state water cadastre, forest, flora and fauna, waste burial and disposal sites and their management features;* *– knows state cadastres belonging to the group of natural areas, that is, regions, protected natural areas, zones with high natural risk, zones with high man-made risk, state cadastres and the features of their management;* *– the content of information related to the unified system of state cadastres, their formation, can use GIS programs in the formation of data in the unified system of state cadastres based on geoinformation technologies.*

Content	*Cadastre concept, content and tasks. Political, economic and social importance of state cadastres. The nature, function and general system of state cadastres. Legal basis of transfer of the unified system of state cadastres. The role of "Land Code", "On State Cadastres", "On State Land Cadastre" and other relevant laws in maintaining state cadastres. Sources and principles of state cadastre management. Level of difficulty: 2* *Comprehensive study of existing natural resources and other objects in the territory of the Republic. Methods of collecting the necessary information about their legal status, amounts and characteristics based on a single methodology. The need to bring cadastres into a single system. Description of objects and entities. Level of difficulty: 2* *Issues of methodical and practical study of national, integrated and comprehensive consideration and assessment of scientific and economic potential of the country. State cadastre service. Service system and tasks. Quantity and quality indicators of objects. Cadastre directions, their interrelation and sequence. Contents of cadastral documents. Level of difficulty: 2* *Place of natural resources (land, water, forest, minerals, specially protected natural areas) in the State cadastre system. Description of natural resources. Territorial location of resources and methods of their study. Quantity and quality of natural resources. Collection, processing and use of data on types of natural resource cadastres. Level of difficulty: 3* *Stages in keeping cadastres. The role of the land cadastre in the general system and procedure. Nature and tasks of water cadastre. Tasks and procedures of the cadastre of mineral deposits and man-made products. Cadastre of specially protected natural areas. Cadastre of areas with high man-made risk. Level of difficulty: 3* *Cadastre of the animal world. Cadastre of the world of plants. Quantitative and qualitative assessment of fauna and flora cadastre objects. The uniqueness of their management. Level of difficulty: 3* *The essence and tasks of keeping state cadastres of linear type. Procedures for maintenance of road cadastre. Methodological approach to railway cadastre management. Peculiarities of keeping the state cadastre in the field of energy. The procedure for maintaining communication and telecommunication cadastres. Cadastre data on urban engineering communications. Qualitative and quantitative assessment of engineering communications in rural areas. Level of difficulty: 4* *Types of real estate. Keeping the cadastre of buildings and structures. Urban planning cadastre. Keeping production and consumption waste cadastre. Determining the volume and quality of production and consumption waste. Cadastre of historical and cultural monuments. Specificity of determining the area and quality of historical and cultural monuments in the territory of the Republic and maintaining the cadastre. Level of difficultyu:4* *Real estate objects in the territory of subjects, their*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. И.Ихлосов, Д.Ризаева. Давлат кадастри асослари. Ўқув қўлланма. NOSHIR, 2019 y. 225 b.* *2.Raxmonov Q., Uspankulov B. Davlat kadastri asoslari. O'quv qo'llanma. TIQXMMI nashryoti, 2018 y. 208b.;* *3. Д.Ярматова, А.Бобожонов, А.Рахимов. Давлат кадастри асослари. Чўлпон номидаги нашриёт матбаа уйи, 2014 й. 234 б.* *4. Ашуров А.Ф. Основы государственных кадастров. Учебное пособие.ТИИИМСХ. Т.: 2020 г.- 168 стр.;* *5. Velta Parsova, Virginija Gurskiene, Madis Kaing. "Real property cadastre in 323ortal countries" Textbook. Jelgava – 2012.;*

Faculty of Land resources and cadastre
The direction of education: 60813100 – Land cadastre and land management

Module designation	*DKA 2105-Fundamentals of state cadasters*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Mukhtorov Uzbekkhan Burkhanovich - Doctor of Philosophy in Economics,associate professor;* *Uspankulov Bekjan Musabekovich – assistant of professor*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours* *Contact hours: lecture – 30 hours,* *practical lessons – 30 hours,* *self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geodesy, Cartography, Cartographic design*

Module objectives/intended learning outcomes	***To know and understand:*** – *knows and can explain the procedure for creating state cadastres, the procedure for dividing the territories of the Republic of Uzbekistan into cadastral units and forming cadastral numbers, creating and maintaining a unified system of state cadastres;* – *understands the creation and maintenance of state cadastres of real estate, that is, state land cadastre, buildings and structures, state urban planning, cultural heritage objects, hydrotechnical structures;* ***To be able to:*** – *understands state cadastres belonging to the series of linear state cadastres, that is, highways, railways, communication facilities, energy facilities, supply pipelines, cartography-geodesy and their management features;* – *knows the features of natural resources, that is, mines, minerals and man-made products, the state water cadastre, forest, flora and fauna, the state register of waste disposal and landfills and their management;* ***To form competencies in:*** – *knows the state cadastres belonging to the group of natural areas, i.e. the state cadastre of territories,*

	protected natural areas, natural danger zones, zones with a high level of man-made danger and their maintenance; – *knows the content of information related to the unified system of state cadastres, their formation, the use of GIS programs in the formation of data in the unified system of state cadastres based on geoinformation technologies.*

Content	*Cadastre concept, content and tasks. Political, economic and social importance of state cadastres. The nature, function and general system of state cadastres. Legal basis of transfer of the unified system of state cadastres. The role of "Land Code", "On State Cadastres", "On State Land Cadastre" and other relevant laws in maintaining state cadastres. Sources and principles of state cadastre management. Difficulty level: 2* *Comprehensive study of existing natural resources and other objects in the territory of the Republic. Methods of collecting the necessary information about their legal status, amounts and characteristics based on a single methodology. The need to bring cadastres into a single system. Description of objects and entities. Difficulty level: 2* *Issues of methodical and practical study of national, integrated and comprehensive consideration and assessment of scientific and economic potential of the country. State cadastre service. Service system and tasks. Quantity and quality indicators of objects. Cadastre directions, their interrelation and sequence. Contents of cadastral documents. Difficulty level: 2* *Place of natural resources (land, water, forest, minerals, specially protected natural areas) in the State cadastre system. Description of natural resources. Territorial location of resources and methods of their study. Quantity and quality of natural resources. Collection, processing and use of data on types of natural resource cadastres. Difficulty level: 3* *Stages in keeping cadastres. The role of the land cadastre in the general system and procedure. Nature and tasks of water cadastre. Tasks and procedures of the cadastre of mineral deposits and man-made products. Cadastre of specially protected natural areas. Cadastre of areas with high man-made risk. Difficulty level: 3* *Cadastre of the animal world. Cadastre of the world of plants. Quantitative and qualitative assessment of fauna and flora cadastre objects. The uniqueness of their management. Difficulty level: 3* *The essence and tasks of keeping state cadastres of linear type. Procedures for maintenance of road cadastre. Methodological approach to railway cadastre management. Peculiarities of maintaining the state cadastre in the field of energy. The procedure for maintaining communication and telecommunication cadastres. Cadastre data on urban engineering communications. Qualitative and quantitative assessment of engineering communications in rural areas. Difficulty level: 4* *Types of real estate. Keeping the cadastre of buildings and structures. Urban planning cadastre. Keeping production and consumption waste cadastre. Determining the volume and quality of production and consumption waste. Cadastre of historical and cultural monuments. Specificity of determining the area and quality of historical and cultural monuments in the territory of the Republic and maintaining the cadastre. Level of difficulty: 4* *Real estate objects in the territory of subjects, their types and composition. Tasks and features of their placement. Valuation of real estate. Data collection, processing and use. Composition of real estates and features of their assessment in land-using entities operating in agriculture. Level of difficulty: 5* *The procedure for maintaining the cartography-geodesy cadastre, the specific features of its transfer. Quantitative and qualitative indicators of the cadastre. How to collect, analyze and use data. Level of difficulty: 5* *Types of information and sources of collection. Procedure for processing and using information. Procedure for creating a database. Powers of public service bodies collecting public funds. The procedure for processing, confirming and using information. Difficulty level: 5*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	*1. I. Ikhlosov, D. Rizaeva. Basics of the state cadastre. Study guide. PUBLISHER, 2019. 225 p.* *2. Rakhmonov Q., Uspankulov B. Basics of state cadastre. Study guide. TIIAME publishing house, 2018. 208b.;* *3. D. Yarmatova, A. Bobojonov, A. Rakhimov. Basics of the state cadastre. Cholpon publishing house, 2014. 234 p.* *4. Ashurov A.F. Osnovy gosudarstvennykh kadastrov. Uchebnoe posobie.TIIAME. T.: 2020 - 168 pages;* *5. Velta Parsova, Virginija Gurskiene, Madis Kaing. "Real property cadastre in other countries" Textbook. Jelgava - 2012.;*

Faculty of Land resources and cadastre
The direction of education: 60722800– Cadastre

Module designation	*DKA 2105-Fundamentals of state cadasters*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Mukhtorov Uzbekkhan Burkhanovich - Doctor of Philosophy in Economics,associate professor;* *Uspankulov Bekjan Musabekovich – assistant of professor*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours* *Contact hours: lecture – 30 hours,* *practical lessons – 30 hours,* *self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geodesy, Cartography, Cartographic design*

Module objectives/intended learning outcomes	***To know and understand:*** – *knows and can explain the procedure for creating state cadastres, the procedure for dividing the territories of the Republic of Uzbekistan into cadastral units and forming cadastral numbers, creating and maintaining a unified system of state cadastres;* – *understands the creation and maintenance of state cadastres of real estate, that is, state land cadastre, buildings and structures, state urban planning, cultural heritage objects, hydrotechnical structures;* ***To be able to:*** – *understands state cadastres belonging to the series of linear state cadastres, that is, highways, railways, communication facilities, energy facilities, supply pipelines, cartography-geodesy and their management features;* – *knows the features of natural resources, that is, mines, minerals and man-made products, the state water cadastre, forest, flora and fauna, the state register of waste disposal and landfills and their management;* ***To form competencies in:*** – *knows the state cadastres belonging to the group of natural areas, i.e. the state cadastre of territories, protected natural areas, natural danger zones, zones with a high level of man-made danger and their maintenance;* – *knows the content of information related to the*

	unified system of state cadastres, their formation, the use of GIS programs in the formation of data in the unified system of state cadastres based on geoinformation technologies.

Content	*Cadastre concept, content and tasks. Political, economic and social importance of state cadastres. The nature, function and general system of state cadastres. Legal basis of transfer of the unified system of state cadastres. The role of "Land Code", "On State Cadastres", "On State Land Cadastre" and other relevant laws in maintaining state cadastres. Sources and principles of state cadastre management. Difficulty level: 2* *Comprehensive study of existing natural resources and other objects in the territory of the Republic. Methods of collecting the necessary information about their legal status, amounts and characteristics based on a single methodology. The need to bring cadastres into a single system. Description of objects and entities. Difficulty level: 2* *Issues of methodical and practical study of national, integrated and comprehensive consideration and assessment of scientific and economic potential of the country. State cadastre service. Service system and tasks. Quantity and quality indicators of objects. Cadastre directions, their interrelation and sequence. Contents of cadastral documents. Difficulty level: 2* *Place of natural resources (land, water, forest, minerals, specially protected natural areas) in the State cadastre system. Description of natural resources. Territorial location of resources and methods of their study. Quantity and quality of natural resources. Collection, processing and use of data on types of natural resource cadastres. Difficulty level: 3* *Stages in keeping cadastres. The role of the land cadastre in the general system and procedure. Nature and tasks of water cadastre. Tasks and procedures of the cadastre of mineral deposits and man-made products. Cadastre of specially protected natural areas. Cadastre of areas with high man-made risk. Difficulty level: 3* *Cadastre of the animal world. Cadastre of the world of plants. Quantitative and qualitative assessment of fauna and flora cadastre objects. The uniqueness of their management. Difficulty level: 3* *The essence and tasks of keeping state cadastres of linear type. Procedures for maintenance of road cadastre. Methodological approach to railway cadastre management. Peculiarities of maintaining the state cadastre in the field of energy. The procedure for maintaining communication and telecommunication cadastres. Cadastre data on urban engineering communications. Qualitative and quantitative assessment of engineering communications in rural areas. Difficulty level: 4* *Types of real estate. Keeping the cadastre of buildings and structures. Urban planning cadastre. Keeping production and consumption waste cadastre. Determining the volume and quality of production and consumption waste. Cadastre of historical and cultural monuments. Specificity of determining the area and quality of historical and cultural monuments in the territory of the Republic and maintaining the cadastre. Level of difficulty: 4* *Real estate objects in the territory of subjects, their types and composition. Tasks and features of their placement. Valuation of real estate. Data collection, processing and use. Composition of real estates and features of their assessment in land-using entities operating in agriculture. Level of difficulty: 5* *The procedure for maintaining the cartography-geodesy cadastre, the specific features of its transfer. Quantitative and qualitative indicators of the cadastre. How to collect, analyze and use data. Level of difficulty: 5* *Types of information and sources of collection. Procedure for processing and using information. Procedure for creating a database. Powers of public service bodies collecting public funds. The procedure for processing, confirming and using information. Difficulty level: 5*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	*1. I. Ikhlosov, D. Rizaeva. Basics of the state cadastre. Study guide. PUBLISHER, 2019. 225 p.* *2. Rakhmonov Q., Uspankulov B. Basics of state cadastre. Study guide. TIIAME publishing house, 2018. 208b.;* *3. D. Yarmatova, A. Bobojonov, A. Rakhimov. Basics of the state cadastre. Cholpon publishing house, 2014. 234 p.* *4. Ashurov A.F. Osnovy gosudarstvennykh kadastrov. Uchebnoe posobie.TIIAME. T.: 2020 - 168 pages;* *5. Velta Parsova, Virginija Gurskiene, Madis Kaing. "Real property cadastre in other countries" Textbook. Jelgava - 2012.;*

Faculty of Land resources and cadastre
The direction of education: 60722800– Cadastre

Module designation	*DSHK 3205- State urban planning cadastre*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Ashurov Abdullo Faizullaevich - Doctor of Philosophy in technical sciences,associate professor;*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours* *Contact hours: lecture – 30 hours,* *practical lessons – 30 hours,* *self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geodesy, land cadastre, building and construction cadastre*

Module objectives/intended learning outcomes	***To know and understand:*** *Electronic geophone of engineering and technical studies, division of residential areas by cadastre, formation and issuance of cadastral numbers, real estate, precise address registers of engineering, transport and social infrastructure objects, approved urban planning documents on the development and construction of areas , to have an idea of the urban planning regulations on the construction of territories and the use of urban planning activity objects, information about the objects and subjects of urban planning activity;* ***To be able to:*** *• to have information on the method of registration of state urban planning cadastre objects, normative and legal bases for maintaining urban planning cadastre, technology of creating state urban planning geoportals, to know and be able to use electronic programs for creating information;* ***To form competencies in:*** *– should have the skills to form thematic layers related to the state urban planning cadastre, describe the spatial location of vector objects (point, line and area), prepare documents of the state urban planning cadastre.*

Content	*Population settlement is one of the most important broad forms of the influence of man and nature on each other and reflects the process of social development. 10-12 thousand years ago, that is, after farming became the main occupation of man, people started building houses and creating settlements. At the same time, group-group population settlement appeared, that is, elements of population settlement appeared. The extensive development of population settlement continued until the third millennium AD. As a result of the territorial division of labor that began in this period, cities were created. Cities concentrated power, religion, crafts, and trade in themselves. They formed settlement areas around them, interacting with rural settlements close to them. Difficulty level: 2* *The existing directions of the current socio-economic policy in Uzbekistan are the expansion of the boundaries of private real estate as a consumer product and means of production, the protection of the rights of their owners in the established order is an important condition for economic development and social stability. The owner, user or tenant of a plot of land or a building can exercise their rights under any circumstances. Some existing cases of land registration in Uzbekistan arise from special aspects of real estate in the country; Registration and registration of rights are completely different concepts. Difficulty level: 2* *The division of territories of the Republic of Uzbekistan by cadastre is carried out in order to create a unified system of real estate registration and to assign cadastral numbers to land plots, buildings, structures. The cadastral division and cadastral numbering system should ensure the uniform identification of any land, plots, buildings and structures in the unified system of real estate registration. districts, plots of land are the units of division of territories of the Republic of Uzbekistan according to the cadastre. The cadastral division boundaries at the level of regions, districts and cities subordinate to the region correspond to the boundaries of administrative divisions. Cadastral zones of the territory of the administrative district (city under the province), respectively. Difficulty level: 2* *The system of identification of land plots, buildings and structures in the Republic of Uzbekistan is built according to the single principle, which is based on the cadastral number of the land plot. The cadastral number is a number that cannot be repeated in the territory of the Republic of Uzbekistan for a plot of land, a building, a structure. The land plot, building, structure is a non-repeating number on the territory of the Republic of Uzbekistan, it is given during its formation in accordance with the procedure established by legislation and is preserved until it exists as a single object of the registered right. The cadastral number of the building, structure is formed as the number of the sequence of buildings and structures on the border of the land plot. The cadastral number of a part of the building, structure is formed as the number of the next order within the boundary of the main building, structure. Mandatory elements that make up the*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	*1. Ashurov A.F. State urban planning cadastre, Study guide. Tashkent 2014* *2. Ashurov A.F. State cadastre database. Study guide. Tashkent 2021.*

Faculty of Agricultural Mechanization

5430400 – Technical service in agriculture and water management

Module designation	*MFA 4204* ***Fundamentals of using machines***
Semester(s) in which the module is taught	*10- semester*
Person responsible for the module	*Docent Berdimuratov Paraxat*
Language	*Uzbek*
Relation to curriculum	*Selection*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours: lecture - 30, practical lessons – 30, self-learning – 60, hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Mechanism and machine theory, Materials science and technology of construction materials, Hydraulics and hydraulic machines.*
Module objectives/intended learning outcomes	
Content	*The importance of using techniques in the cultivation of agricultural products* *General description of production processes and machine-tractor units* *The equation of motion of the aggregate* *Use-technological properties of working machines* *Features of using mobile power tools* *Compilation of aggregates* *Agregatlarni kinematikasi* *Turning technology and movement methods of the unit* *Costs of using aggregates in technological processes* *Importance of aggregates in production of work product* *Types of aggregate productivity*

	The main reserves of increasing aggregate work productivity. *Design of technological processes in agricultural production* *Mechanized work technology and production rules* *Efficiency of technical use of machines* *Technological map specific to the region where the farm is located and the procedure for selecting tractors and agricultural machines;* *Technological map specific to the region where the farm is located and the procedure for selecting tractors and agricultural machines;* *Determining requirements for machine-tractor units and fuel consumption;* *Determining requirements for machine-tractor units and fuel consumption;* *Organization of effective use of tractors and agricultural machines;* *Organization of effective use of tractors and agricultural machines;* *Planning of technical maintenance work for farm machinery;* *Planning of technical maintenance work for farm machinery;* *Xo'jalikning mashina saroyi va neft mahsulotlarini saqlash shahobchasini loyihalash* *Design of the farm's machine shed and oil products storage branch* *Determination of technical and economic indicators of the use of farm equipment* *Determination of technical and economic indicators of the use of farm equipment* *Evaluation of the composition of the aggregate according to the coefficient of use of the tractor's traction force* *Evaluation of the composition of the aggregate according to the coefficient of use of the tractor's traction force* *Evaluation of the composition of the unit according to the coefficient of work paths* *Studying the technical and operational indicators of modern tractors produced by foreign companies through the Internet;* *To study the application indicators of innovative technology and machines used in the cultivation of agricultural products;* *Analysis of ergonomic indicators of innovative technologies and tools used in the production processes of agricultural machines* *Study of remote control systems of agricultural machinery produced in foreign countries via the Internet.* *Study of technical and operational indicators of*

	modern tractors produced by foreign companies *Study of technical and operational indicators of innovative technologies and machines used in basic and shallow soil cultivation.* *To study the technical and operational indicators of innovative technologies and machines used in planting seeds and seedlings.* *Studying the technical and operational indicators of innovative technologies and machines used in basic and shallow tillage* *Studying the technical and operational indicators of innovative technologies and machines used in planting seeds and seedlings* *To study the technical and operational indicators of innovative technologies and machines used in inter-row cultivation.* *To study the technical and operational indicators of innovative technologies and machines used in the harvesting of agricultural products.* *To study the types of use of drip irrigation systems in production and their structure.* *Study of remote control systems of machine-tractor units. Study of modern systems of management of production processes.* *To study the promising directions of applying the "precision farming" system to production.* *To study the prospects of increasing the efficiency of the use of agricultural machinery.* *To study the application guidelines of resource-saving techniques and technologies used in the cultivation of agricultural products.* *To study the technical and operational indicators of resource-saving techniques and technologies used in production processes.* *Studying the structure of the gas cylinder supply system installed on tractors abroad and in our country* *Studying the technical specifications of agricultural machines manufactured by foreign companies through the Internet* *Selection of innovative technologies and techniques used in agricultural production processes and analysis of their technical and economic indicators* *Study of modern systems of management of production processes* *To study the technical and economic indicators of the tractors produced at the Tashkent Tractor Plant* *To study the technical and operational indicators of innovative technologies and machines used in inter-row cultivation.* *To study the technical and operational indicators of innovative technologies and machines used in the harvesting of agricultural products.*

	To study the types of use of drip irrigation systems in production and their structure. *Study of remote control systems of machine-tractor units. Study of modern systems of management of production processes.* *To study the promising directions of applying the "precision farming" system to production.* *To study the prospects of increasing the efficiency of the use of agricultural machinery.* *To study the application indicators of resource-saving techniques and technologies used in the cultivation of agricultural products.* *Technological map specific to the region where the farm is located and the procedure for selecting tractors and agricultural machines;* *Determining requirements for machine-tractor units and fuel consumption;* *Organization of effective use of tractors and agricultural machines* *Planning of technical maintenance work for farm machinery;* *Design of the farm's machine shed and oil products storage branch* *Determination of technical and economic indicators of the use of farm equipment* *Evaluation of the composition of the aggregate according to the coefficient of use of the tractor's traction force* *Evaluation of the composition of the unit according to the coefficient of work paths* *Evaluation of the actual performance of the unit by utilization coefficients* *Determination of the composition and number of techniques used in the organization of cotton picking in a continuous flow method* *Optimizing the structure of the equipment used in the production of agricultural products under the conditions of the "Cluster" system and organizing technical service for them.* *Study of remote control systems of machine-tractor units.* *To study the types of use of drip irrigation systems in production and their structure.* *To study the technical and operational indicators of innovative technologies and machines used in the harvesting of agricultural products.* *To study the technical and operational indicators of innovative technologies and machines used in inter-row cultivation.*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1.Vocational Higher Secondary Education (VHSE) Agriculture science and processing technology Second Year Reference Book. State Council of Educational Research and Training (SCERT), KERALA. 2016. pp. 189* *2.Soil conservation and conservation agriculture. A training manual for agricultural extension consultants and farmers in Eastern Europe and Central Asia. Ankara, 2017. - 158 p.* *3.Resource-saving technologies and technical means in crop production: a course of lectures / comp. Truflyak E.V. – Krasnodar: Kuban State Agrarian University, 2015. – 69 p.;* *4.E.L. Revyakin, A.T. Tabashnikov, E.M. Samoilenko, V.I. Dragaitsev. Resource-saving technologies: status, prospects, efficiency: scientific. ed. – M.: FGBNU "Rosinformagrotekh", 2011. – 156 p.*

Faculty of Land resources and cadastre
The direction of education: 60813100 – Land cadastre and land management

Module designation	*DKA 2105-Fundamentals of state cadasters*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Mukhtorov Uzbekkhan Burkhanovich - Doctor of Philosophy in Economics,associate professor;*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours* *Contact hours: lecture – 30 hours,* *practical lessons – 30 hours,* *self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Geodesy, Cartography, Cartographic design*

Module objectives/intended learning outcomes	*To know and understand:* – *knows and can explain the procedure for creating state cadastres, the procedure for dividing the territories of the Republic of Uzbekistan into cadastral units and forming cadastral numbers, creating and maintaining a unified system of state cadastres;* – *understands the creation and maintenance of state cadastres of real estate, that is, state land cadastre, buildings and structures, state urban planning, cultural heritage objects, hydrotechnical structures;* *To be able to:* – *understands state cadastres belonging to the series of linear state cadastres, that is, highways, railways, communication facilities, energy facilities, supply pipelines, cartography-geodesy and their management features;* – *knows the features of natural resources, that is, mines, minerals and man-made products, the state water cadastre, forest, flora and fauna, the state register of waste disposal and landfills and their management;* *To form competencies in:* – *knows the state cadastres belonging to the group of natural areas, i.e. the state cadastre of territories, protected natural areas, natural danger zones, zones with a high level of man-made danger and their maintenance;* – *knows the content of information related to the unified system of state cadastres, their formation, the use of GIS programs in the formation of data in the unified system of state cadastres based on geoinformation technologies.*

Content	*Cadastre concept, content and tasks. Political, economic and social importance of state cadastres. The nature, function and general system of state cadastres. Legal basis of transfer of the unified system of state cadastres. The role of "Land Code", "On State Cadastres", "On State Land Cadastre" and other relevant laws in maintaining state cadastres. Sources and principles of state cadastre management. Difficulty level: 2* *Comprehensive study of existing natural resources and other objects in the territory of the Republic. Methods of collecting the necessary information about their legal status, amounts and characteristics based on a single methodology. The need to bring cadastres into a single system. Description of objects and entities. Difficulty level: 2* *Issues of methodical and practical study of national, integrated and comprehensive consideration and assessment of scientific and economic potential of the country. State cadastre service. Service system and tasks. Quantity and quality indicators of objects. Cadastre directions, their interrelation and sequence. Contents of cadastral documents. Difficulty level: 2* *Place of natural resources (land, water, forest, minerals, specially protected natural areas) in the State cadastre system. Description of natural resources. Territorial location of resources and methods of their study. Quantity and quality of natural resources. Collection, processing and use of data on types of natural resource cadastres. Difficulty level: 3* *Stages in keeping cadastres. The role of the land cadastre in the general system and procedure. Nature and tasks of water cadastre. Tasks and procedures of the cadastre of mineral deposits and man-made products. Cadastre of specially protected natural areas. Cadastre of areas with high man-made risk. Difficulty level: 3* *Cadastre of the animal world. Cadastre of the world of plants. Quantitative and qualitative assessment of fauna and flora cadastre objects. The uniqueness of their management. Difficulty level: 3* *The essence and tasks of keeping state cadastres of linear type. Procedures for maintenance of road cadastre. Methodological approach to railway cadastre management. Peculiarities of maintaining the state cadastre in the field of energy. The procedure for maintaining communication and telecommunication cadastres. Cadastre data on urban engineering communications. Qualitative and quantitative assessment of engineering communications in rural areas. Difficulty level: 4* *Types of real estate. Keeping the cadastre of buildings and structures. Urban planning cadastre. Keeping production and consumption waste cadastre. Determining the volume and quality of production and consumption waste. Cadastre of historical and cultural monuments. Specificity of determining the area and quality of historical and cultural monuments in the territory of the Republic and maintaining the cadastre. Level of difficulty: 4* *Real estate objects in the territory of subjects, their types and composition. Tasks and features of their placement. Valuation of real estate. Data collection, processing and use. Composition of real estates and features of their assessment in land-using entities operating in agriculture. Level of difficulty: 5* *The procedure for maintaining the cartography-geodesy cadastre, the specific features of its transfer. Quantitative and qualitative indicators of the cadastre. How to collect, analyze and use data. Level of difficulty: 5* *Types of information and sources of collection. Procedure for processing and using information. Procedure for creating a database. Powers of public service bodies collecting public funds. The procedure for processing, confirming and using information. Difficulty level: 5*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	*1. I. Ikhlosov, D. Rizaeva. Basics of the state cadastre. Study guide. PUBLISHER, 2019. 225 p.* *2. Rakhmonov Q., Uspankulov B. Basics of state cadastre. Study guide. TIIAME publishing house, 2018. 208b.;* *3. D. Yarmatova, A. Bobojonov, A. Rakhimov. Basics of the state cadastre. Cholpon publishing house, 2014. 234 p.* *4. Ashurov A.F. Osnovy gosudarstvennykh kadastrov. Uchebnoe posobie.TIIAME. T.: 2020 - 168 pages;* *5. Velta Parsova, Virginija Gurskiene, Madis Kaing. "Real property cadastre in other countries" Textbook. Jelgava - 2012.;*

Faculty of Land resources and cadastre
The direction of education: 60722800 – Cadastre

Module designation	*KIKG-2205- Computer graphics in cadastral works*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Mukhtorov Uzbekkhan Burkhanovich - Doctor of Philosophy in Economics,associate professor;* *Uspankulov Bekjan Musabekovich – assistant of professor*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours* *Contact hours: lecture – 30 hours,* *practical lessons – 30 hours,* *self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Fundamentals of geodesy, land cadastre, geodetic works in land preparation, remote sensing, state cadastres? Geoinformation system and technologies*

Module objectives/intended learning outcomes	***To know and understand:*** • *to have in-depth practical and theoretical knowledge of the science program, to have an idea of the important role of mastered land formation and land cadastre in working with drawings, maps, plans, topographic maps;* ***To be able to:*** • *know how to master computer programs AutoSad, Corel Draw, apply their solutions in practice and be able to use them;* ***To form competencies in:*** • *should have the skills to formalize topographic-cartographic, land surveying, land cadastre maps and plans, drawings and projects using automated tools.*

Content	*It is considered a component of the unified system of state cadastres, and it consists of a system of updated information and documents about the geographical location, legal status, owner, quality descriptions and price of a certain type of natural, economic object or other object maintained by the state cadastre. It is maintained as a multi-purpose information system designed to ensure the maintenance and evaluation of a unified national calculation of the natural and economic potential of the Republic of Uzbekistan and some of its regions. Difficulty level: 2* *One of the new directions of computer graphics is devoted to the development of methods and principles of creating real images. According to these principles, it should be possible to directly observe images or record them using optical devices. The need for such images appeared in the fields of design, architecture, state cadastre management. The expansion of the functional capabilities of computers laid the foundation for the development of computer graphics and led to the creation of systems that provide animation of images. Applying these capabilities to the cadastral field, in turn, makes it possible to quickly achieve high accuracy. Difficulty level: 2* *Computer graphics is understood as the issue of creating, storing, processing volume models of graphic or geometric objects and depicting them using modern computers. The progress of science and technology has turned our society into an information society. Most of the people working in this society are engaged in scientific work on the production, storage, processing and implementation of information. It is impossible to do such work without modern computer technologies. Data processing processes in them are carried out with the help of computer graphics, which creates great convenience for the user. Computer graphics refers to the concepts of creating, storing, and processing volume models of objects and their depiction and processing with the help of computers. Difficulty level: 2* *A number of positive results have been achieved in this field in our country due to the fact that the head of state has set specific tasks for the wider implementation of computer graphics in all aspects of our life and increasing the efficiency of their use. For this reason, the demand and need for a wider acquaintance with concepts (glossary) in the field of computer graphics is increasing. Difficulty level: 3* *Studying the experiences of foreign countries and comparative analysis of their methods of computer graphics, cadastral work in our country, serves to further improve them. Difficulty level: 3* *The use of computer graphics is of great importance in the maintenance of the state cadastre of buildings and structures, the state registration of rights to them, and the creation of the cadastral volume of buildings and structures. The location of buildings and structures. Cadastral plans and maps with dimensions are created. Computer graphics provides a wide range of opportunities in performing these tasks. Difficulty level: 3*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	*1. Computer graphics in cadastral works. R. Q. Oymatov, Q. Rakhmonova, J. Oymatov. Tashkent 2021.*

Faculty of Land resources and cadastre
The direction of education: 60722800 – Cadastre

Module designation	*RYK 31105-Digital land cadastre*
Semester(s) in which the module is taught	*7,8*
Person responsible for the module	*Rakhmonov Kasimdjon - doctor of technical sciences, associate professor*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical*
Workload (incl. contact hours, self-study hours)	*Total workload: 300 hours* *Contact hours: lecture – 60 hours,* *practical lessons – 60 hours,* *self-learning – 180 hours*
Credit points	*10*
Required and recommended prerequisites for joining the module	*Fundamentals of state cadastres, land cadastre, land monitoring*

Module objectives/intended learning outcomes	***To know and understand:*** *to have an idea about the use of land resources in the implementation of scientific research works, their evaluation, participation in activities related to protection, and the ability to use exemplary methods and technical tools and devices in conducting experimental and design research;* ***To be able to:*** *to have the ability to perform land cadastre work in a digitized system based on a modern approach, to have the ability to apply international and professional standards of information technology, modern methodologies, instrumental and computing tools in practice in accordance with the training specialty, to be able to use modern digital technologies and to be able to use them, enterprise, institution and organizations to maintain land cadastre; administrative district, city, province and republican land cadastre, formalization of land cadastre documents, use of land cadastre data, land accounting and evaluation works and be able to use them; (skill)* ***To form competencies in:*** *– must have the skills to use land accounting and other information related to land cadastre, to determine the quantity and quality of the land fund, and to review and use the results of these works.*

Content	*The content and essence of the land account. Tasks of land accounting. Types of land accounting. Digital technologies in land accounting. Difficulty level: 2* *Features of the land account maintained by the enterprise. Features of the land account maintained at the institution. Land accounting procedure in the territory of the organization. Prospects of digital land accounting in the territory of the land user entity. Difficulty level: 2* *Concepts of the land user entity. Types of land user entities. Land accounting procedure in land user entities. Features of digital land accounting in the territory of the land user entity. Difficulty level: 2* *The procedure for keeping the main land account in the territory of the land user entity. Current land accounting procedure in the YFS area. Land accounting by land types in the YFS territory. Difficulty level: 3* *General concepts about the contour of the earth. The procedure for creating a register of fields. Creative approaches to field registration. Difficulty level: 3* *The concept of land explication. The procedure for creating a land explication in an array. Peculiarities of land explication in the territory of the neighborhood assembly. Difficulty level: 3* *Land accounting documents. Basic land account. Current land account. Digitization of land accounting documents. The content of the district land account. Types of district land accounting. Digital technologies in district land accounting. Difficulty level: 4* *Grouping of district land fund by quality. Calculation of the area of district agricultural land by productivity. Grouping of district agricultural lands according to their normative value and keeping land records. Level of difficulty: 4* *The purpose and tasks of drawing up the district land balance. The procedure for drawing up the district land balance. Innovative technologies in drawing up the district land balance. The procedure for accepting the land balance developed in the administrative district. The procedure for development and adoption of urban land balance. Digitization of district land balance documents. Registration of district and city land balance documents. Level of difficulty: 5* *The content of the land balance of the Republic of Karakalpakstan, regions and Tashkent city. Conditions for drawing up the land balance of the Republic of Karakalpakstan, regions and the city of Tashkent. The extent of using modern technologies in the preparation of the land balance of the Republic of Karakalpakstan, regions and the city of Tashkent. Organization of land cadastre management in the region. Control of land cadastre management in the region. Digitization of regional land cadastre documents. Level of difficulty: 5* *The procedure for formation of the republican land balance. Conditions for drawing up the republican land balance. Use of digital technologies in the land balance of the republic. The content of the national land account of the Republic. Compilation of the national land account of the*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	*1. Velta Parsova, Virginija Gurskiene, Madis Kaing. "Real property cadastre in other countries" Textbook. Jelgava - 2012.;* *2. Babajonov A.R., Rakhmanov Q.R., Gafirov A. Land cadastre. Textbook.- T., TIMI publishing house, 2008.- 210p.* *3. Chertovitsky A.S., Land cadastre. Uchebnoe posobie.- T.TIIM typography, 2012 g.-296 p.*

Module designation	*DKHT 3105 legal maintenance of state cadastres*
Semester(s) in which the module is taught	*Semester 7*
Person responsible for the module	*A.Ashurov, (PhD) doctor of philosophy of technical sciences*
Language	*Uzbek*
Relation to curriculum	*mandatory*
Teaching methods	*Lecture, practical training, independent education*
Workload (incl. contact hours, self-study hours)	*Total load: 150 hours* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training - 30 hours* *Independent education - 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Fundamentals of state cadastres, land cadastre, land law*

Module objectives/intended learning outcomes	– *To have an idea about the legal basis of the unified system of the state cadastre of the Republic of Uzbekistan, the concepts of legal maintenance (DKYAT), the main parts of the DKYAT, the concepts of information infrastructure for the purpose of cadastre, the legal basis of the cadastre and the technologies of maintaining the DKYAT; knowledge)* – *Establishing DKYAT, conducting it on the basis of a single methodology, bringing cadastral data into a single system, being able to perform the service system and tasks of state cadastres, being able to ensure interdependence and sequence in maintaining cadastral directions, natural resources and to know how to maintain linear cadastres and be able to use them; (skill)* – *must have the skills to develop controlled objects and their characteristics, quantitative and qualitative indicators of objects, cadastral data. (qualification)*

Content	*Regulation of relations in the field of maintaining state cadastres, collecting and using cadastral information. Maintenance of state cadastres, rights to cadastral objects. Regulation of relations arising in connection with the state registration of concluded transactions. ¬The system of regulatory legal documents of the Republic of Uzbekistan. Studying the content of regulatory and legal documents. The purpose of the law on state cadastres is to study issues of regulation of relations in the field of keeping state cadastres, collecting and using cadastral information. Level of difficulty: 2* *The state land cadastre is considered the main component of the unified system of state cadastres, which includes information on the natural, economic, legal regime, categories, quality characteristics and value of land, the location and size of land plots, their distribution among land owners, land users, tenants and owners. and documents. The state land cadastre includes the state registration of rights to land plots, accounting of the quantity and quality of land, soil inspection, land valuation, as well as the integration, storage and updating of information on the land cadastre. Level of difficulty: 2* *Laws of the Republic of Uzbekistan "On Geodesy and Cartography" and "On State Cadastres" regarding the maintenance of cartography-geodesy state cadastre. Regulations approved by the Cabinet of Ministers of the Republic of Uzbekistan on the procedure for creation and maintenance of the unified system of state cadastres, approved by the decision of the Cabinet of Ministers of the Republic of Uzbekistan No. 66 of February 16, 2005, are the legal basis. State cadastre of cartography and geodesy. Study of the system of updated reliable information about cartographic-geodetic state cadastre objects, cartographic-geodetic data on the territory of the Republic of Uzbekistan, performed geodesy, topography and cartographic works, including their quantitative and qualitative descriptions. Level of difficulty: 2* *State water cadastre. Law of the Republic of Uzbekistan "On Water and Water Use". Organization of rational use of water resources. Regulation of water management relations, assessment of economic activity, ecological situation. The purpose of maintaining the state water cadastre. Study of legislation on water objects, water resources, water regime, quality and its use, which make up the single state water fund in the state water cadastre. To study the organized information system about water users, which is constantly updated and clarified when necessary. Level of difficulty: 3* *To study the legal bases of the activities related to the maintenance of the state forest cadastre. Laws of the Republic of Uzbekistan "On Forestry", "On State Cadastres". Study of the Regulation approved by the Cabinet of Ministers on the procedure for creating and maintaining a unified system of state cadastres, and the system of other regulatory legal documents. State forest cadastre. Study of the system of updated reliable information about the objects of the state forest cadastre,*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to correctly reflect the results of analysis, to independently observe the studied processes and to complete the assignments and tasks given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	*1. И.Ихлосов, Д.Ризаева. Давлат кадастри асослари. Ўқув қўлланма. NOSHIR, 2019 y. 225 b.* *2.Raxmonov Q., Uspankulov B. Davlat kadastri asoslari. O'quv qo'llanma. TIQXMMI nashryoti, 2018 y. 208b.;* *3. Д.Ярматова, А.Бобожонов, А.Рахимов. Давлат кадастри асослари. Чўлпон номидаги нашриёт матбаа уйи, 2014 й. 234 б.* *4. Ашуров А.Ф. Основы государственных кадастров. Учебное пособие.ТИИИМСХ. Т.: 2020 г.- 168 стр.;* *5. Velta Parsova, Virginija Gurskiene, Madis Kaing. "Real property cadastre in 351ortal countries" Textbook. Jelgava – 2012.;*

Module designation	*HK 3205 Cadastre of territories*
Semester(s) in which the module is taught	*Semester 7*
Person responsible for the module	*Ш.Нарбаев, Doctor of Philosophy in Economics, associate professor*
Language	*Uzbek, Russian*
Relation to curriculum	*selected*
Teaching methods	*Lecture, practical training, independent education*
Workload (incl. contact hours, self-study hours)	*Total load: 150 hours* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training - 30 hours* *Independent education - 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Fundamentals of state cadastres, land cadastre*

Module objectives/intended learning outcomes	• *to have an understanding of the structure of the territory cadastre, its organization and management, formation of information resources of the territory cadastre system;* • *The Law "On State Cadastres", the Regulation "On the procedure for maintaining the state cadastre of territories", the Regulation "On the maintenance of the state cadastre", the economic basis of the maintenance of the state cadastre, the system of infrastructures providing the state cadastre, necessary information on the maintenance of the state cadastre. Objects of the USSR know and use data collection methods;* • *Organization of the territory cadastre, its management based on a single methodology, bringing cadastral data into a single system, service system and state cadastre tasks, ensuring interdependence and sequence in state cadastre management. should have the skills to maintain cadastral lines, natural resources and line-type cadastres*

Content	*Cadastre concept, content and tasks. The political, economic and social importance of territorial cadastres. The nature, function and general system of zonal cadastres. Legal basis of the territory cadastre. The role of the "Land Code", "On State Cadastres" and other related laws, the Regulation "On the procedure for creating and maintaining a single system of State Cadastres" and other regulatory legal documents in the maintenance of the cadastre of territories. Level of difficulty: 2* *Uniformity of the methodology of maintaining the territory cadastre at all levels, complete coverage of the natural resource and economic potential, socio-economic development and ecological condition of the territories in relation to the territories where the territory cadastre is maintained. Uniformity of the methodology of geospatial data formation on objects. Actuality, correctness, completeness, completeness, accuracy, clarity and documentation of territorial cadastre information resources. Openness of territory cadastre information and its availability to everyone, legality of obtaining, distributing and storing it. Interconnection of land cadastre and other state cadastres with information systems and registers that organize state information resources. Coordinating the activities of the basic entities of the state cadastre of regions that ensure the creation, updating, processing, storage, presentation and use of information resources of the cadastre of regions. Coordinating the creation and maintenance of the cadastre of territories with the creation and maintenance of the state land cadastre, DKYaT and the National Geoinformation System. Level of difficulty: 2* *Худудлар кадастрини тузиш ва юритиш. Худудлар Competent bodies for creating and maintaining the cadastre. Organizational structure of the territory cadastre. State and economic management bodies, economic entities of all forms of ownership that create, update, process, store, present and use information resources that must be registered and taken into account in the territory cadastre system. Level of difficulty: 2* *Networks of national, regional, district and city geoportals and geoinformation systems that ensure registration, accounting, storage, updating and presentation of territorial cadastre information resources to users. Territorial cadastre metadata information resources, including the composition, structure, quality of the territory, some parts, conditions of use of geospatial data. Types of cadastral documents and geospatial data. Geospatial database. Cadastre of territories entered or formed using information resources and maintaining the register of entry/exit documents in printed and/or electronic form. Level of difficulty: 3* *The scheme of maintaining the territory cadastre. Ways of maintaining the territory cadastre. Territory cadastre systems at the republican level. Regional cadastral systems. Territory cadastre systems at the district level. Territorial cadastre systems at the city level. The composition, content, formats, periodicity and order of presentation of the information necessary for the*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to correctly reflect the results of analysis, to independently observe the studied processes and to complete the assignments and tasks given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	1. *3D Cadastre in an international Context, Jonatien E. Stoter and Peter van Oosterom 2006. CRC Press Taylor& Francis Group, New York.* 2. *Raxmonov Q. Ahsurov A.F. Hududlar davlat kadastri., O'quv qo'llanma. Tashkent 2018 y.* *Ashurov A.F. Davlat kadastrlari ma'lumotlari bazasi. O'quv qo'llanma. Tashkent 2021 y. O'zbekiston Respublikasi Oliy ta'lim vazirligining 2021 yil 23 noyabrdagi 500 sonli buyrug' bilan talabalar uchun o'quv qo'llanma sifatida tavsiya etilgan.*

Faculty of Land resources and cadastre
The direction of education: 60722800 – Cadastre

Module designation	*DMB 3206 - State cadastre database*
Semester(s) in which the module is taught	*7*
Person responsible for the module	*Mukhtorov Uzbekkhan Burkhanovich - Doctor of Philosophy in Economics,associate professor;*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours* *Contact hours: lecture – 30 hours,* *practical lessons – 30 hours,* *self-learning – 90 hours*
Credit points	*6*
Required and recommended prerequisites for joining the module	*Geodesy, land cadastre, building and construction cadastre, territory cadastre, fundamentals of state cadastres, geoinformation systems and technologies*

Module objectives/intended learning outcomes	•***To know and understand:*** • *geospatial data included in the state cadastre database, the unified system of state cadastres and attribute tables of the digital part of the data entered into it, to have the imagination to visualize cadastral cards based on the cadastral database; (knowledge)* • ***To be able to:*** • *know and be able to use geo-information systems in the management of state cadastres, types and content of information for state cadastres, raster data, vector data, software used in the formation of the state cadastre database; (skill)* • ***To form competencies in:*** • *For DKMB, one should have the skills to work with vector maps, create their geographic basis, edit, place their layers, and accept their management solutions. (qualification)*

Content	*Cadastre concept, content and tasks. Political, economic and social significance of state cadastres. The nature, function and general system of state cadastres. Legal basis of transferring the unified system of state cadastres. The role of "Land Code", "On State Cadastres", "On State Land Cadastre" and other related laws in maintaining state cadastres. Sources and principles of state cadastre management. Level of difficulty: 2* *Comprehensive study of available natural resources and other objects on the territory of the republic. Methods of collecting the necessary information about their legal status, amounts and characteristics based on a single methodology. The need to bring cadastres into a single system. Description of objects and subjects. Level of difficulty: 2* *Issues of methodical and practical study of national, integrated and comprehensive consideration and assessment of scientific and economic potential of the country. State cadastre service. Service system and tasks. Quantity and quality indicators of objects. Cadastre directions, their interrelation and sequence. Contents of cadastral documents. Level of difficulty: 2* *Place of natural resources (water, forest, minerals, waste disposal, flora and fauna) in the State cadastre system. Description of natural resources. Territorial location of resources and methods of their study. Quantity and quality of natural resources. Collection, processing and use of data on types of natural resource cadastres. Level of difficulty: 3* *Stages in keeping cadastres. The role of the state water cadastre in the general system and the procedure for its maintenance. The essence and tasks of the state water cadastre. Functions and procedures of the state water cadastre. Quantitative and qualitative assessment of state water cadastre objects. The uniqueness of their management. Level of difficulty: 3* *The nature and tasks of maintaining the state forest cadastre. Procedures for maintaining the state forest cadastre. Methodological approach to the management of the state forest cadastre. Peculiarities of maintaining the state forest cadastre. The procedure for maintaining the state forest cadastre. Level of difficulty: 3* *The procedure for maintaining the state cadastre of flora. Keeping the state cadastre of flora. Methods of qualitative and quantitative assessment of flora. Basic concepts of maintaining the state cadastre of flora. Peculiarities of determining the area and quality of plants in the territory of the Republic and maintaining the cadastre. Level of difficulty: 4* *The procedure for maintaining the state cadastre of the animal world. Methods of qualitative and quantitative assessment of the animal world. Basic concepts of animal world state cadastre management. Determining the area and quality of the animal world in the territory of the republic and the specificity of keeping the cadastre. Level of difficulty: 4* *The essence and tasks of keeping state cadastres of*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	1. A. Ashurov. "Data base of state cadastres" TIQXMMI, 2020, 156 p. 2. O. Mukhtorov, A. Inamov, J. Lapasov. Instructional manual for practical training in "Geoinformation systems and technologies". T.: TIQXMMI, 2017. 3. Mukhtorov O'.B., Inamov A.N., Islamov O'.P., Geoinformation system and technologies. (For lecture) T., TIQXMMI, 2019. 220 pages

Faculty of Land resources and cadastre
The direction of education: 60722800 – *C*adastre

Module designation	*BDK 4110-State cadastre of buildings and structures*
Semester(s) in which the module is taught	*10*
Person responsible for the module	*Ashurov Abdullo Faizullaevich - doctor of philosophy in technical sciences, PhD;*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours* *Contact hours: lecture – 30 hours,* *practical lessons – 30 hours,* *self-learning – 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Computer graphics in cadastral work, basics of state cadastres, geoinformation system and technologies, legal support of state cadastres, land law, land construction*

Module objectives/intended learning outcomes	***To know and understand:*** *• the value of buildings and structures, features of their use, the fact that these objects are for domestic and production purposes, their use for specified purposes, the tax zone in which they are located and other information form the basis of the economic status of buildings and structures, and to have an idea about the scientific methods of conducting research in this field ;* ***To be able to:*** *• compliance of buildings and structures with land development schemes, master plans of cities, settlement projects, as well as architectural and urban planning requirements, parameters of buildings (floors, general, living, production areas), modern, scientific and knowledge and ability to use modern technological advances (skills);* ***To form competencies in:*** *should have in-depth theoretical and practical knowledge of the science program, an idea of the specific important role of mastered land construction and land cadastre in working with drawings, maps, plans, topographic maps; (knowledge)*

Content	*Taking into account that the state cadastre of buildings and structures is connected with the state land cadastre, its history can be justified by the scientific opinion that it was inherited from the time of the Roman ruler Augustus. It is based on the combination of the words "Capit gum registrum", which means "collection of land documents and population registration work" carried out in those times, and started in the 3rd century BC. Level of difficulty: 2* *The state cadastre of buildings and structures is designed to provide state authorities and management bodies, interested legal entities and individuals with reliable information about objects of the state cadastre of buildings and structures. The state cadastre of buildings and structures is maintained in the Republic of Uzbekistan in order to create a single system of state cadastres and a single state account of buildings and structures and to ensure the organization of its management. Level of difficulty: 2* *Relations on the maintenance of the state cadastre of buildings and structures are regulated by the legislation of the Republic of Uzbekistan, the Law of the Republic of Uzbekistan "On State Cadastres", the Regulation on the Procedure for the Creation and Maintenance of a Unified System of State Cadastres, approved by the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 66 dated February 16, 2005, It is carried out in accordance with the decision of the Cabinet of Ministers of the Republic of Uzbekistan No. 278 of June 2, 1997 "On maintaining the state cadastre of buildings and structures in the Republic of Uzbekistan" and other legal documents. Level of difficulty: 2* *Documents confirming the establishment of property rights to buildings and structures are as follows:* *the decision of the district (city) mayor to approve the act of the commission on the acceptance of the completed building, structure, house into use, the contract of sale of the house, apartment, the contract of sale and acceptance of the building and structure, certified by a notary, together with the act of transfer and acceptance of the building and structure , notarized purchase agreement, notarized lease agreement, notarized agreement on gifting a building, structure, residence, notarized agreement on exchange of a building, structure, residence, along with a handover-acceptance document rent agreement approved by a notary, providing ownership rights to a privatized state building, structure, residence, right of inheritance granted by notaries and to the corresponding part of the building, structure, which is the joint property of the spouses a certificate of ownership and a court decision or a bailiff's decision or a deed of transfer of the building and structure concluded between the debtor and the debtor, approved by the bailiff. Level of difficulty: 3* *The building or structure will be included in the cadastral plan after the relevant information on buildings and structures is collected and transferred to the state register. The cadastral plan consists of a series of maps and plans with a scale from 1:100 to 1:10000, which ensures*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	*1. 3D Cadastre in an international Context, Jonatien E. Stoter and Peter van Oosterom 2006. CRC Press Taylor& Francis Group, New York.* *2. Ashurov A.F., Usmanov M., Uspankulov B.M. "State cadastre of buildings and structures", Study guide, Tashkent 2019.* *3. Artemenko V.V., Loyko P.F., Ogarkov A.P., Sevostyanov A.V.* *4.Cadastre land naselennyx point. Uchebnoe posobie. M.: Kolos, 1997g - 166 p.* *5 Ismailov T., Babajanov A. Basics of planning and construction of settlements projects in cities and villages. Tashkent "New century generation", 2002. - 202 p.*

Faculty of Land resources and cadastre
The direction of education: 60722800 – Cadastre

Module designation	*HK 4109-Cadastre of territories*
Semester(s) in which the module is taught	*10*
Person responsible for the module	*Narbaev Sharafiddin Kengeshovich - Doctor of Philosophy in Economics,associate professor;*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours* *Contact hours: lecture – 60 hours,* *practical lessons – 60 hours,* *self-learning – 150 hours*
Credit points	*9*
Required and recommended prerequisites for joining the module	*Computer graphics in cadastral works, basics of state cadastres, geoinformation system and technologies, legal support of state cadastres, land law, land structure, state cadastre of buildings and structures*

Module objectives/intended learning outcomes	***•To know and understand:*** • *To have an idea about the structure of the territory cadastre, its organization and management, formation of information resources of the territory cadastre system;* ***To be able to:*** • *• Knowledge of the Law on State Cadastres, the Regulation on the procedure for maintaining the state cadastre of territories, the Regulation on the maintenance of the unified system of state cadastres, the economic basis of maintaining the state cadastre, the infrastructure system that provides the unified system of state cadastres, the methods of collecting the necessary information about the objects of the unified system of state cadastres and their use;* ***To form competencies in:*** • *• Must have the skills to organize the cadastre of territories, maintain it on the basis of a single methodology, bring cadastral data into a single system, be able to perform the service system and tasks of the state cadastre, ensure interdependence and sequence in the maintenance of cadastral lines,*

	maintain natural resources and linear type cadastres

Content	*The information stored in the state cadastre of territories is open and everyone can use it, with the exception of information containing restricted information. Protection of information stored in the state cadastre of territories is carried out by the relevant subjects of information relations in accordance with the law. Restrictions on the use of information of the state cadastre of territories that are considered state property or state or commercial secrets are determined in accordance with the procedure provided for by law. Difficulty level: 2* *The unified database of the state cadastre of territories to the geoinformation system of the Ministry of Internal Affairs of the Republic of Uzbekistan, the Ministry of Emergency Situations, the Ministry of Water Management, the Ministry of Culture and Sports, the Ministry of Health, the State Committee for Communication, Information and Telecommunication Technologies, the State Committee for Geology and Mineral Resources, State Architecture and Construction Committee, State Committee for Nature Protection, Academy of Sciences, Hydrometrology Service Center under the Cabinet of Ministers, Geological Survey of the Earth's Depth under the Cabinet of Ministers, State Inspectorate for Safe Conduct of Works in Industry, Mining and Communal Household Sector, Katta and Aloked under the Cabinet of Ministers Monitoring of the technical condition and safety of important water management facilities is provided in coordination with the state inspection, the state joint-stock railway company "Uzbekistan Railways", the state joint-stock committee "Uzavtoyol", the state joint-stock committee "Uzbekenergo" and the national holding company "Uzbekneftgaz". and is accepted. Difficulty level: 2* *One of the main goals of the state cadastre of regions is the need for the goal-oriented development of the territory, the creation of material assets of natural resources, and the creation of a database about them for the purpose of effective use of existing natural resources. Multi-purpose development of the territory is explained by the need to create various material and other wealth by society, which requires differentiated methods and methods of using nature. From this point of view, the development of the territory has a socio-economic significance. On the other hand, the anthropogenic impact on nature leads to negative impact on the environment, that is, the development of the territory has an ecological nature. Difficulty level: 2* *Basic requirements are calculated based on the essence of the principle areas and the main principles of development. The principles of regional development are conditionally divided into general ones, which are included in the development of regions, and specific ones, which are included only in the development of urban or rural areas: economic, social, recreational and ecological nature of regional development; regional development forecasting and planning; regionalization of territories; regional development management; sustainable development of regions. Difficulty level: 3* *Economic reforms in the country are aimed at creating*

Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*
Reading list	*1. 3D Cadastre in an international Context, Jonatien E. Stoter and Peter van Oosterom 2006. CRC Press Taylor& Francis Group, New York.* *2. Rakhmanov Q. Ahsurov A.F. State cadastre of territories., Study guide. Tashkent 2018* *3. Ashurov A.F. State cadastre database. Study guide. Tashkent 2021. It is recommended as a study guide for students by order No. 500 of the Ministry of Higher Education of the Republic of Uzbekistan dated November 23, 2021.*

Faculty of Land resources and cadastre

The direction of education:

Module designation	*RYK 4104-Digital land cadastre*
Semester(s) in which the module is taught	*10*
Person responsible for the module	*Rakhmonov Kasimdjon - doctor of technical sciences, associate professor*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical*
Workload (incl. contact hours, self-study hours)	*Total workload: 120 hours* *Contact hours: lecture – 30 hours,* *practical lessons – 30 hours,* *self-learning – 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Fundamentals of state cadastres, land cadastre, land monitoring*

Module objectives/intended learning outcomes	***To know and understand:*** • *• to have an idea of the use of land resources in the implementation of scientific research, their assessment, participation in activities related to protection, the use of exemplary methods and technical tools and devices in the conduct of experimental and design research; (knowledge)* ***• To be able to:*** • *to have the ability to perform land cadastral work in a digitized system based on a modern approach, to have the ability to apply international and professional standards of information technology, modern methodologies, instrumental and computing tools in practice in accordance with the training specialty, to be able to use and be able to use modern digital technologies, enterprise, maintaining land cadastre in institutions and organizations; managing land cadastre of administrative district, city, province and republic, formalizing land cadastre documents, using land cadastre data, knowing and being able to use land accounting and evaluation works; (skill)* ***• To form competencies in:*** • *must have the skills to list land plots, use land cadastral data, determine the quantity and quality of the land fund, review and use cadastral numbers, soil*

	inspection, normative land assessment and the results of these works. (qualification)

Content	*The content and essence of the land account. Tasks of land accounting. Types of land accounting. Digital technologies in land accounting. Difficulty level: 2* *Features of the land account maintained by the enterprise. Features of the land account maintained at the institution. Land accounting procedure in the territory of the organization. Prospects of digital land accounting in the territory of the land user entity. Difficulty level: 2* *Concepts of the land user entity. Types of land user entities. Land accounting procedure in land user entities. Features of digital land accounting in the territory of the land user entity. Difficulty level: 2* *The procedure for keeping the main land account in the territory of the land user entity. Current land accounting procedure in the YFS territory. Land accounting by land types in the territory of YFS. Difficulty level: 3* *General concepts about the contour of the earth. The procedure for creating a register of fields. Creative approaches to field registration. Difficulty level: 3* *The concept of land explication. The procedure for creating an explication of land in an array. Features of land explication in the territory of the neighborhood assembly. Difficulty level: 3* *Land accounting documents. Basic land account. Current land account. Digitization of land accounting documents. Difficulty level: 4* *The content of the district land account. Types of district land accounting. Digital technologies in district land accounting. Level of difficulty: 4* *Grouping of district land fund by quality. Calculation of the area of district agricultural land by productivity. Grouping of district agricultural lands according to their normative value and keeping land records. Level of difficulty: 5* *The purpose and tasks of drawing up the district land balance. The procedure for drawing up the district land balance. Innovative technologies in drawing up the district land balance. Level of difficulty: 5*
Exams and assessment formats	*To fully master the theoretical and methodological concepts of science, to be able to accurately reflect the results of analysis, to independently observe the studied processes and to fulfill the assignments and assignments given in the interim control forms, to submit a written work for the final control.*
Study and examination requirements	*Students who successfully pass the science* *The total maximum marks will be the sum of the final exam (40%), Midterm (60%), and allotment points. To pass the subject successfully, the student must score 60% or more of the allotted points.*

Reading list	1. *1. Velta Parsova, Virginija Gurskiene, Madis Kaing. "Real property cadastre in other countries" Textbook. Jelgava - 2012.;* 2. *2. Babajonov A.R., Rakhmanov Q.R., Gafirov A. Land cadastre. Textbook.- T., TIMI publishing house, 2013.- 208 p.* 3. *3. Chertovitsky A.S., Land cadastre. Uchebnoe posobie.-T.TIIM typography, 2012 g.-296 p.*

Module designation	*TRK 2204 Cadastre of natural resources*
Semester(s) in which the module is taught	*4-semester*
Person responsible for the module	*Narbayev Sh.K. - Associate Professor, Doctor of Philosophy in Economics (PhD).* *Akhmadaliyev VA - assistant*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total load: 120* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 60 hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Fundamentals of state cadastres, land cadastre, soil science and agriculture, land monitoring, geodesy, cartography*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* – *knows and can explain the concepts of the unified system of the state cadastre (DKYaT), the main parts of the cadastre of natural resources, the concepts of information infrastructure for the purpose of cadastre, the legal basis of the cadastre and the technologies of maintaining the cadastre of natural resources;* – *knows and can use the law on state cadastres, the Regulation on the maintenance of DKYaT, the economic basis of natural resources cadastre management, the system of infrastructures providing the natural resources cadastre, the methods of collecting the necessary information about the objects of the natural resources cadastre;* – *skills in organizing natural resources cadastre, maintaining it on the basis of a single methodology, bringing cadastral data into a single system, being able to perform the service system and tasks of state cadastres, cadastre lines, ensuring their interdependence and sequence in their maintenance, maintaining natural resources and linear type cadastres will have;* – *will have the ability to register natural resources, perform their accounting and evaluation, and use laws and regulatory documents in maintaining the cadastre of natural resources.*

Content	*Cadastre concept, content and tasks. Unified system of state cadastres. The nature, function and general system of state cadastres. Object and subject of state cadastres. Legal basis of state cadastre management. Principles and documents of state cadastre management. Organization of state cadastre maintenance. Level of difficulty: 2* *Content of the state land cadastre. The procedure for maintaining the state land cadastre. Purpose and tasks of land cadastre. Types and principles of state land cadastre management. Components of the state land cadastre. Importance of state land cadastre in national economy. The role of the land cadastre in the unified system of state cadastres. Organization of state land cadastre management. Level of difficulty: 2* *Content of development of the state water cadastre and general rules of its maintenance. Organization and maintenance of the state water cadastre. Functions and powers of the Hydrometeorological Service Center, the State Committee for Geology and Mineral Resources, and the Ministry of Agriculture and Water Management in maintaining the state water cadastre. Level of difficulty: 3* *General rules for maintaining the state forest cadastre. Organization of state forest cadastre management. The procedure for maintaining the state forest cadastre. Procedure for using state forest cadastre data. Level of difficulty: 3* *Content and essence of the state cadastre of mines, mineral deposits and man-made products. The main information content of the cadastre and the procedure for their use. The procedure for maintaining the state cadastre of mines, mineral deposits and man-made products of the Republic of Uzbekistan. Level of difficulty: 3* *General rules and content of maintaining the state cadastre of flora objects. The procedure for maintaining the state cadastre of flora objects. General rules and content of the state cadastre of the animal world. Procedure for maintaining the state cadastre of the animal world. The procedure for collecting and presenting information on objects of the state cadastre of flora and fauna. Level of difficulty: 4* *Protected areas in the republic, their categories. General rules for maintaining the state cadastre of protected natural areas. Structure of the state cadastre of protected natural areas. Organization and management of cadastre development. Level of difficulty: 4* *The procedure for maintaining the state cadastre of*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. И.Ихлосов, Д.Ризаева. Давлат кадастри асослари. Ўқув қўлланма. NOSHIR, 2019 y. 225 b.* *2. Raxmonov Q., Uspankulov B. Davlat kadastri asoslari. O'quv qo'llanma. TIQXMMI nashryoti, 2018 y. 208b.;* *3. Ашуров А.Ф. Давлат кадастрлари маълумотлар базаси. Ўқув қўлланма. Тошкент 2021 й.* *4. Рахмонов Қ.Р. Давлат кадастрлари. Ўқув қўлланма. Т.,ТИМИ, 2008 - 160 б.* *5. Нишонбоев Н. Давлат кадастри асослари. Ўқув қўлланма. Т.ТАҚИ, 2007 – 126 б.*

Module designation	*HK 3204 Cadastre of territories*
Semester(s) in which the module is taught	*6- semester*
Person responsible for the module	*Ashurov Abdullo Faizullaevich - doctor of philosophy in technical sciences, PhD;* *Akhmadaliev Vakhobjon Abdurakhmonovich - assistant*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total load: 120* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 60 hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Geodesy, land cadastre, remote sensing, fundamentals of state cadastres, Geoinformation systems and technologies*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* – *Knows and can explain the structure of the territory cadastre, its organization and management, formation of information resources of the territory cadastre system;* – *Understands the legal bases of the cadastre of territories, the role and function of the state cadastre of territories in the unified system of state cadastres, the methods of collecting information provided to it;* – *Realizes the need to organize the cadastre of territories on the basis of a single methodology;* – *Knows how to form cadastral information in regions for all cadastral types available in state cadastres;* – *Knows the structure of the state cadastre of territories and the organization and management of its creation;* – *Can use the technical complexes of the state cadastre information system and geoportals of the regions.*

Content	*Cadastre concept, content and tasks. The political, economic and social importance of territorial cadastres. The nature, function and general system of zonal cadastres. Legal basis of the territory cadastre. The role of the "Land Code", "On State Cadastres" and other related laws, the Regulation "On the procedure for creating and maintaining a unified system of state cadastres" and other normative legal documents in maintaining the cadastre of territories. Level of difficulty: 2* *Principles of maintaining the state cadastre of territories. Compilation and maintenance of the territory cadastre. Competent bodies for creating and maintaining the cadastre of territories. Organizational structure of the territory cadastre. Technical and software tools of the territory cadastre system. The main issues of creating a cadastre of territories. The main stages of creating the state cadastre of territories. Level of difficulty: 2* *The scheme of maintaining the territory cadastre. Ways of maintaining the cadastre of territories. Territory cadastre systems at the republican level. Regional cadastral systems. Territory cadastre systems at the district level. Territorial cadastre systems at the city level. Level of difficulty: 2* *Information stored in the territory cadastre and the procedure for using it. Protection of information stored in the territory cadastre. Information that is stored in the territory cadastre and has no restrictions on use. Information that is stored in the territory cadastre and has no restrictions on use. Level of difficulty: 3* *Formation and use of state information resources of the territory cadastre. Procedure for documenting information and organizing the use of state information resources. Software and technical tools, with the help of them, the use of regional cadastre data and implementation of their processing operations. Level of difficulty: 3* *Ways of maintaining the cadastre of territories. Territory cadastre systems at the republican level. Regional cadastral systems. Territory cadastre systems at the district level. Territorial cadastre systems at the city level. The composition, content, formats, periodicity and procedure of presentation of the information necessary for maintaining the territory cadastre. Protection of information stored in the territory cadastre. Information that is stored in the territory cadastre and has no restrictions on use. Information that is stored in the territory cadastre and has no restrictions on use. Level of difficulty: 3*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*3. 3D Cadastre in an international Context, Jonatien E. Stoter and Peter van Oosterom 2006. CRC Press Taylor& Francis Group, New York.* *4. Raxmonov Q. Ahsurov A.F. Hududlar davlat kadastri., O'quv qo'llanma. Tashkent 2018 y.* *5. Ashurov A.F. Davlat kadastrlari ma'lumotlari bazasi. O'quv qo'llanma. Tashkent 2021 y.* *6. И. Ихлосов, Д.Ризаева. Давлат кадастри асослари. Ўқув қўлланма. NOSHIR, 2019 y. 225 b.* *7. Raxmonov Q., Uspankulov B. Davlat kadastri asoslari. O'quv qo'llanma. TIQXMMI nashryoti, 2018 y. 208 b.*

Module designation	*YKG 3204 Computer graphics in land planning*
Semester(s) in which the module is taught	*6- semester*
Person responsible for the module	*Ashurov Abdullo Faizullaevich - doctor of philosophy in technical sciences, PhD;*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total load: 150* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 90 hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Basics of geodesy, land cadastre, geodetic works in land preparation, remote sensing, state cadastres? Geoinformation system and technologies*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* *– Draw topographic drawings of real estate cadastre objects in modern programs, acquire and explain practical and theoretical knowledge on the subject, knowledge of mastered land construction and work with land cadastre drawings, maps, plans, topographic maps;* *– perfectly mastering the computer programs AutoSAD, Corel Draw graphic programs, knows how to apply their solutions in practice and can use them;* *– acquires the skills of formalizing topographic-cartographic, land surveying, land cadastre maps and plans, drawings and projects using automated tools.*

Content	*It is considered a component of the unified system of state cadastres, and it consists of a system of updated information and documents about the geographical location, legal status, quantity, quality descriptions and value of a certain type of natural, economic object or other object maintained by the state cadastre. It is maintained as a multi-purpose information system designed to provide a unified national calculation and evaluation of the natural and economic well-being of the Republic of Uzbekistan and some of its regions.. Level of difficulty: 2* *One of the new directions of computer graphics is dedicated to the development of methods and principles of creating real images. According to these principles, it should be possible to directly observe images or record them with the help of optical devices. The need for such images appeared in the fields of design, architecture, state cadastre management. The expansion of the functional capabilities of computers laid the foundation for the development of computer graphics and led to the creation of systems providing animation of images. Applying these possibilities to the field of cadastre, in turn, allows to achieve speed and high accuracy. Level of difficulty: 2* *Computer graphics is understood as the issue of creating, storing, processing volume models of graphic or geometric objects and depicting them with the help of modern computers. The progress of science and technology has turned our society into an information society. Most of the people working in this society are engaged in scientific work on the production, storage, processing and implementation of information. It is impossible to do such work without modern computer technologies. Data processing processes in them are carried out with the help of computer graphics, which creates great convenience for the user. Computer graphics refers to the concepts of creating, storing, and processing dimensional models of objects and their depiction and processing using computers.. Level of difficulty: 3* *Due to the fact that the head of our state has set specific tasks for the wider implementation of computer graphics in all aspects of our life and increasing the efficiency of their use, a number of positive results are being achieved in this field in our country. For this reason, there is a growing demand and need for a wider acquaintance with concepts (glossary) in the field of computer graphics. Level of difficulty: 4* *The use of computer graphics is of great importance in the maintenance of the state cadastre of buildings and structures, the state registration of rights to them, and the creation of the cadastral volume of buildings and structures. This is the location of new constructions. Cadastral plans and maps with their dimensions are created. Computer graphics provides a wide range of opportunities in performing these tasks. Level of difficulty: 4*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*8. Kadastr ishlarida kompьyuter grafikasi. R.Q.Oymatov, Q.Raxmonova J.Oymatov. Toshkent 2021y.* *9. W. Schofield, M. Breach. Engineering Surveying., Published by Elsevier Ltd. All rights reserved. Copyright © 2007.-637 r* *10. Bakanova V.V. Geodeziya. M., Nedra. 2000. – 277 s.* *11. Nurmatov E.X, O'tanov O'. Geodeziya. Toshkent: O'zbekiston, 2003. – 224 b..* *12. И. Ихлосов, Д.Ризаева. Давлат кадастри асослари. Ўқув қўлланма. NOSHIR, 2019 y. 225 b.*

Module designation	*DKMB 4205 Database for state cadastres*
Semester(s) in which the module is taught	*8- semester*
Person responsible for the module	*Associate professor, PhD Ashurov Abdullo*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture - 30, practical lessons – 30, self-learning – 90, hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Geodesy, land cadastre, building and construction cadastre, territory cadastre, fundamentals of state cadastres, geoinformation systems and technologies*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* – *knows and can explain the procedure for creating and maintaining a single system of state cadastres, the structure of its database, and the regulatory and legal basis for creating and maintaining it;* – *will have an idea about the technologies used for the maintenance and digitalization of local state cadastres, their technical capabilities, and the formation of the database of the unified system of state cadastres on a national scale;* – *knows and can understand the software used in the creation of the database of state cadastres and the geospatial data and their requirements;* – *knows how to use various technical tools and methods in the formation of primary and secondary data in the formation of the state cadastre database;* – *will have the ability to create geographic and attribute tables of objects in special software during the formation of the state cadastre database;* – *can develop a mechanism for forming and maintaining a database for each type of state cadastre.*

Content	*The procedure for forming thematic layers related to the geoinformation system of the State Cadastre Unified Database and submitting them to the State Cadastre Unified System. Provision of state cadastral information related to the unified system of state cadastres. The structure and content of the information provided to the geoinformation system of the unified system of state cadastres. Maintaining the state cadastre of regions while creating a database of state cadastres. Objectives and tasks of the state cadastre of territories. Organization and maintenance of the structure of the database of the state cadastre of regions and its creation. Procedure for providing users with state cadastre information of regions. Level of difficulty: 2* *Use of geospatial data in the creation of a database of state cadastres. Concept of geospatial object. State and local systems of geospatial data coordinates. Level of difficulty: 2* *Maintaining a database of state cadastres in foreign countries. Digital structure of state cadastre management in the Russian Federation. Peculiarities of database formation in the cadastral system of Western European countries. Digitization system of state cadastres of Southern European countries. Level of difficulty: 3* *Changes, priorities, achievements and plans in the era of modern technologies in the new and digital economy. Creation of modern IT infrastructure. Complete cadastral online services. Collection, processing and use of data on types of natural resource cadastres. Level of difficulty: 3* *Improvement of state cadastre maintenance based on the development of the database use system. Specific aspects of the formation of the state cadastre database of fauna and flora objects. The composition of the database of the state cadastre of objects of the animal world. Integration of cadastral information of wildlife objects with other cadastres by relevant state agencies. Cadastre data reporting forms. Level of difficulty: 4* *Specific aspects of the formation of the cadastral database at the regional level. The composition of the database of the state cadastre of flora objects. The procedure for state accounting of flora objects and the volume of their use. Formation of cadastral information in graphic form about objects of the flora. Formation of cadastral data on flora objects at the regional level. Level of difficulty: 5*
Exams and assessment formats	*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.*

Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. А.Ашуров. Давлат кадастрлари маълумотлар базаси. Ўқув қўлланма. ТИҚХММИ Т., 2021.- 135 б.* *2. O'. Mukhtorov, A. Inamov, J. Lapasov. Instructional manual for practical training in "Geoinformation systems and technologies". T.: TIIAME, 2017.* *3. Mukhtorov O'.B., Inamov A.N., Islamov O'.P., Geoinformation system and technologies. (For lecture) T., TIIAME, 2019. 220 pages;*

Module designation	*RYK 4205 Land cadastre*
Semester(s) in which the module is taught	*7- semester*
Person responsible for the module	*Rakhmonov Kasimdjon - doctor of technical sciences*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total load: 150 hours* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training - 30 hours* *Independent education - 90 hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Fundamentals of state cadastres, land cadastre, land monitoring*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* – *knows and can explain the state policies and reforms being carried out on digitalization of the land cadastre;* – *knows and understands the goals and tasks of the state organizations that maintain the state land cadastre and the work they are doing on digitization of the land cadastre;* – *will acquire qualifications and skills in digitalization of land cadastre, modern geo-information systems, their software, hardware platforms and database formation;* – *knows the methods of obtaining data from primary and secondary sources for the digital land cadastre and can use devices for entering the database;* – *understands and knows the content of the laws and regulations adopted by the government on digitization of the land cadastre at the national level;* – *practical aspect can enter land cadastral data into attribute tables in ArcGIS software and perform analytical problems.*

Content	*The content and essence of land accounting. Tasks of land accounting. Types of land accounting. Digital technologies in land accounting. Features of the land account maintained by the enterprise. Features of the land account maintained at the institution. Land accounting procedure in the territory of the organization. Prospects of digital land accounting in the territory of the land user entity. Level of difficulty: 2* *Concepts of the land user entity. Types of entities using land. Land accounting procedure for land user entities. Features of digital land accounting in the territory of the land user entity. General concepts about the contour of the earth. The procedure for creating a register of fields. Creative approaches to field registration. Level of difficulty: 2* *The concept of land explication. The procedure for creating a land explication in an array. Peculiarities of land explication in the territory of the community assembly. Land accounting documents. Basic land account. Current land account. Digitization of land accounting documents. Level of difficulty: 2* *The content of the district land account, types of maintenance, digital technologies. Grouping of district land fund by quality. Calculation of the area of district agricultural land by productivity. Grouping of agricultural lands of the district according to their normative value and keeping land records. Level of difficulty: 3* *The procedure for accepting the land balance developed in the administrative district. The procedure for development and adoption of urban land balance. Digitization of district land balance documents. Registration of district and city land balance documents. The content of the land balance of the Republic of Karakalpakstan, regions and the city of Tashkent. Conditions for drawing up the land balance of the Republic of Karakalpakstan, regions and the city of Tashkent. The scope of using modern technologies in the preparation of the land balance of the Republic of Karakalpakstan, regions and the city of Tashkent. Level of difficulty: 3* *Organization of land cadastre management in the region. Control of land cadastre management in the region. Digitization of regional land cadastre documents. The procedure for formation of the republican land balance. Conditions for drawing up the republican land balance. Use of digital technologies in the land balance of the republic. Level of difficulty: 3* *The content of the national land account of the Republic. The scope of preparation and use of the national land account of the Republic. Use of electronic programs in the preparation of the national land account. Land valuation types and description. Scope of use of land assessment data. Digital technologies in the use of land assessment data in economic sectors. Level of difficulty: 4* *Use of land cadastre data in economic sectors. Use of land cadastre data in the analysis of production activity of an agricultural enterprise. Use of land cadastre data in land planning. Level of difficultyu:4*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1.Velta Parsova, Virginija Gurskiene, Madis Kaing. "Real property cadastre in 382ortal countries" Textbook. Jelgava – 2012.;* *2. Babajonov A.R., Raxmonov Q.R, G'ofirov A. Yer kadastri. Darslik.- T.,TIMI nashryoti, 2008y.- 210b.* *3. Чертовицкий А.С., Земельный кадастр. Учебное пособие.-Т.ТИИМ типографияси, 2012 г.-296 с.*

Module designation	*HMJ 2205 Engineering equipment of territories*
Semester(s) in which the module is taught	*4- semester*
Person responsible for the module	*Ashurov Abdullo Faizullaevich - doctor of philosophy in technical sciences, PhD*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total load: 150* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 90 hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Geodesy, land cadastre, remote sensing, fundamentals of state cadastres, Geoinformation systems and technologies, Land resources management*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* *– Knows and can explain the theoretical knowledge, practical skills on the engineering equipment of territories, how important and urgent issue is the maintenance of this state cadastre today, and the tasks of organizing these works;* *– He got an idea about the importance of highways and engineering structures in the country's economy;* *– Knows engineering structures, their features and territorial features of engineering equipment in the operation of state cadastres and can use them in engineering works;* *– knows and is able to evaluate the role and importance of science in the design of local roads, its application in national economic enterprises, determining the optimal sizes of land ownership and land users' land of agricultural enterprises, and delivering cultivated products to destinations;* *– acquires the skills to assess their economic efficiency by determining the importance of maps and plans and land cadastral projects in the placement of engineering objects of general economic importance.*

Content	*Local roads and their types. Calculation of road connections and cargo volumes in the district. Determination of road category. Road category and their standards. Level of difficulty: 2* *Importance of highways in the national economy. Traffic - use indicators of the road. Motorway. Level of difficulty: 2* *Relief forms. Describe the terrain. Determining the direction of the slope along the road route with the greatest slope. Determining the boundary of cyv catchment areas for a given point of water flow. Level of difficulty: 2* *Determining the boundary of water catchment areas for a given point of water flow. Determining the characteristic points of bending of the place in the given direction. Level of difficulty: 3* *Flow methods of construction. Determining the volume of earthworks in road construction. Selection of machines for earthworks. Level of difficulty: 3* *Calculation of the radius of the curve in the plan bend. View on the road. Longitudinal section of the road. Project line. View in longitudinal section. Basing the maximum value of the longitudinal slope. Cross section. Level of difficulty: 3* *Side slope of road bed. Ensuring the priority and durability of the road base. Fundamentals of road design. Level of difficulty: 3* *Understanding the design of watercourse crossings. Specific characteristics of the rivers of Uzbekistan. Level of difficulty: 4* *Search types. Anticipate the direction of the road axis. Design of road plan, longitudinal section and cross section. Defining the scope of work. Level of difficulty: 4*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Мусаев И.М. Худудни мухандислик жихозлаш. Маъруза тўплами Тошкент, ТИКХММИ, 2000 й.* *2. Артёменко В.В., Лойко П.В., ОгарковА.П.,Севостьянов А.В., Кадастр земель населённкх пунктов, Москва "КОЛОС" 1997г. 132 с.* *3. Designing Land Registration Sustims for Developing Countries. OUP Oxford, 2012 .* *4. Raxmonov Q. Ahsurov A.F. Hududlar davlat kadastri., O'quv qo'llanma. Tashkent 2018 y.* *5. Ashurov A.F. Davlat kadastrlari ma'lumotlari bazasi. O'quv qo'llanma. Tashkent 2021 y.* *6. Raxmonov Q., Uspankulov B. Davlat kadastri asoslari. O'quv qo'llanma. TIQXMMI nashryoti, 2018 y. 208 b.*

Module designation	*GTT 2105 Geoinformation system and technologies*
Semester(s) in which the module is taught	*5,6- semester*
Person responsible for the module	*Associate professor, PhD Mukhtorov Uzbekkhan*
Language	*Uzbek*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 300* *Contact hours: lecture - 40, practical lessons – 80, self-learning – 180, hours*
Credit points	*10 credits*
Required and recommended prerequisites for joining the module	*Geodesy, Cartography, Information technologies and process modeling*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* *– knows and can explain information systems and technologies, their basic components, software, database, hardware platforms, raster and vector formats;* *– knows and can create shape files in GIS software, gnospatial linking of rasters, work with gnographic world coordinate systems;* *– knows and is able to convert text coordinates of points in files of different formats into vector format, vectorization of rasters;* *– can independently perform the tasks of creating thematic layers, placing data in attribute tables, and at the same time combining tables into attributes;* *– knows and can perform geographic database formation, database management and data visualization methods;* *– can perform the tasks of displaying data in the geographic information system, geo-imaging, classification and re-classification, comparing maps, developing a map composition and preparing it for publication, and placing a map.*

Content	*Geoinformatics is a theoretical basis for creating geoinformation systems. Development history of GATs. Ancestors of modern GATs. Classification of GATs. Classification of GATs according to the architectural principle of construction. Classification of GATs by hardware platform. Classification of GATs by territorial coverage. Classification of GATs according to functional capabilities. Implementation scheme of GATs. The structure of universal GATs. Hardware and software of GATs. Level of difficulty: 2* *Land shape and dimensions, used models. Геоахборот тизимларида қўлланиладиган атамалар, терминлар. ГАТ технологиялари қўлланиладиган соҳалар ва у билан боғлиқ йўналишлар. Level of difficulty: 2* *Basic platforms of GAT. Geographic and attribute data. Geoinformation science is the collection, storage, analysis and synthesis of geographic data / geospatial data through Geographical Information Systems, Display and use. Level of difficulty: 2* *Land shape and dimensions, used models. Coordinate systems used in geodesy and cartography. Cartographic projections. Errors in cartographic projections. Classification of cartographic projections. Gauss-Kruger equiangular cross-cylindrical projection. Graphing of topographic maps and plans and their nomenclature. Level of difficulty: 3* *Data collection methods. Stages of data collection. Basic types of geographic information. Get raster information. Get vector information. Obtaining auxiliary or secondary geographical information. Obtaining information through digital photogrammetry. Obtaining information through a GPS (Global Positioning Systems) device. Getting information from external sources. Geographic information formats. Level of difficulty: 3* *General principles of spatial data visualization. Vector data visualization. Thematic cards. Raster data visualization. The question of generalization. Visualization of geofields. Measurement operations. Analysis of spatial object relations. Spatial queries. Overlay operations. Cutting and shearing operations. Aggregation and disaggregation of object attributes. Buffer zones. Proximity zones. Analysis of engineering fields. Analysis of geofields. Restore geofields. Level of difficulty: 3* *Types of spatial objects in GATs. Understanding of spatial data models. Raster models of data. Regular-cell representation of data. Quadrotomic model of data. Vector models of data. Vector-to-raster and raster-to-vector transformations. Models of surfaces (geofields). Level of difficulty: 4* *Geodata (geodata). Photogrammetric analysis of data. Modeling. Spatial modeling in GAT. Spatial data formats. Geospatial analysis. Methods of geospatial analysis. Database query. Vector data request. Raster data request. Geospatial measurements. Overlay operation. Network analysis. Earth surface analysis. Contour horizontals. Creating a slope. Aspect generation. Level of difficultyu:4* *General principles of spatial data visualization. Vector*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*9. O'.Mukhtorov, A. Inamov - "Geoinformation system and technologies". - Tashkent, TIIAME NRU, 2022 year* *10. O'.Mukhtorov, A. Inamov, J. Lapasov. Instructional manual for practical training in "Geoinformation systems and technologies". T. TIIM, 2017.* *11. B.Markus, O'. Mukhtorov, Z. Mamatkulov, Z. Abdurakhmonov, Sh. Sattorov - "Three-dimensional modeling in geoinformation systems". - Tashkent: TIIAME printing, 2021* *12. Muxtorov O'.B., Inamov A.N., Islomov O'.P., Geoaxborot tizim va texnologiyalar. (Ma'ruza uchun) T., TIQXMMI, 2019 yil. 220 bet.*

Module designation	*YEK 2105 Land cadastre*
Semester(s) in which the module is taught	*4,5- semester*
Person responsible for the module	*Rakhmonov Kasimdjon - doctor of technical sciences, associate professor, M. Abdurakhimova - assistant*
Language	*Uzbek, Russian*
Relation to curriculum	*mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total load: 300 hours* *Auditorium Hours:* *Lecture - 60 hours;* *Practical training - 60 hours* *Independent education - 180 hours*
Credit points	*10 credits*
Required and recommended prerequisites for joining the module	*Geodesy, Cartography, Soil Science and Agriculture*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* – *knows and can explain the components of the state land cadastre, the ministries and agencies that implement them, their rights and obligations regarding the management of the land cadastre;* – *knows the normative legal documents that are the basis for maintaining the state land cadastre and has the skills to use them;* – *acquires qualifications and skills for state registration of rights to land plots, their collection of documents and their issuance;* – *can form cadastral numbers in the registration of land plots and prepare their plan graphic data;* – *is able to classify land plots into attribute tables of objects based on their legal status and maintain land accounts;* – *can calculate the economic value of cultivated fields based on the quality assessment of land;* – *will be able to keep a land account for changes in land types in the territory of the land user subject and have the skills to prepare an explanation of land types.*

Content	*The essence, purpose and tasks of land cadastre. The role, function and importance of the land cadastre in the unified system of state cadastres. Types, principles and documents of state land cadastres. The land fund of the Republic of Uzbekistan - as an object of the land cadastre. Level of difficulty: 2* *Ways to obtain land cadastral data. Statistical methods of obtaining and processing land cadastre data. Methods of analysis of land cadastre data. Use of modern information technologies in land cadastre management. Level of difficulty: 2* *Registration of rights to land plots. Land accounting, its content, types and method of transfer. Land valuation, its importance in economic sectors. Soil inspection and the method of conducting it. Methodology of economic assessment of land and its transfer. Level of difficulty: 2* *Tasks and importance of land cadastre in enterprises, institutions and organizations. Organization of land cadastre in enterprises, institutions and organizations. Description of land ownership, land use and land properties in enterprises, institutions and organizations. Land accounting in enterprises, institutions and organizations. Description of the quality of land types. Level of difficulty: 3* *Contents of the land cadastre in the administrative district. Organization of land cadastre and state control of land use in the district. Land cadastral documents in the district. Procedure for registration of rights to land plots in the district. State land accounting and land quality accounting in the district. Land balance in the district. Level of difficulty: 3* *Content and importance of the land cadastre maintained in the region. Procedure for accepting land balance of administrative district and city. The content of the land balance in the region and the conditions for its preparation. Organization of land cadastre and state control of land use in the province. Level of difficulty: 3* *Tasks of organizing land cadastre and state control of land use in the republic. National land report of the country's land balance. Description of land areas of the Republic of Uzbekistan within the World Land Fund. Level of difficulty: 4* *Use of land cadastre data in economic sectors. Use of land cadastre data in the analysis of production activity of an agricultural enterprise. Use of land cadastre data in land planning. Level of difficultyu:4* *Peculiarities of land cadastre management in the Commonwealth of Independent States (CIS). Land cadastre in developed countries. Level of difficulty:5* *The importance of using geoinformation systems and technologies (GAT) in solving land cadastral issues. Level of difficulty:5*

Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1. Bobojonov A.R., Raxmonov Q.R, Gofirov A. Yer kadastri. T.TIMI, 2008. -220 b.* *2. Kurbonov E.Q., Bobojonov A.R., Raxmonov Q.R, Yer kadastri asoslari. T.TTESI, 1999. -75 b.* *3. Чертовицкий А.С., Бозоров А.К. "Земелный кадастр. Т. "Фан ва технология" 2013 г. 296 с* *4. Қ.Рахмонов, А.Бобожонов, А.Ж.Гофиров. Ер кадастри. Ўқув қўлланма. ТИМИ, 2012. 173 б.*

Module designation	*YAT 2204 Land information system*
Semester(s) in which the module is taught	*4 - semester*
Person responsible for the module	*Rakhmanov Kosimdjon, DSc*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total load: 120* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Geodesy, Introduction to state cadastres, Information technologies and mathematical modeling of processes, Geoinformation system and technologies, Land Use Economics and Management*

Module objectives/intended learning outcomes	– After mastering the discipline, the student: – knows and can explain actions related to the collection, storage and processing of all information and data related to land; – can widely use special programs, aerial and space images, information on geoportals in the Internet system; – knows and can perform the methods of determining the area of agricultural land in an automated way with the help of special programs and entering data, periodically updating them; – can independently use special GIS programs, CAD, MAPPING, ArcView, AtlasGIS program, MapInfo, ArcCAD System, Panorama programs to form a land information system; – can perform operations such as digital image processing, data vectorization, generalization, buffering, and topology; – database, database management system (DBMS). Knows the types of database management software, DBMS and can use it to form a land information system; – knows and can perform operations such as geospatial analysis, geospatial analysis methods (database query, vector data query, raster data query), geospatial measurements, Overlay operation; – knows and can explain geodescription methods, classification, reclassification, map comparison, graphic and report views, map representation, three-dimensional representation methods; – knows and can use management in the land information system, software and its types, requirements for installing geographic information programs, computer technologies used in the system and their management, expert systems.

Content	Concept and tasks of land information systems science. General information on GIS ball. The main used terms and terms. Areas of application of the system. The concept of geomatics and its place in the system. Geographic and attribute data. Geocoding. Level of difficulty 2 Information and understanding of information. Data collection methods. Stages of data collection. Types of basic geographic information. Get Raster and Vector information. Obtaining auxiliary or secondary geographic information. Obtaining information through digital photogrammetry. Getting information through a GPS device. Obtaining information from external sources. Geographic information formats. Level of difficulty 2 Information and tasks of special GIS programs. (CAD, MAPPING, ArcView, AtlasGIS software, MapInfo, ArcCAD System, Panorama) Understanding of digitization. Rules of digital imaging Special scanners. Raster and rasterization. Digital image processing. Vector and vectorization. Data generalization. Buffering. Topology. Level of difficulty 2 Understanding of database. Database Management System (MBBT). Database management programs. Types of MBBT. Advantages of MBBT. Tasks of MBBT. Placing information in MBBT tables. Database design. Understanding of SQL. The importance of indexing in the query process. Level of difficulty 3 A concept in a geodatabase. Photogrammetric data analysis. Modeling and models. Spatial modeling in GAT. Spatial data formats. Level of difficulty 3 Role and tasks of management in land information system. Software and its types. Study of requirements for installation of geographic information programs. Computer technologies used in the system and their management. Concepts of expert systems. Level of difficulty 3 The role of multimedia tools in using the land information system. Studying land information system programs and data through the Internet. The role of three-dimensional models. Study of the mobilized geographic information system. Level of difficulty 4 Methods of obtaining space velocities. Problems with remote access. Information on the characteristics of various space images (IKONOS, Quickbird, WorldView, EROS V, IRS satellites). Global Positioning System and its application. Information on GRS-receivers hub. Level of difficulty 5
Exams and assessment formats	*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.*

Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1.Сафаров Э., Мусаев И., Абдураҳманов Х. География ахборот тизимлари ва технологиялари. –Тошкент, 2008. ТИМИ, -160 б.* *2.Чертовицкий А.С., Базаров А.К. Ердан фойдаланишни бошқариш. Тошкент, 2009.* *3.Бабажанов А.Р., Рахмонов Қ., Ғофуров А.Ж. Ер кадастри. Дарслик, Т.: 2008. – 211 б.* *4.Чертовиский А.С., Земелние кадастр. Учебное пособие.-Т.ТИИМ типография, 2012 г.-296 с.* *5.Рахмонов Қ., Успанкулов Б.М. Давлат кадастрлар асослари Дарслик. "ТИҚХММИ" МТУ Т.: Т.:2023.-216 б.*

Module designation	*BIK 3204 State cadastre of buildings and structures*
Semester(s) in which the module is taught	*5- semester*
Person responsible for the module	*Ashurov Abdullo Faizullaevich - doctor of philosophy in technical sciences, PhD;* *Uspankulov Bekzhan Musabekovich - assistant*
Language	*Uzbek, Russian*
Relation to curriculum	*Elective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total load: 120* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 60 hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Basics of geodesy, land cadastre, geodetic works in land preparation, remote sensing, state cadastres*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* *– knows and can explain the value of buildings and constructions, their usage characteristics, whether these objects are for domestic or production purposes, their use for specified purposes, the tax zone where they are located and other information;* *– understands the compliance of buildings and constructions to land development schemes, master plans of cities, settlement projects, as well as architectural and urban planning requirements, building parameters (floors, common, living, production areas), modern technologies used in creating cadastral data base about them;* *– Understands information about the objects and subjects of the state cadastre of buildings and structures, the competent bodies for its maintenance;* *– Theoretical and practical knowledge of cadastre of buildings and structures, knows how to work with mastered land structure and land cadastre drawings, maps, plans, topographic maps;* *– knows how to create a cadastral folder for residential objects;* *– Buildings and structures can use electronic programs used in the formation of text and graphic data of the state cadastre.*

Content	*Procedure for maintaining the state cadastre of buildings and structures. Structure and content of the cadastre of buildings and structures. Organization of cadastre of buildings and structures. The procedure for dividing the territories of the Republic of Uzbekistan by cadastre and forming and issuing cadastral numbers of land plots, buildings and structures. Level of difficulty: 2* *Procedure for state registration of rights to buildings and structures. The procedure for state registration of rights to real estate using the information system complex according to the "One window" principle. Level of difficulty: 2* *Basic principles of state registration of buildings and structures. Documents confirming rights to buildings and structures and other private property. Organization of state registration of buildings and structures. Terms of state registration and inventory of buildings and structures. Record of internal measurement and external measurement of buildings. Level of difficulty: 3*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*13. 3D Cadastre in an international Context, Jonatien E. Stoter and Peter van Oosterom 2006. CRC Press Taylor& Francis Group, New York.* *14. Ашуров А.Ф., Усмонов М., Успанкулов Б.М. "Бино ва иншоотлар давлат кадастри", Ўқув қўлланма, Тошкент 2019 й.* *15. Г.А. Калабухов, В.Н. Баринов, Н.И. Трухина, А.А. Харитонов. Основы кадастра недвижимости. учебное пособие. Воронеж 2014 г.- 171 с.* *16. И. Ихлосов, Д.Ризаева. Давлат кадастри асослари. Ўқув қўлланма. NOSHIR, 2019 y. 225 b.* *17. Raxmonov Q., Uspankulov B. Davlat kadastri asoslari. O'quv qo'llanma. TIQXMMI nashryoti, 2018 y. 208 b.*

Module designation	*DSK 3205 State urban planning cadaster*
Semester(s) in which the module is taught	*6- semester*

Person responsible for the module	*Ashurov Abdullo Faizullaevich - doctor of philosophy in technical sciences, PhD;* *Abdurakhimova Mohigul Oybek's daughter - assistant*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total load: 150* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 90 hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Fundamentals of geodesy, land cadastre, building and construction cadastre, state cadastre*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* – *knows and can explain how to divide residential areas according to cadastre, form and issue cadastral*

	numbers; *– understands real estate, precise address registers of engineering, transport and social infrastructure objects, approved urban planning documents on the development and construction of territories, urban planning regulations on the construction of territories and the use of objects of urban planning activities;* *– understands information about objects and subjects of urban planning activity;* *– knows the method of registration of objects of the state urban planning cadastre, the normative-legal basis for maintaining the urban planning cadastre, the technology of creating state urban planning geoportals;* *– knows electronic programs for creating information on the state urban planning cadastre;* *– can use electronic programs to create thematic layers related to the state urban planning cadastre, describe the spatial location of vector objects (point, line and area).*

Content	*The purpose and tasks of the science of state urban planning cadastre. Development history of cadastral works. Placement and development of residential areas. State registration of rights to land and immovable property in residential areas. The procedure for dividing the territories of the Republic of Uzbekistan by cadastre. Procedure for forming and issuing cadastral numbers of land plots, buildings and structures. Level of difficulty: 2* *State registration of rights to immovable property and transactions concluded on it. Keeping the city (district) land cadastre book. Quantitative accounting of land areas in cities and towns. Division of city territories into taxation zones. Level of difficulty: 2* *Determining the valuable social factors of residential areas. Monitoring the quality of lands. Economic evaluation of land in urban development cadastre. Accounting for land valuation. Urban planning development factors. Use of modern information technologies in maintaining the state urban planning cadastre. Level of difficulty: 3* *Creation of an automated system for maintaining the state urban planning cadastre. Studying the experiences of the countries of the world in maintaining the state urban planning cadastre. The system of basic regulatory documents on the maintenance of the state urban planning cadastre. Organizational and legal foundations of the state urban planning cadastre. The role of the state Urban Development Cadastre in the management of land resources. Level of difficulty: 3* *To study the experiences of urban development cadastre in neighboring Commonwealth countries. Powers of the state and authorities to maintain the state urban planning cadastre. Level of difficulty: 3*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. И.Ихлосов, Д.Ризаева. Давлат кадастри асослари. Ўқув қўлланма. NOSHIR, 2019 y. 225 b.* *2. Raxmonov Q., Uspankulov B. Davlat kadastri asoslari. O'quv qo'llanma. TIQXMMI nashryoti, 2018 y. 208b.;* *3. Ашуров А.Ф. Давлат шаҳарсозлик кадатсри,Ўқув қўлланма. Тошкент 2014 й.* *4. Ашуров А.Ф. Давлат кадастрлари маълумотлар базаси. Ўқув қўлланма. Тошкент 2021 й.* *5. И.В. Лесных, В.Б. Жарников, В.Н. Клюшниченко, С.Н. Ушаков. Городской кадастр, Новосибирск: СГГА. Институт кадастра и геоинформационных систем, 2000.- 120 с.*

Module designation	*NKXR 4105 Maintenance of duty cadastral maps*
Semester(s) in which the module is taught	*11- semester*
Person responsible for the module	*Ashurov Abdullo Faizullaevich - doctor of philosophy in technical sciences, PhD;*
Language	*Uzbek*
Relation to curriculum	*Selective*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total load: 120* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours* *Independent education 60 hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*basics of state cadastres, state cadastre database, computer graphics in cadastral work, organization of cadastral work, land cadastre, state urban development cadastre, state forest cadastre, state cadastre of buildings and structures*

Module objectives/intended learning outcomes	*After mastering the discipline, the student* *– In maintaining the unified system of the state cadastre of the Republic of Uzbekistan, to have an idea about the concepts of maintaining duty cadastral maps, maintenance of duty cadastral maps of State cadastral objects;* *– Keeping duty cadastral maps of state cadastre objects based on a single methodology, bringing the duty cadastral maps of cadastral objects into a single system, being able to fulfill the service system and tasks of state cadastres, being able to ensure interdependence and sequence in maintaining cadastral directions, natural resources and linear type cadastres know how to manage and be able to use them;* *– The duty of the state cadastral objects should have the skills to maintain cadastral maps and develop their characteristics, quantity and quality indicators of objects, cadastral data.*

Content	*Legislation on keeping duty maps of cadastral objects. On state registration of rights to real estate. Application of international treaty provisions other than those stipulated in the legislation of the Republic of Uzbekistan on state registration of rights to real estate. Level of difficulty: 2* *The purpose and tasks of the science of maintaining duty cadastral maps of cadastral objects. Compilation of cadastral maps on a cartographic basis in accordance with the law on state registration of cadastral objects, cadastral data in graphic and text form. Cadastral maps in state cadastral registration. Information available in the unified state register of real estate. Level of difficulty: 2* *Keeping duty cadastral maps of state cadastral objects of mines, mineral deposits and man-made products of the Republic of Uzbekistan. Representing the locations of land plots occupied by all types of mines, mineral targets and man-made objects on official cadastral maps. Assessment of the state of mineral raw material resources, ensuring the development of a program for the development of work on the geological study of underground resources, the study and evaluation of the main data of mines, mineral targets and objects of man-made products. The locations of land plots occupied by all types of mines, mineral targets and man-made objects are reflected on official cadastral maps. Level of difficulty: 3* *Maintenance of duty cadastral maps of state water cadastral objects. Identified objects - real estate objects that are not registered in the unified state register of real estate, identified according to the results of urban development activity monitoring. Use of information in the form of electronic documents from the Unified State Register of Real Estate to maintain the "Cadastre Territory Plan" layer. Using information from planning and development projects or area survey projects to maintain the "Planned Objects" layer. Using remote sensing space data or orthophoto maps obtained from drones to maintain the "unaccounted objects" layer. Level of difficulty: 3*

Exams and assessment formats	*Maintenance of duty cadastral maps of state forest cadastre objects. About the land plots, buildings and structures related to the objects of the state forest cadastre, the location of the land plots occupied by all types of objects should be reflected on duty cadastral maps. The structure of the intended use of land in the land cadastral information on land plots related to the objects of the state forest cadastre. About the objects of the state forest cadastre, the locations of the land plots occupied by all types of objects are reflected on the official cadastral maps. Level of difficulty*: 3 *Maintenance of duty cadastral maps of cartography-geodesy state cadastral objects.* *Laws of the Republic of Uzbekistan "On Geodesy and Cartography" and "On State Cadastres" regarding the maintenance of cartography-geodesy state cadastre. Cartographic-geodesian state cadastral objects, the location of all types of land plots occupied by the objects are reflected on duty cadastral maps. Inclusion of updated reliable information on cartography-geodesy data, performed geodesy, topography and cartography works, including their quantity and quality descriptions, in official cadastral maps. Level of difficulty*: 3 *Keeping duty cadastral maps of state cadastre objects of flora of the Republic of Uzbekistan. The location of land plots occupied by all types of flora objects should be shown on official cadastral maps. The main and current types of information that ensure continuous updating of the state cadastre cadastre information of plant world objects. Level of difficulty: 4* *Keeping duty cadastral maps of state cadastral objects of the animal world. Organization of total cadastral data on animal world, accounting and registration and assessment information. The locations of the land plots occupied by all types of animal world objects should be reflected on duty cadastral maps. Level of difficulty: 4* *Maintaining duty cadastral maps of state cadastral objects of protected areas. The locations of the land plots occupied by all types of state cadastral objects of the protected areas should be reflected on duty cadastral maps. Level of difficulty: 5*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*1. Velta Parsova, Virginija Gurskiene, Madis Kaing. "Real property cadastre in* 404*ortal countries" Textbook. Jelgava – 2012. ;* *2. Raxmonov Q., Uspankulov B. Davlat kadastri asoslari. O'quv qo'llanma. TIQXMMI nashriyoti, 2018 y. 208 b.;* *3. Ashurov A.F. Основы государственных кадастров. Учебное пособие.TIQXMMI T.: 2020 g.- 168 str.*

Example form for Module Handbook

A **Module Handbook or collection of module descriptions that is also available for students to consult** should contain the following information about the individual modules:

Module designation	*Building materials, QUM2205*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Yunusova Farida Rakhmonberdiyevna, phone, associate professor*
Language	*Uzbek/Russian*
Relation to curriculum	*selection*
Teaching methods	*Lecture, practical training, laboratory work*
Workload (incl. contact hours, self-study hours)	*Total load: 150* *Auditorium hours: 60* *Lecture - .30 hours;* *Practical training. 10...hours* *Laboratory work-20 hours:* *Independent education - 90 hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*: Physics, Chemistry, mathematics.*

Module objectives/intended learning outcomes	**To know and understand:** *- when choosing construction materials,* *- draw a conclusion knowing the conditions of their operation, know the acquisition, structure, properties, and theoretical foundations of materials;* **To be able to:** *- should have the skills of analytical reasoning and application, knowing the properties of construction materials,* *- planning and changing the properties of materials to the required aspects;* **To form competences in:** *- must be able to take into account dry and hot climate conditions and energy efficiency when transporting,* *- storing and using materials while maintaining their physical and mechanical properties and quality, and should be able to know and use them.*

Content	"Construction materials" for students choose raw materials, produce construction materials, have an idea of their use, improve raw materials and products in the production of construction materials in terms of energy efficiency according to the requirements of the present time, justify the possibility of using them for various purposes, while maintaining their technical properties, their mass The tasks include teaching the theoretical foundations and technological processes of providing energy and resource-saving technologies in lightening and production. Introduction to science. General information on building materials, their classification. Origin, types of building materials.The concept of the main physical and mechanical properties of building materials. Level of difficulty: 3. Natural stone materials. origin, classification, properties. General understanding of natural stone materials. Level of difficulty: 3. Artificial scorched materials and items. General understanding of pottery, raw materials, methods and properties of production. Level of difficulty: 4. Mineral binders, grading, properties. Hardening binder in the Air-construction mortar,gypsum binder, raw materials, production technology, properties . Level of difficulty: 5. Hydraulic binders.Hydraulic binder-portlandtsement, raw materials,production methods, technolo - Gia , properties. Level of difficulty: 5. Properties of the minerological composition of Portland cement. Types of portlandtsement. Level of difficulty: 6. General information on concrete paving, grading. Level of difficulty: 5. Concretions: binder for heavy concrete, water in a fine and large filler bath, technical requirements for them. Level of difficulty: 5. Types of concretions, water in the form of a hydraulic concrete sink,technical requirements for them. Level of difficulty: 5. Construction mixtures, their classification, properties . Level of difficulty: 4. General concept, grading, production process, properties, use of reinforced concrete products. Level of difficulty: 5. Artificial stone materials, types.Silicate materials.Asbestos cement parts. Level of difficulty: 5. Waterproofing materials, grader, properties, use. Level of difficulty: 5. Modern building materials, grading. Level of difficulty: 5. The following topics are recommended for practical classes: 1. Determination of the nominal content of heavy concrete. Level of difficulty: 4. 2. For the manufacture of heavy concrete, it is necessary to evaluate the composition. Level of difficulty: 4. 3. The nominal content of hydrotechnical concrete is determined. Level of difficulty: 5. 4. For the production of hydrotechnical concrete, the content of the composition is determined. Leyel of difficulty: 5. 5. Clay the composition of the complex construction mixture

Exams and assessment formats	*There are two mid-term tests (20 minutes each) and a final oral exam (40 minutes), as well as homework in the form of written or creative work.*
Study and examination requirements	*Students to successfully pass science* *The total maximum score will be the sum of the points allocated to the final exam (40%), Midterm (20%), homework (10%) and classroom activity (10%). To successfully pass the subject, a student must score 60% or more of the allotted points.*
Reading list	*M. Clara Gonsalves, Fernanda Margarido. Materials for construction and civil engineering. Springer International Publishing, Switzerland 2015, pages 1-5, 11-14.* *A. Hamidov "Construction materials and products", Tashkent, Science and Technology, 2012.* *Kasimov E., Construction materials. T. "Mekhnat", 2010., 511 pages.* *E.S. Kulikova, I.S. Ukerainskyi. "Stroitelnye materialy", Khabarovsk, TOGU, 2017* *Samigov N.A., Samigova M.S. "Building materials and products". Tashkent. "Mekhnat", 2014. 310b.*

Faculty of Agricultural Mechanization

5430300 – Technical service in agriculture and water management

Module designation	*DTSV 3203 Diagnostic and technical service tools*
Semester(s) in which the module is taught	*8- semester*
Person responsible for the module	*Professor Farmonov Erkin*
Language	*Uzbek*
Relation to curriculum	*Choice*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 90* *Contact hours: lecture - 20, practical lessons – 10, self-learning – 60 hours*
Credit points	*3 credits*
Required and recommended prerequisites for joining the module	*Information technologies, Materials science and technology of construction materials, Tractors and vehicles.*
Module objectives/intended learning outcomes	
Content	*The importance of technical service in the use of techniques.*

	Types of technical maintenance of machines. *The main states of cars and their external signs.* *The role and importance of diagnostics in technical service* *The concept of prediction in science. Forecasting and modern economics* *Diagnostic tasks. Diagnostic tools and their technology* *Predicting the technical condition of machines based on the results* *Requirements for the suitability of diagnostic machines* *Diagnostics of machines by orgonoliptic methods.* *Management of the technical condition of machines according to the results of diagnostics* *Study of conventional symbols used in kinematic schemes.* *Determination and analysis of the main performance indicators of power units.* *Basing the periodicity of maintenance and repair of agricultural and reclamation machines.* *Study of diagnostic aggregates and their structure.* *Determining the demand for mobile and stationary diagnostic units.* *Diagnostic tools and their technology. Diagnostic tasks* *Diagnostic tools and their technology. Diagnostic tasks* *Types of diagnosis, parameters and classification of diagnostic tools* *Types of diagnosis, parameters and classification of diagnostic tools* *Technical condition of machines, stages of diagnostic methods. Predicting the technical condition of machines based on the results.* *Technical condition of machines, stages of diagnostic methods. Predicting the technical condition of machines based on the results.* *Tractors and complex agricultural machinery* *diagnostic technology. Basic organizational principles.* *Tractors and complex agricultural machinery* *diagnostic technology. Basic organizational principles* *Availability of diagnostic machines* *requirements. Car diagnostics.* *Availability of diagnostic machines* *requirements. Car diagnostics.*

	Management of the technical condition of machines according to the results of diagnostics. Classification of technical diagnostic tools. *Management of the technical condition of machines according to the results of diagnostics. Classification of technical diagnostic tools.* *Loss of oil products and ways to reduce them. Diagnostics of machines by orgonoliptic methods.* *Loss of oil products and ways to reduce them. Diagnostics of machines by orgonoliptic methods.* *Oil products during the use of agricultural machinery* *cost calculation methods. Collection and recovery of used oil products.* *Oil products during the use of agricultural machinery* *cost calculation methods. Collection and recovery of used oil products.* *Factors affecting the reliability of machines during storage. Description of the operational production concept and its main features.* *Factors affecting the reliability of machines during storage. Description of the operational production concept and its main features.* *Technical condition of machines during non-working periods* *change. Types and methods of car maintenance.* *Technical condition of machines during non-working periods* *change. Types and methods of car maintenance.* *Technological and technical maintenance of machines during storage. Procedure for storing machines, tools and equipment in warehouses and exchange places.* *Technological and technical maintenance of machines during storage. Procedure for storing machines, tools and equipment in warehouses and exchange places.* *Drawing up an annual program of technical maintenance of machines. Establishment of repair and service base.* *Drawing up an annual program of technical maintenance of machines. Establishment of repair and service base.* *Diagnostic tools and their technology. Diagnostic tasks* *Diagnostic tools and their technology. Diagnostic tasks* *Types of diagnosis, parameters and classification of*

	diagnostic tools *Types of diagnosis, parameters and classification of diagnostic tools* *Technical condition of machines, stages of diagnostic methods. Predicting the technical condition of machines based on the results* *Technical condition of machines, stages of diagnostic methods. Predicting the technical condition of machines based on the results*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	1. *Igamberdiev A. Aliqulov S. Traktorlar va qishloq xo'jaligi mashinalaridan foydalanish, texnikservis. Toshkent, 2020.-283 b (o'quv qo'llanma)* 2. *Z.Sh.Sharipov, P.T.Berdimuratov, B.B.Xakimov Mashina va traktor agrigatlarini diagnostikalash va texnik servisi (o'quv qo'llanma). –Toshkent:, 2021y. -235 b.* 3. *Ashirbekov I.A., Gorlova I.G. Mashinalar ishonchliligi va texnik servisi. (o'quv qo'llanma). – Toshkent:, 2011y. -450 b.* 4. *Yo'ldoshev Sh.U., Xoliyorov Yo.B. va boshqalar. Zamonaviy texnik xizmat ko'rsatish va ta'mirlash korxonalarini tashkil etish va texnologik jihozlash bo'yicha qo'llanma. –Toshkent: O'zMEI, 2011y. -132b.*

Module designation	*MAT1114 Advance Mathematics*
Semester(s) in which the module is taught	*1,2 semestr*
Person responsible for the module	*Associate Professor Turaev Foziljon*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training , independent education*

Workload (incl. contact hours, self-study hours)	*Total workload: 420* *Contact hours: lecture – 60, practical lessons – 100, self-learning – 260, hours*
Credit points	*14*
Required and recommended prerequisites for joining the module	*Basic Algebra, Geometry, Informatics*
Module objectives/intended learning outcomes	***To know and understand:*** - *elements of linear algebra;* - *analytic geometry;* - *mathematic analysis;* - *theory of complex numbers;* - *derivative of functions, indefinite and definite integrals, multivariable functions and series in solving practical problems related to land resources* ***To be able to:*** *- to choose convenient methods of solving differential equations and use them in process analysis, to know solutions to problems;* *- using mathematical symbols to express quantitative and qualitative relations of objects;* *- derivative of a function, indefinite and definite integral, use of multivariable functions and series in solving practical problems.* **To form competences in:** *- deep practical and theoretical knowledge , application of mathematical concepts in practice;* *- able to mathematically analyze statistical data;* *- to be able to build a mathematical model of a problem and find its solution using mathematical research methods;* *- solving optimization problems of land resources.*

Content	*Matrices and operations on them, determinants and their main properties. Methods of solving the system of linear algebraic equations. Level of difficulty: 2* *Elementary problems of analytic geometry in plane and space. Level of difficulty: 3* *Algebra of vectors. A straight line in space and their equations in different forms. Level of difficulty: 2* *Mathematical analysis. Differential calculus. Concept of indefinite integral. The main methods of integration. Definite integral and its applications. Calculating the definite integral. Applications of the definite integral to geometric and mechanical problems.* *Level of difficulty: 4* *Theory of multivariable functions. Partial derivative, full differential. Application of full differentials in approximate calculations. Determining the extreme of a multivariable function. Determining tangent plane and normal to a curve in space. Directional derivative. Gradient.* *Level of difficulty: 4* *Ordinary differential equations and methods of solving. Higher order differential equations. System of linear differential equations. Level of difficulty: 5* *Number and functional series. Power series. Taylor and Maclauren series and their applications. Expanding a function to a Fourier series. Level of difficulty: 5*
Exams and assessment formats	*One Midterm assessment and one final control exam in the form of written work (80 minutes each) .*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*18. PETER W. O'NEIL. Advanced engineering mathematics. 2010.* *19. Claudio Canuto, Anita Tabacco. Mathematical Analysis I, (II) . Springer-Verlag, Italia, Milan, 2015.* *20. B.Xudayarov "Matematika" Part I. Chiziqli algebra va analitik geometriya. Tashkent, "Fan and technology", 2018. -284 p. (in Uzbek)* *21. B.Xudayarov "Matematikadan misollar va masalalar to'plami" Tashkent "Uzbekistan" 2018. 304 p. (in Uzbek)* *22. T. Ergashev "Differensial tenglamalar" Tashkent " Uzbekistan " 2023 years. 320 p .(in Uzbek)*

Module designation	*MAT1109 Higher Mathematics*
Semester(s) in which the module is taught	*1 semestr*

Person responsible for the module	*Senior teacher Normuminov Bakhodir*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training , independent education*
Workload (incl. contact hours, self-study hours)	*Total workload: 270* *Contact hours: lecture – 60, practical lessons – 60, self-learning – 150, hours*
Credit points	*9*
Required and recommended prerequisites for joining the module	*Basic Algebra, Geometry, Informatics*
Module objectives/intended learning outcomes	***To know and understand:*** - *elements of linear algebra;* - *analytic geometry;* - *mathematic analysis;* - *theory of complex numbers;* - *derivative of functions, indefinite and definite integrals, multivariable functions and series in solving practical problems related to ecology sector* ***To be able to:*** *- to choose convenient methods of solving differential equations and use them in process analysis, to know solutions to problems;* *- using mathematical symbols to express quantitative and qualitative relations of objects;* *- derivative of a function, indefinite and definite integral, use of multivariable functions and series in solving practical problems.* **To form competences in:** *- deep practical and theoretical knowledge , application of mathematical concepts in practice;* *- able to mathematically analyze statistical data;* *- to be able to build a mathematical model problem of water sector and find its solution using mathematical research methods;* *- solving optimization problems of ecology sector.*

Content	*Matrices and operations on them, determinants and their main properties. Methods of solving the system of linear algebraic equations. Level of difficulty: 2* *Elementary problems of analytic geometry in plane and space. Level of difficulty: 3* *Algebra of vectors. A straight line in space and their equations in different forms. Level of difficulty: 2* *Mathematical analysis. Differential calculus. Concept of indefinite integral. The main methods of integration. Definite integral and its applications. Calculating the definite integral. Applications of the definite integral to geometric and mechanical problems.* *Level of difficulty: 4* *Theory of multivariable functions. Partial derivative, full differential. Application of full differentials in approximate calculations. Determining the extreme of a multivariable function. Determining tangent plane and normal to a curve in space. Directional derivative. Gradient.* *Level of difficulty: 4* *Ordinary differential equations and methods of solving. Higher order differential equations. System of linear differential equations. Level of difficulty: 5* *Number and functional series. Power series. Taylor and Maclauren series and their applications. Expanding a function to a Fourier series. Level of difficulty: 5*
Exams and assessment formats	*One Midterm assessment and one final control exam in the form of written work (80 minutes each) .*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*23. Claudio Canuto, Anita Tabacco. Mathematical Analysis I, (II) . Springer-Verlag, Italia, Milan, 2015* *24. B.Xudayarov "Matematikadan misollar va masalalar to'plami" Tashkent "Uzbekistan" 2018. 304 p. (in Uzbek)* *25. T. Ergashev "Differensial tenglamalar" Tashkent " Uzbekistan " 20 23 years. 320 p .(in Uzbek)* *26. Sh.Alimov, R.Ashurov "Matematik analiz" Part I. Tashkent, "Mumtoz so'z", 2018. -583 p. (in Uzbek)* *27. PETER W. O'NEIL. Advanced engineering mathematics. 2010.*

Module designation	*MAT1115 Higher Mathematics*
Semester(s) in which the module is taught	*1,2 semestr*

Person responsible for the module	*PhD, associate professor Abdullaev Akmaljon*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training , independent education*
Workload (incl. contact hours, self-study hours)	*Total workload: 420* *Contact hours: lecture – 90, practical lessons – 90, self-learning – 270, hours*
Credit points	*15*
Required and recommended prerequisites for joining the module	*Basic Algebra, Geometry, Informatics*
Module objectives/intended learning outcomes	***To know and understand:*** - *elements of linear algebra;* - *analytic geometry;* - *mathematic analysis;* - *theory of complex numbers;* - *derivative of functions, indefinite and definite integrals, multivariable functions and series in solving practical problems related to water sector and land reclamations* ***To be able to:*** *- to choose convenient methods of solving differential equations and use them in process analysis, to know solutions to problems;* *- using mathematical symbols to express quantitative and qualitative relations of objects;* *- derivative of a function, indefinite and definite integral, use of multivariable functions and series in solving practical problems.* **To form competences in:** *- deep practical and theoretical knowledge , application of mathematical concepts in practice;* *- able to mathematically analyze statistical data;* *- to be able to build a mathematical model problem of water sector and find its solution using mathematical research methods;* *- solving optimization problems of water sector.*

Content	*Matrices and operations on them, determinants and their main properties. Methods of solving the system of linear algebraic equations. Level of difficulty: 2* *Elementary problems of analytic geometry in plane and space. Level of difficulty: 3* *Algebra of vectors. A straight line in space and their equations in different forms. Level of difficulty: 2* *Mathematical analysis. Differential calculus. Concept of indefinite integral. The main methods of integration. Definite integral and its applications. Calculating the definite integral. Applications of the definite integral to geometric and mechanical problems.* *Level of difficulty: 4* *Theory of multivariable functions. Partial derivative, full differential. Application of full differentials in approximate calculations. Determining the extreme of a multivariable function. Determining tangent plane and normal to a curve in space. Directional derivative. Gradient.* *Level of difficulty: 4* *Ordinary differential equations and methods of solving. Higher order differential equations. System of linear differential equations. Level of difficulty: 5* *Number and functional series. Power series. Taylor and Maclauren series and their applications. Expanding a function to a Fourier series. Level of difficulty: 5*
Exams and assessment formats	*One Midterm assessment and one final control exam in the form of written work (80 minutes each) .*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*28. B.Xudayarov "Matematikadan misollar va masalalar to'plami" Tashkent "Uzbekistan" 2018. 304 p. (in Uzbek)* *29. T. Ergashev "Differensial tenglamalar" Tashkent " Uzbekistan " 20 23 years. 320 p .(in Uzbek)* *30. PETER W. O'NEIL. Advanced engineering mathematics. 2010.* *31. Claudio Canuto, Anita Tabacco. Mathematical Analysis I, (II) . Springer-Verlag, Italia, Milan, 2015.* *32. Sh.Alimov, R.Ashurov "Matematik analiz" Part I. Tashkent, "Mumtoz so'z", 2018. -583 p. (in Uzbek)*

Module designation	*ODT2105 – Ordinary differential equations*
Semester(s) in which the module is taught	*4 semestr*

Person responsible for the module	*DSc, professor Ergashev Tuhtasin*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training , independent education*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture – 20, practical lessons – 40, self-learning – 90, hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Basic Algebra, Geometry, Informatics*
Module objectives/intended learning outcomes	***To know and understand:*** *- first order differential equations;* *- higher order differential equations;* *- systems of differential equations;* *- methods of approximate solution of differential equations;* *- stability theory in solving practical problems related to construction of hydraulic structures.* ***To be able to:*** *- to choose convenient methods of solving the ordinary differential equations and use them in process analysis, to know solutions to problems;* *- using mathematical symbols to express quantitative and qualitative relations of objects;* *- numerical and functional series in solving practical problems.* **To form competences in:** *- deep practical and theoretical knowledge , application of mathematical concepts in practice;* *- able to mathematically analyze statistical data;* *- to be able to build a mathematical model problem of construction of hydraulic structures* *and find its solution using mathematical research methods;* *- solving optimization problems of construction of hydraulic structures.*

Content	*- First order differential equations. Homogeneous, linear, Bernoulli equations. Complete differential equations. Unsolved equations with respect to the derivative. Level of difficulty: 2* *- Higher order differential equations. Equations that can be reduced in order. Level of difficulty: 4* *- Higher order linear differential equations. Equations with variable coefficients. Equations with constant coefficients. Non-homogeneous equations with constant coefficients. The method of variation of constants. Level of difficulty: 4* *- Systems of differential equations. Systems with constant coefficients. Non-homogeneous systems with constant coefficients. The method of variation of constants. Level of difficulty: 5* *- First order partial differential equations. Linear and non-linear equations. The Pfaff equation. Potential field. Level of difficulty: 4* *- Methods of approximate solution of differential equations. Level of difficulty: 5* *- Stability theory. Special points. Phase plane. Level of difficulty: 5*
Exams and assessment formats	*One Midterm assessment and one final control exam in the form of written work (80 minutes each) .*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*33. B.Xudayarov "Matematikadan misollar va masalalar to'plami" Tashkent "Uzbekistan" 2018. 304 p. (in Uzbek)* *34. T. Ergashev "Differensial tenglamalar" Tashkent " Uzbekistan" 2023 years. 384 p .(in Uzbek)* *35. PETER W. O'NEIL. Advanced engineering mathematics. 2010.* *36. Claudio Canuto, Anita Tabacco. Mathematical Analysis I, (II) . Springer-Verlag, Italia, Milan, 2015.* *37. Sh.Alimov, R.Ashurov "Matematik analiz" Part I. Tashkent, "Mumtoz so'z", 2018. -583 p. (in Uzbek)*

Module designation	*IUM 1114- Mathematics for Economists*
Semester(s) in which the module is taught	*1, 2, 3 semesters*
Person responsible for the module	*Associate professor, V. Vakhobov, PhD , associate professor Abdullaev Akmaljon, asst. M. Sadullaeva*
Language	*Uzbek, Russian, English*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, practical lesson, self-learning*

Workload (incl. contact hours, self-study hours)	*Total workload: 420* *Contact hours: 180* *Lecture - 60 hours;* *Practical training - 120 hour* *self-learning - 240 hours*
Credit points	*14*
Required and recommended prerequisites for joining the module	*Basic elements of Algebra, Geometry, Informatics*
Module objectives/intended learning outcomes	***To know and understand:*** *- elements of linear algebra ;* *- analytical geometry;* *-mathematical analysis;* *- the use of derivatives of functions, indefinite and definite integrals, multivariable functions, differential equations and series in solving practical problems related to the economics of water management;* *- mathematical statistics.* ***To be able to:*** *- to be able to choose convenient methods of solving differential equations and to use them in the analysis of processes , to know the solutions for the problems of the economy of water management ;* *- Using mathematical symbols to express quantitative and qualitative relations of objects ;* *- function derivative, indefinite and definite integral, multivariable functions and series use in solving practical problems ;* *- probabilities theory and elements of mathematical statistics .* **To form competences in:** *- in-depth practical and theoretical knowledge of science, application of mastered mathematical concepts in practice ;* *- to be able to analyze statistical data mathematically;* *- to be able to build a mathematical model of water economy issues with the help of mathematical research methods and find its solution ;* *- to be able to solve optimization issues of water management economy .*

Content	*- Matrices and operations on them, determinants and their main properties. Methods of solving the system of linear algebraic equations. Level of difficulty: 2* *- Elementary problems of analytic geometry in plane and space. Level of difficulty: 3* *- Algebra of vectors. A straight line in space and their equations in different forms. Level of difficulty: 2* *- Mathematical analysis. Differential calculus. Concept of indefinite integral. The main methods of integration. Definite integral and its applications. Calculating the definite integral. Applications of the definite integral to geometric and mechanical problems. Level of difficulty: 4* *- Theory of multivariable functions. Partial derivative, full differential. Application of full differentials in approximate calculations. Determining the extreme of a multivariable function. Determining tangent plane and normal to a curve in space. Directional derivative. Gradient. Level of difficulty: 4* *- Ordinary differential equations and methods of solving. Higher order differential equations. System of linear differential equations. Level of difficulty: 5* *- Number and functional series. Power series. Taylor and Maclauren series and their applications. Expanding a function to a Furer series. Level of difficulty: 5* *- Combinatory main rules. Placements, place permutations , grouping . Random events and of probability different definitions. Probabilities add swelling and increase theorems. Conditional probability. Full probably and Baes theorems. Level of difficulty: 5* *- Bernoulli's formula of Mouavre- Laplace local and integral formulas . Poisson's theorem . Random quantities. Distribution laws. Discreet random of quantities numerous characteristics. Continuously random quantities. Distribution function and his properties. Density function. Level of difficulty: 5* *- Big numbers law Chebyshev inequality and of the theorem essence _ Probabilities of theory central limit theorem. Level of difficulty: 5* *- Statistical distribution of the sample. point, fixed, interval, effective and justified what happens Selection characteristics. Dispersion analysis and his village economy in the economy application Correlation. Correlation theory two main issue _ Regression analysis. Level of difficulty: 5*
Exams and assessment formats	*One intermediate and one final control performed in the form of written work (80 minutes each) .*

Study and examination requirements	*Requirements for passing the course* *The total maximum score will be the sum of the points allocated to the final exam (40%) and the Midterm exam (60%). In order to successfully pass the subject, a student must score 60% or more of the allotted points.*
Reading list	*1. Athanasios Papoulis. Probability, random variables, and stochastic processes* *2. Sheldon M. Ross. Introduction to Probability and Statistics for Engineers and Scientists, Fifth Edition. 2014* *3. A.N.Kolmogorov Foundations of the theory of probability. Second English Edition* *4. Rick Durrett . Probability (Theory and Examples) 2019* *5. Dmitry Panchenko Lecture Notes on Probability Theory. 2019* *6. PETER W.O'NEIL. Advanced engineering mathematics. 2010* *7. Claudio Canuto, Anita Tabacco, Mathematical Analysis I, (II). Springer- Verlag, Italia, Milan, 2015.* *8. B.Khudayarov "A collection of examples and problems from mathematics" Tashkent "Uzbekistan" 2018. 304 p.*

Module designation	*MA1110 - mathematical analysis*
Semester(s) in which the module is taught	*2, 3 semestr*
Person responsible for the module	*DSc, professor Ergashev Tuhtasin*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training , independent education*
Workload (incl. contact hours, self-study hours)	*Total workload: 300* *Contact hours: lecture – 40, practical lessons – 80, self-learning – 180, hours*
Credit points	*10*
Required and recommended prerequisites for joining the module	*Basic Algebra, Geometry, Informatics*

Module objectives/intended learning outcomes	***To know and understand:*** *- function, limit and derivative;* *- Indefinite integral, definite integral ;* *- Function of many variables* *numerical and functional seriesin solving practical problems related to construction of hydraulic structures* ***To be able to:*** *- to choose convenient methods of calculation of the integrals and use them in process analysis, to know solutions to problems;* *- using mathematical symbols to express quantitative and qualitative relations of objects;* *- numerical and functional series in solving practical problems.* **To form competences in:** *- deep practical and theoretical knowledge , application of mathematical concepts in practice;* *- able to mathematically analyze statistical data;* *- to be able to build a mathematical model problem of construction of hydraulic structures* *and find its solution using mathematical research methods;* *- solving optimization problems of construction of hydraulic structures.*
Content	*-The function and its delivery methods. Numerical limit. The limit of the function. Level of difficulty: 2* *- The derivative of the function and its applications. Level of difficulty: 2* *- Indefinite integral. Definite integral. Improper integrals. Applications of integrals. Level of difficulty: 4* *- Theory of multivariable functions. Partial derivatives, full differential. Application of full differentials in approximate calculations. Determining the extremum of a multivariable function. An attempt to determine the plane and normal to a curve in space. Directional derivative. Gradient. Level of difficulty: 4* *- Numeric and functional series. Graded rows. Taylor and Maclauren series and their applications. Expanding a function to a Fure array. Level of difficulty: 5*
Exams and assessment formats	*One Midterm assessment and one final control exam in the form of written work (80 minutes each) .*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	*38. B.Xudayarov "Matematikadan misollar va masalalar to'plami" Tashkent "Uzbekistan" 2018. 304 p. (in Uzbek)* *39. T. Ergashev "Differensial tenglamalar" Tashkent " Uzbekistan " 20 23 years. 320 p .(in Uzbek)* *40. PETER W. O'NEIL. Advanced engineering mathematics. 2010.* *41. Claudio Canuto, Anita Tabacco. Mathematical Analysis I, (II) . Springer-Verlag, Italia, Milan, 2015.* *42. Sh.Alimov, R.Ashurov "Matematik analiz" Part I. Tashkent, "Mumtoz so'z", 2018. -583 p. (in Uzbek)*

Module designation	*MFT2104 – Equations of mathematical physics*
Semester(s) in which the module is taught	*5 semestr*
Person responsible for the module	*DSc, professor Ergashev Tuhtasin*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training , independent education*
Workload (incl. contact hours, self-study hours)	*Total workload: 120* *Contact hours: lecture – 20, practical lessons – 40, self-learning – 60, hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Basic Algebra, Geometry, Informatics*

Module objectives/intended learning outcomes	***To know and understand:*** *- classification of partial differential equations;* *- basic equations and problems of mathematical physics;* *- Furye's method;* *- method of integral transformations;* *- numerical methods in solving practical problems related to construction of hydraulic structures.* ***To be able to:*** *- to choose convenient methods of solving the partial differential equations and use them in process analysis, to know solutions to problems;* *- using mathematical symbols to express quantitative and qualitative relations of objects;* *- numerical and functional series in solving practical problems.* ***To form competences in:*** *- deep practical and theoretical knowledge, application of mathematical concepts in practice;* *- able to mathematically analyze statistical data;* *- to be able to build a mathematical model problem of construction of hydraulic structures;* *- and find its solution using mathematical research methods;* *- solving optimization problems of construction of hydraulic structures.*
Content	*- Classification of partial differential equations. Level of difficulty: 2* *- Basic equations and problems of mathematical physics. Level of difficulty: 2* *- Hyperbolic equations. Equation of vibration of string. Dalamber formula. Level of difficulty: 4* *- Joint differential operators. Riemann's method. Furey's method. Level of difficulty: 4* *- Parabolic equations. Heat diffusion equation. Level of difficulty: 5* *- Elliptic equations. Laplace equation. Green's formula. Green's function. Level of difficulty: 5* *- The method of integral substitutions. Numerical methods. Level of difficulty: 5*
Exams and assessment formats	*One Midterm assessment and one final control exam in the form of written work (80 minutes each) .*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	***1.*** *B.Xudayarov "Matematikadan misollar va masalalar to'plami" Tashkent "Uzbekistan" 2018. 304 p. (in Uzbek)* ***2.*** *T. Ergashev "Differensial tenglamalar" Tashkent " Uzbekistan" 2023 years. 384 p .(in Uzbek)* ***3.*** *PETER W. O'NEIL. Advanced engineering mathematics. 2010.* ***4.*** *Claudio Canuto, Anita Tabacco. Mathematical Analysis I, (II). Springer-Verlag, Italia, Milan, 2015.* ***5.*** *Sh.Alimov, R.Ashurov "Matematik analiz" Part I. Tashkent, "Mumtoz so'z", 2018. -583 p. (in Uzbek)* ***6.*** *Salohiddinov M.S. Matematik fizika tenglamalari. Toshkent, 2000 yil. (in Uzbek)*

Module designation	*AGG1105- Linear algebra and analytical geometry*
Semester(s) in which the module is taught	*1 semestr*
Person responsible for the module	*DSc, professor Ergashev Tuhtasin*
Language	*Uzbek, Russian*
Relation to curriculum	*Mandatory*
Teaching methods	*Lecture, practical training , independent education*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture – 20, practical lessons – 40, self-learning – 90, hours*
Credit points	*5*
Required and recommended prerequisites for joining the module	*Basic Algebra, Geometry, Informatics*
Module objectives/intended learning outcomes	***To know and understand:*** *- elements of linear algebra;* *- analytic geometry;* *- theory of complex numbers in solving practical problems related to water sector and land reclamations* ***To be able to:*** *- to choose convenient methods of solving of the linear algebraic systems and use them in process analysis, to know solutions to problems;* *- using mathematical symbols to express quantitative and qualitative relations of objects;* *- vectors, equations of the line and plane, curves and surfaces of the second order in solving practical problems.* **To form competences in:** *- deep practical and theoretical knowledge , application of mathematical concepts in practice;* *- able to mathematically analyze statistical data;* *- to be able to build a mathematical model problem of water sector and find its solution using mathematical research methods;* *- solving optimization problems of water sector.*

Content	*- Matrices and operations on them, determinants and their main properties. Methods of solving the system of linear algebraic equations. Level of difficulty: 2* *- Vectors and actions on them. Linear independence of vectors. Decomposition of vectors by basis vector . Level of difficulty: 2* *- Second order curves. Circle. Ellipse, hyperbola, parabola and their elements. Level of difficulty: 4* *- Equations of the line and plane and their special cases. Construction of planes. Angle between planes. Mutual arrangement of planes. Level of difficulty: 4* *- Second-order surfaces and their canonical equations. Level of difficulty: 5* *- Complex numbers. Actions on complex numbers given algebraic and trigonometric forms. Level of difficulty: 5*
Exams and assessment formats	*One Midterm assessment and one final control exam in the form of written work (80 minutes each) .*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*43. B.Xudayarov "Matematikadan misollar va masalalar to'plami" Tashkent "Uzbekistan" 2018. 304 p. (in Uzbek)* *44. T. Ergashev "Differensial tenglamalar" Tashkent " Uzbekistan " 20 23 years. 320 p .(in Uzbek)* *45. PETER W. O'NEIL. Advanced engineering mathematics. 2010.* *46. Claudio Canuto, Anita Tabacco. Mathematical Analysis I, (II) . Springer-Verlag, Italia, Milan, 2015.* *47. Sh.Alimov, R.Ashurov "Matematik analiz" Part I. Tashkent, "Mumtoz so'z", 2018. -583 p. (in Uzbek)*

Module designation	*ENS 1104-Probability Theory and mathematical statistics*
Semester(s) in which the module is taught	*IV semester*
Person responsible for the module	*PhD , Associate Professor Abdullaev Akmaljon*
Language	*Uzbek, Russian*
Relation to curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Workload (incl. contact hours, self-study hours)	*Total load : 1 20* *Auditorium Hours: 50* *Lecture - 20 hours;* *Practical training - 30 hour* *Independent education - 70 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*Basic elements of Algebra, Geometry, Informatics*

Module objectives/intended learning outcomes	***To know and understand:*** *- Basic rules of combinatorics.* *- The space of random events.* *addition and multiplication of probabilities .* *-Full probability and Bayes theorems.* *-Bernoulli scheme* *- Local and integral formulas of Mouavr-Laplace.* *- Random quantities. Distribution laws.* *-numerical characteristics of random quantities.* *-The law of large numbers.* *- Use of mathematical statistics and one-factor dispersion analysis method, Correlation, Regression analysis in solving practical problems related to water management.* ***To be able to:*** *- to be able to choose convenient methods of solving combinatorics problems and use them in the analysis of processes , to know solutions for energy problems in water management;* *-Using mathematical symbols to express quantitative and qualitative relations of objects ;* *- application of combinatorics and mathematical statistics in solving practical problems .* **To form competences in:** *- in-depth practical and theoretical knowledge of science, application of mastered mathematical concepts in practice ;* *- to be able to analyze statistical data mathematically ;* *- to be able to build a mathematical model of the problem of water management with the help of mathematical research methods and find its solution ;* *- to be able to solve energy optimization issues.*

Content	*Combinatory main rules. Placements, place permutations , grouping . Random events and of probability different definitions . Probabilities to add and increase theorems . Level of difficulty: 2* *Conditional probability . Full probably and Baes theorems . Bernoulli formula of Mouavre-Laplace local and integral formulas . Poisson theorem . Random quantities . Level of difficulty: 3* *Distribution laws. Discreet random of quantities numerous characteristics . Continuously random quantities . Distribution function and his properties . Density function . Some main distribution laws . Level of difficulty: 2* *Big numbers law _ Chebyshev inequality and of the theorem essence _ Probabilities of theory central limit theorem and his village economy issues in solution application Level of difficulty: 4* *Mathematician statistics and his duties . Chief and selection collections , representative selection . Don't be picky statistics distribution , it geometric explain . Point price Unmoved, effective and justified grades . Selection characteristics . Interval price Normal of distribution unknown parameters α andσ to interval price build Village economy information based on to productivity interval price build. Level of difficulty: 4* *One factorial dispersion analysis method . Dispersion analysis method essence, normal distributed one how many head of collections medium values equality about statistics the hypothesis dispersion analysis method with check and his village in the farm application Correlation . Correlation of theory two main issue Regression analysis . Level of difficulty: 5*
Exams and assessment format	*One intermediate and one final control performed in the form of written work (80 minutes each) .*
Study and examination requirements	*Requirements for passing the course* *The total maximum score will be the sum of the points allocated to the final exam (40%) and the Midterm exam (60%). In order to successfully pass the subject, a student must score 60% or more of the allotted points.*
Reading list	*9. Athanasios Papoulis . Probability, random variables, and stochastic processes . 2020* *10. Sheldon M. Ross . Introduction to Probability and Statistics for Engineers and Scientists, Fifth Edition. 2014* *11. A. N. Kolmogorov . Foundations of the theory of probability. Second English Edition* *12. Rick Durrett . Probability (Theory and Examples) 2019* *13. Dmitry Panchenko . Lecture Notes on Probability Theory. 2019*

60810400 - Application of innovative techniques and technologies in agriculture

Module designation	*MITT4205 Technical support of mechanized works*
Semester(s) in which the module is taught	*11- semester*
Person responsible for the module	*Professor Igamberdiyev Asqar*
Language	*Uzbek*
Relation to curriculum	*Choice*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture - 30, practical lessons – 30, self-learning – 90 hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Mechanism and machine theory, Materials science and technology of construction materials, Mathematical modeling of information technologies and processes, Land reclamation and agricultural machines, Machine detailing and design fundamentals, Tractors and vehicles, Hydraulics and hydraulic machines.*
Module objectives/intended learning outcomes	
Content	*Basic concepts of technical maintenance of mechanized works;* *Technical support of agricultural production processes.* *Technical support of energy and renewable technologies.* *Rules of mechanized work and production.* *General requirements for the performance of mechanized works and production processes.* *Agrotechnical requirements for power tools.* *Agrotechnical requirements for agricultural machines.* *Indicators of use of machine-tractor aggregates.* *Factors affecting the choice of innovative techniques and technologies, requirements and procedures.* *Problem situations that arise in the production process and their types.* *Fundamentals of technical regulation of mechanized work.* *Material and technical support for the use of the park of agricultural machinery.* *Service theory.* *Organization of storage of agricultural machinery. Storage technology.*

	Innovative technical systems in the use of the park of agricultural machinery. *Calculation of indicators of power balance in use of high-power tractors, graphic representation (4 hours).* *Calculation of traction force balance indicators depending on the properties of the wheels of high-power tractors with the ground, graphical representation (4 hours).* *Selection of agricultural machines for high-power tractors, construction of a machine-tractor unit, evaluation of power consumption, productivity and fuel consumption (4 hours).* *Selection of power tools (tractors) for agricultural machines, construction of a machine-tractor assembly, evaluation of power consumption, work productivity and fuel consumption (4 hours)* *Creating a technological map specific to the region where the farm is located, graphically determining the demand for energy resources for mechanized work (2 hours).* *Using a technological map specific to the region where the farm is located, graphically determine the fuel consumption requirements of energy vehicles performing mechanized work (hour 2).* *Effective use of vehicles in hydromelioration works, their correct selection for various conditions* *An understanding of science.* *Analysis of the activities of farmers operating in foreign countries through the Internet, the availability of equipment and the level of their use.* *To study the types and technical indicators of tractors and agricultural machinery used in agriculture manufactured in foreign countries via the Internet.* *To study the technical specifications, functions, fields of application of high-power tractors produced in foreign countries and in our country.* *Analysis of innovative technologies and techniques used in agricultural production processes* *Study of innovative mechanical and chemical methods used in the elimination of weeds between rows of plants.* *Learning the types, innovative methods and tools of technical service for modern tractors and trucks.* *Study of modern systems of management of production processes.* *Studying the technical performance indicators of*

	modern tractors produced by foreign companies. *To study the foreign experience of increasing the efficiency of the use of agricultural techniques.* *Study of modern systems of management of agricultural production processes* *Studying the technical and operational indicators of innovative technologies and machines used in the main tillage* *Studying the technical and operational indicators of innovative technologies and machines used in shallow tillage* *To study the technical and operational indicators of innovative technologies and machines used in planting seeds and seedlings.* *To study the technical and operational indicators of innovative technologies and machines used in inter-row cultivation.* *Studying the technical and operational indicators of innovative technologies and machines used in harvesting agricultural products* *Study of remote control systems of machine-tractor units* *Study of foreign and local experiences on technical support of mechanized works* *Study of foreign and local experiences in the maintenance of machine-tractor units*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *Igamberdiev A.K., Alikulov S. Use of tractors and agricultural machinery, technical service. T., TIQXMMI, 2020. - 227 b (study guide);* 2. *Igamberdiev A.K. Use and technical service of tractor aggregates. T., TIQXMMI, 2021. – 430 b (textbook);* 3. *Production and technical operation of MTP: textbook / I.M. Kurochkin, D.V. Dorovskikh. – Tambov: Publishing house of the Federal State Budgetary Educational Institution of Higher Professional Education "TSTU", 2012. – 200 p. ISBN 978-5-8265-1097-1.* 4. *Maslov G.G. Technical operation of MTP. (Tutorial) Maslov G.G., Karabanitsky A.P., Kochkin E.A./ Kuban State Agrarian University, 2008. – p.142* 5. *Technical operation of the machine and tractor fleet: workshop A.G. Arzhenovsky, S.L. Nikitchenko, S.V. Asaturyan, Yu.M. Cheremisin, V.V. Dolzhikov. – Zernograd: Azov-Black Sea Engineering Institute of the Don State Agrarian University, 2016. – 166 p.*

Faculty of Agricultural Mechanization

5430300 – Educational direction "Technical service in agriculture and water management".

Module designation	*MSFA4204 Fundamentals of effective use of machines*
Semester(s) in which the module is taught	*10- semester*
Person responsible for the module	*Docent Aliqulov Sadulla*
Language	*Uzbek*
Relation to curriculum	*Selection*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture - 30, practical lessons – 30, self-learning – 90 hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Construction and theory of tractors and agricultural machines, Basics of using machines, Basics and procedures for selection of innovative techniques and technologies.*
Module objectives/intended learning outcomes	

Content	*The importance of using techniques in the cultivation of agricultural products* *General description of production processes and machine-tractor units* *The equation of motion of the aggregate* *Use-technological properties of working machines* *Features of using mobile power tools* *Compilation of aggregates* *Kinematics of aggregates* *Turning technology and movement methods of the unit* *Importance and types of aggregates in production of work product* *The main reserves of increasing aggregate work productivity.* *Efficiency of technical use of machines* *Effect of technological speed of the machine on technical efficiency* *Effect of the shape and dimensions of the processed area on the technical efficiency of the machine.* *Influence of machine design parameters on technical efficiency* *Modern control methods and perspectives in increasing machine productivity* *Calculation of the productivity of the main tillage aggregates. Planting seeds and calculating the work output of shallow cultivation units between the rows. Calculating the productivity of units for sprinkling technological materials on the soil surface. Calculating the work output of the grain harvester* *Calculating the productivity of the cotton picking machine* *Calculation of the work output of transport aggregates* *Determining the number of plug bodies in the main soil tillage unit* *Determining the number of machines in the shallow tillage unit .* *Studying the types, functions, organization of use, issues of sets and technical indicators of tractors and agricultural machines produced in foreign countries via the Internet* . *Studying the technical specifications, functions, fields of application of high-power tractors, wide-ranging agricultural machines and combined units produced in foreign countries and in our country .*

	Study of modern systems of management of production processes. *Study of technical and operational indicators of modern tractors produced by foreign companies .* *Study of technical and operational indicators of innovative technologies and machines used in basic and shallow tillage.* *Studying the technical and operational indicators of innovative technologies and machines used in planting seeds and seedlings .* *Studying the technical and operational indicators of innovative technologies and machines used in inter-row processing of plants* *Study of technical and operational indicators of innovative technologies and machines used in harvesting agricultural products .* *Studying the types of application of drip irrigation systems in production and their structure .* *Study of remote control systems of machine-tractor units .*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *Obidov A., Alikulov S. and others, "Mechanization of agricultural production". T., 2018. -182 p. (textbook);* 2. *Igamberdiev A.K., Alikulov S. "Use of tractors and agricultural machinery, technical service". T., TIQXMMI, 2020. – 227 b (study guide);* 3. *Alikulov S., Farmanov E.T., Berdimuratov P.T. Methodical guide for practical training in the subject "Use of agricultural machinery and basics of technical service", T., TIQXMMI MTU, 2022. -50 p.* 4. *Igamberdiev A.K., Alikulov S. Methodical guide for practical training in the subject "Use of innovative technologies in agriculture", T., TIQXMMI, 2022. -27 p.*

Faculty of Agricultural Mechanization

5430400 – Application of innovative techniques and technologies in agriculture

Module designation	*RET3205* ***Resource-efficient techniques and technologies***
Semester(s) in which the module is taught	*8- semester*
Person responsible for the module	*Professor FarmonovErkin*
Language	*Uzbek*
Relation to curriculum	*Choice*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture - 30, practical lessons – 30, self-learning – 90, hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Mechanism and machine theory, Materials science and technology of construction materials, Tractors and vehicles.*
Module objectives/intended learning outcomes	
Content	*Current state and perspective of economic use of natural resources.* *Raw material resources and their efficient use.* *Energy resource. Use of economical technologies of energy resources in agriculture and water management.* *Results of the use of resource-efficient technologies in different countries. Water resource.* *The state of using resource-saving technologies in agriculture.* *Land resource. Soil-protecting and resource-efficient farming.* *Information and Internet resources*

	Mekhnat resource activities in the resource-efficient farming system. *Organizational-economic mechanism of resource saving.* *New technology and aggregates that prepare the soil for planting, resource-efficient techniques and technologies.* *An improved resource-efficient seeder for planting winter wheat between rows of cotton* *Calculation of resources of technical means and raw materials in ASM.* *Organizational economic mechanism of resource saving. Calculation of technical economic indicators.* *Water resources for agricultural crops. Calculation of water consumption.* *Calculation of indicators of sprinkler devices and equipment.* *Calculation of land resources and their amount intended for agricultural arable land.* *Activities in the farming system. Learning the methods of labor resource calculation.* *Determining the requirements for machine-tractor units and fuel consumption of the farm.* *Organization of effective use of tractors and agricultural machines.* *Selection of agrotechnical standards and quality indicators of processes.* *Determining unit usage indicators.* *Organization of efficient maintenance of tractors and agricultural machines.* *Study of resource-efficient techniques and technologies used in foreign countries* *Studying the technical and operational indicators of innovative technologies and machines used in basic and shallow tillage* *Studying the technical and operational indicators of innovative technologies and machines used in planting seeds and seedlings* *To study the technical and operational indicators of innovative technologies and machines used in inter-row cultivation.* *To study the technical and operational indicators of innovative technologies and machines used in the harvesting of agricultural products.* *To study the types of use of drip irrigation systems in production and their structure.* *Study of remote control systems of machine-tractor units. Study of modern systems of management of production processes.* *To study the promising directions of applying the "precision farming" system to production.* *To study the prospects of increasing the efficiency of the use of agricultural machinery.*

	To study the application guidelines of resource-saving techniques and technologies used in the cultivation of agricultural products. *To study the technical and operational indicators of resource-saving techniques and technologies used in production processes.* *To study technical indicators of use of resource-saving techniques and technologies used in harvesting agricultural products.* *Study of innovative methods of complex mechanization of agricultural production.* *Selection of production process conditions and aggregates and study of their technical indicators.* *Selection of agrotechnical standards and quality indicators of the process.*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	*1.Vocational Higher Secondary Education (VHSE) Agriculture science and processing technology Second Year Reference Book. State Council of Educational Research and Training (SCERT), KERALA. 2016. pp. 189* *2.Soil conservation and conservation agriculture. A training manual for agricultural extension consultants and farmers in Eastern Europe and Central Asia. Ankara, 2017. - 158 p.* *3.Resource-saving technologies and technical means in crop production: a course of lectures / comp. Truflyak E.V. – Krasnodar: Kuban State Agrarian University, 2015. – 69 p.;* *4.E.L. Revyakin, A.T. Tabashnikov, E.M. Samoilenko, V.I. Dragaitsev. Resource-saving technologies: status, prospects, efficiency: scientific. ed. – M.: FGBNU "Rosinformagrotekh", 2011. – 156 p.*

Example form for Module Handbook

A **Module Handbook or collection of module descriptions that is also available for students to consult** should contain the following information about the individual modules:

Module designation	*Organization and technology of hydromelioration work*

Semester(s) in which the module is taught	*7 semestr*
Person responsible for the module	*T. F.N., associate professor L. X. Irmukhamedova* *Katta shkituvchi G. L. Firlina*
Language	*uzbek, Russian*
Relation to curriculum	*Main*
Teaching methods	*Lecture, practical training, Independent Education.*
Workload (incl. contact hours, self-study hours)	*General advertising: 150 hours* *Watch Audience:* *Report-30 hours;* *Practice activity-30 hours* *Self-study-90 hours.*
Credit points	*5 credit*
Required and recommended prerequisites for joining the module	*Melioration and construction machinery, hydraulic structures, engineering structures, Irrigation and melioration*
Module objectives/intended learning outcomes	*- On the tasks and work performed in the construction and repair of hydromelioration facilities, irrigation networks; on material and technical resources ensuring the quality and efficiency of work performed during the construction process; to have an idea of the water management system, the construction organizations in it and their activities;* *-to know the technologies of work performed in the construction of hydromelioration facilities, irrigation networks; to know the requirements for building materials, conditions and quality of use of machine-mechanisms and equipment in the performance of works, to know and be able to use technical literature, educational documents in the field, to apply the achievements of advanced technologies, science and technology in;* *- to determine the composition and procedure for the work carried out in the construction of structures and facilities, to carry out technological calculations on the selection of machine mechanisms, equipment for their implementation; to determine the acceptance, quality of the work performed; to effectively organize the water farm construction process, taking into account market principles, and to carry out Management in modern ways,*

Content	Introduction, general information. Technical normalization in construction. Scientific and technical progress in construction. The main requirements for the production of hydromelioration construction, the main directions of increasing labor productivity, reducing the duration and cost of construction. Ensuring the quality of work. Tasks of technical normalization. Methods of technical normalization. Organization of technical normalization in construction. The main types of regulatory documents, their designation and procedure for their use. Foreign experience in technical and descriptive moderation. Level of difficulty: 3. Grunts and their building properties. Doing land work. Taking into account the quality of the gurunts when performing construction and repair work. The main types and elements of Grunt structures. Balance of Grunt volumes, working volumes. Basic construction processes. methods of execution during the construction, repair and restoration and operation of irrigation and melioration facilities. Level of difficulty: 3 Performing ground work with excavators with one and many sinks. Digging the grunts using excavators with one and many sinks. The main working parameters and conditions of selection of excavators. Methods of digging a grunt with an excavator. Calculation of the work productivity of the excavator and factors affecting productivity. Level of difficulty: 4. Digging land-carrying out land work with Transport Machines. Suspension, trailer reclamation machines, their use, scope of application and job descriptions. Organizational and technological ways of increasing the productivity of mechanisms. Organization of the transportation of grunts in construction. Special vehicles with periodic and continuous movement. Job descriptions of vehicles, conditions of application and technical economic indicators. Compaction of grunt in quality lifts. Organization and technologies of grunt compaction work. Methods and means of compaction, conditions for their enslavement. Ways to calculate and increase the productivity of compaction machines. Control of grunt laying work and the quality of compaction. Level of difficulty: 4. Hydromechanization. Technologies and technical means of performing land work in the method of hydromechanization in the construction and operation of irrigation and melioration systems. Placement of the grunt using water. Extraction of the grunt by mechanical means, disposal by water, transportation works. Drilling is the performance of blasting work. To the means of blasting, the requirements for it. Calculation of the amount of explosives. Safety measures when performing earthworks. Level of difficulty: 4. Application of monolithic concrete and reinforced concrete in construction. The role of concrete and reinforced concrete in the construction and reconstruction of hydraulic structures and irrigation systems. Hydraulic concrete. Requirements for hydraulic concrete. Experience and future of using polymerbeton, polymer additive and lightweight concretions in hydromeliorative construction. Primary objects (materials) in concrete works and the requirements for them. Technological processes of mining, transportation mechanisms and processing of fillers. The composition of the concrete mixture. Level of difficulty: 3

Exams and assessment formats	*One intermediate control (30 minutes will be given a vacancy) and a final oral examination (40 minutes will be given) are provided*
Study and examination requirements	*Requirements for a successful transition from science* *The maximum points to be collected in total will consist of the sum of the points allocated to the final exam (40%), the interval control (60%), including independent education. To successfully pass the subject, the student must score 60% of the allocated points and collect high amount in it.*
Reading list	*1. B.B.Hasanov, L.X.Irmuhamedova, G.L.Firlina. Organization and technology of hydromelioration work. Textbook. "TIQXMMI" MTU printing house. T. 2022. 268 b.* *2. Khosankhadzhaev A'., Davrov G'., Akhmedov I. - Performance of hydrotechnical work. Tashkent. Mubina Holigraf Service. 2014.369 P.* *3. B.B.Khasanov, L.X.Irmukhamedova, G.L.Firlina "Proizvodstvo hydrotechnicheskix Rabot". Izdatelstvo. "TIIMSCH", 2020. 136 P.*

Name of the module/subject and password in the curriculum	*Performing hydraulic works*
Semester in which science is taught	*10 semesters*
Responsible teacher of the module/subject F.I.Sh, degree and title	*Doctor of Technical Sciences, Professor B.B. Hasanov* *Senior teacher G.L. Fyrlina*
In which language to be taught	*State, Russian*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education*
Study load (by types of classroom hours and independent study hours)	*General download:* *Auditorium Hours:* *Lecture - 20 hours;* *Practical training 40 hours*
Number of credits allocated to science	*4 credits*
This is a list of prerequisite subjects	*Land reclamation and construction machinery, Hydraulic structures, Engineering structures, Irrigation and land reclamation.*

Expected Learning Objectives	- on tasks and performed works in the construction and repair of hydrotechnical structures, pumping stations and irrigation networks; about the material and technical resources that ensure the quality and effectiveness of the works performed during the construction process; on nature protection measures in hydraulic engineering construction; on the principles of organization, planning and management of hydrotechnical construction in the market economy; to have an idea about the water management system, construction organizations in it and their activities; - technologies of work performed in the construction of hydrotechnical structures, pumping stations and irrigation networks; to know the requirements for construction materials, conditions and quality of use of machinery and equipment when performing work; to know and be able to use the basic principles of planning and management of water management construction - the use of technical literature, normative documents in this field, the application of advanced technologies, scientific and technical achievements of our country and abroad; - determination of the composition and order of works performed in the construction of facilities and objects, implementation of technological accounting books on the selection of machines, mechanisms, tools and equipment for their execution; - creating a technological map of work processes; to determine the acceptance and quality of completed works; analysis of the organizational structure of water management construction organizations, organization of construction, planning and management issues; taking into account the principles of the market, it is necessary to have the skills of effective organization of planning and management in modern methods.
The content of science	*In students, the organization of the construction of water management facilities and structures at the level of modern requirements, the application of advanced technological processes, the basics of solving complex mechanization issues of all types of work, the design, operation and construction of water management systems, the organizational structure of enterprises and organizations, and the profile of the direction on the organization of work and construction is the formation of knowledge, skills and competences.*
Exams and assessment format	*One mid-term examination (30 minutes) and a final oral exam (40 minutes) are provided.*

Study and examination requirements	*The total maximum points will be the sum of the points allocated to the final exam (40%), Midterm control (60%), including independent study. In order to successfully pass the subject, a student must score 60% or more of the allotted points.*
Literature	*Husankhodjaev O., Davranov G., Akhmedov I. - Performing hydraulic works. Tashkent. Mubina Holigraph Service. 2014.369 p.* *B.B. Khasanov, L.Kh. Irmukhamedova, G.L. Fyrlina "Proizvodstvo hydrotechnicheskih rabot". Izdatelstvo. "TIIMSX", 2020. 136 p.*

Faculty of Agricultural Mechanization

60810400 - Application of innovative techniques and technologies in agriculture

Module designation	QSXT3205 Transport in agriculture and water management
Semester(s) in which the module is taught	*8- semester*
Person responsible for the module	*Professor Igamberdiyev Asqar*
Language	*Uzbek*
Relation to curriculum	*Choice*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture - 30, practical lessons – 30, self-learning – 90 hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Mechanism and machine theory, Materials science and technology of construction materials, Mathematical modeling of information technologies and processes, Land reclamation and agricultural machines, Machine detailing and design fundamentals, Tractors and vehicles, Hydraulics and hydraulic machines.*
Module objectives/intended learning outcomes	
Content	*Importance of transport in agricultural and water economy production* *Means of transport* *Agricultural and water economy loads. Types of cargo.* *Use (operational) properties of tractor vehicles* *Features of use of motor vehicles* *Transportation of agricultural goods. Basic concepts and rules.* *Transportation of agricultural and reclamation*

	machines. Basic concepts and rules. *Organization of transportation. Traffic routes of vehicles.* *Vehicle performance.* *Determining performance and fuel consumption standards for dump trucks and trucks.* *Technical and economic indicators of the use of vehicles.* *Technical use of vehicles.* *Vehicle performance. Characteristic manifestations of loss of performance of vehicle aggregates and systems.* *Ensuring the operational capacity of transport vehicles. Diagnosis of vehicles and identification and provision of parking resources.* *Diversity of repair work in planning and use of repair work. Vehicle maintenance and repair system.* *Determining the indicators of the use of vehicles* *Calculation of the traction characteristics of the transport tractor for the given road conditions* *Calculating the composition of the transport tractor train and determining the operating mode.* *Calculation of the performance of the vehicle in motion* *Calculation of the main performance indicators and construction of the movement route graph according to the pendulum movement method of vehicles* *Calculation of the main performance indicators and construction of the movement route graph according to the method of circular movement of the vehicle* *Effective use of vehicles in hydromelioration works, their correct selection for various conditions* *An understanding of science.* *Analysis of the activities of farmers operating in foreign countries through the Internet, the availability of equipment and the level of their use.* *Studying the types and technical indicators of tractors and agricultural vehicles manufactured in foreign countries via the Internet* *To study the technical specifications, tasks, and fields of application of high-powered tractors and trucks produced in foreign countries and in our country.* *Analysis of the innovative transport process used in agricultural production processes* *To study the mechanical and chemical methods used in the elimination of weeds between rows of plants.* *Learning the types, innovative methods and tools of*

	technical service for modern tractors and trucks. *Study of modern systems of management of production processes.* *Studying the technical performance indicators of modern tractors produced by foreign companies.* *Prospects for improving the efficiency of the use of means of transport. To study recommendations for increasing the efficiency of the use of transport and other equipment by increasing the reliability of machines.* *The importance and role of transport works in the economy of the Republic* *Classification of roads. Speed of traffic on highways, passing ability. Synopsis or summary preparation* *History of development of highways. Analysis of the current state of roads.* *Traffic of cars on roads. Forces affecting the movement of cars. A dynamic factor. Bite rate data collection* *Completing operations of calculating the composition of the tractor train, preparing conclusions* *To study the functions and basics of the TXK system for cars.*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *Igamberdiev A.K. Transport in agriculture and water management. Tashkent. 2020.-283 b (study guide)* 2. *Igamberdiev A.K. Use and technical service of tractor aggregates. T., TIQXMMI, 2021. – 430 b (textbook);* 3. *Iofinov S.A., Syrin A.A. Use of cars and tractors for transport work in agriculture. L: Kolos, 1968.-280 p.* 4. *Mirnyuk S.K. Use of transport in agriculture. Moscow, Kolos, 1982.-287 p.* 5. *Lobodaev V.D., Udovenko V.M. Road transportation of agricultural goods. Minsk, Harvest, 1987.-279 p.*

Faculty of Agricultural Mechanization

60810300 – Technical service in agriculture and water management

Module designation	*QME3105 Ergonomics of agricultural machines*
Semester(s) in which the module is taught	*9- semester*
Person responsible for the module	*Docent Aliqulov Sadulla*
Language	*Uzbek*
Relation to curriculum	*Main*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture - 30, practical lessons – 30, self-learning – 90 hours*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Construction, structure and theory of tractors and self-propelled machines, Materials science and technology of construction materials, Basics of selection of innovative techniques and technologies.*
Module objectives/intended learning outcomes	
Content	*Importance of agricultural mechanization and development prospects* *Basic concepts and rates of ergonomics science* *Anthropometric indicators of the operator* *Basics of chirotechnics* *Regulation of the operator's workplace* *Toolbar development* *Fundamentals of artistic design of techniques.* *The appearance of the tractor*

	Structural safety of tractors and self-propelled machines *Means of restricting the movement of the operator in the cab* *Driver protection systems* *Safety cabins and protective equipment* *"Human-Machine-Environment" system in technical management.* *Technical management system and tools* *Prospects for the development of ergonomic features of agricultural machinery* *Study of the ergonomic qualities of control equipment of chain tractors.* *Study of the ergonomic qualities of control equipment of chain tractors, continued.* *Study of ergonomic qualities of control equipment of wheeled tractors.* *Study of ergonomic qualities of control equipment of wheeled tractors, continued.* *Study of ergonomic qualities of control equipment of self-propelled agricultural machines* *Study of ergonomic qualities of control equipment of self-propelled agricultural machines, continued* *Study of safety requirements for access to the cab of tractors and self-propelled machines* *Study of safety requirements for access to the cab of tractors and self-propelled vehicles, continued* *Study the requirements for the equipment of the operator's cabin* *Study of requirements for equipment of the operator's cabin, continued* *To study the safety requirements of tractor and self-propelled machine operator visibility from the workplace* *Study of tractor and self-propelled machine operator visibility safety requirements, cont* *To study the requirements for protective equipment and power tools during the operation of tractors and self-propelled machines.* *Study of the requirements for protective equipment and power equipment during the operation of tractors and self-propelled machines, continued.* *Get acquainted with modern agricultural techniques at the Expo Center of the Republic of Uzbekistan.* *Determination of anthropometric dimensions of the operator*

	Determination of anthropometric dimensions of the operator, continued *Determine the dimensions of the operator up to the knee joint* *Determining the dimensions of the operator to the knee joint, cont* *Determine the coordinates of the conditional point of the operator* *Determining the coordinates of the conditional point of the operator, continued* *Adjusting the cabin seat to the anthropometric dimensions of the operator* *Adjusting the cab seat to the anthropometric dimensions of the operator, continued* *Comparative assessment of anthropometric characteristics of the operator* *Comparative assessment of anthropometric characteristics of the operator, continued* *Study of the ergonomic qualities of control equipment of chain tractors.* *Study of the ergonomic qualities of control equipment of chain tractors, continued* *Study of ergonomic qualities of control equipment of wheeled tractors.* *Continuation of the study of ergonomic qualities of control equipment of wheeled tractors.* *Study of ergonomic qualities of control equipment of self-propelled agricultural machines* *Study of ergonomic qualities of control equipment of self-propelled agricultural machines, continued* *Study of safety requirements for access to the cab of tractors and self-propelled machines* *Study of safety requirements for access to the cab of tractors and self-propelled vehicles, continued* *Study the requirements for the equipment of the operator's cabin* *Study of requirements for equipment of the operator's cabin, continued* *To study the safety requirements of tractor and self-propelled machine operator visibility from the workplace* *Study of tractor and self-propelled machine operator visibility safety requirements, cont* *To study the requirements for protective equipment and power tools during the operation of tractors and self-propelled machines.*

	Study of the requirements for protective equipment and power equipment during the operation of tractors and self-propelled machines, continued. *Analyzing the availability of equipment and the level of use of it by farmers operating in foreign countries through the Internet.* *Analyzing the availability of equipment and the level of use of it by farmers operating in foreign countries through the Internet.* *Analyzing the availability of equipment and the level of use of it by farmers operating in foreign countries through the Internet.* *Studying the types, functions, organization of use, issues of sets and technical indicators of tractors and agricultural machines produced in foreign countries through the Internet.* *Studying the types, functions, organization of use, issues of sets and technical indicators of tractors and agricultural machines produced in foreign countries through the Internet.* *Studying the types, functions, organization of use, issues of sets and technical indicators of tractors and agricultural machines produced in foreign countries through the Internet.* *To study the technical characteristics, functions, fields of application of high-power tractors, wide-ranging agricultural machines and combined units produced in foreign countries and in our country.* *To study the technical characteristics, functions, fields of application of high-power tractors, wide-ranging agricultural machines and combined units produced in foreign countries and in our country.* *To study the technical characteristics, functions, fields of application of high-power tractors, wide-ranging agricultural machines and combined units produced in foreign countries and in our country.* *Selection of innovative technologies and techniques used in agricultural production processes and analysis of their technical and economic indicators.* *Selection of innovative technologies and techniques used in agricultural production processes and analysis of their technical and economic indicators.* *Study of technical and operational indicators of modern tractors produced by foreign companies.* *Study of technical and operational indicators of*

	modern tractors produced by foreign companies. *Study of technical and operational indicators of modern tractors produced by foreign companies.* *Study, analysis of software ergonomics system "Human - computer - human", "Human - computer - process", "Human - software - software", "Human - machine", giving conclusions and preparing abstracts.* *Study, analysis of software ergonomics system "Human - computer - human", "Human - computer - process", "Human - software - software", "Human - machine", giving conclusions and preparing abstracts.* *Study, analysis of software ergonomics system "Human - computer - human", "Human - computer - process", "Human - software - software", "Human - machine", giving conclusions and preparing abstracts.* *Collection of materials, analysis and report preparation using Internet data of the "Remote control of equipment" system.* *Collection of materials, analysis and report preparation using Internet data of the "Remote control of equipment" system.* *Studying, analyzing and preparing presentations of convenient, efficient management systems of the tractor and machine operator's workplace according to the "Ergodesign" system based on Internet data.* *Studying, analyzing and preparing presentations of convenient, efficient management systems of the tractor and machine operator's workplace according to the "Ergodesign" system based on Internet data.*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*

Reading list	1. *Alikulov S. Ergonomics of agricultural machines. Study guide. Tashkent, 2023. 114 pages* 2. *Alikulov S., Haliqova N. Methodical guide for practical training in "Ergonomics of agricultural machines". Tashkent, 2021. 42 pages* 3. *Resolution of the Cabinet of Ministers of the Republic of Uzbekistan "On approval of general technical regulations on the safety of the design of agricultural machinery; T. March 18, 2016, No. 80.* 4. *I.S. Konstantinov. Fundamentals of ergonomics and design of cars and tractors. Methodological instructions for performing laboratory work on the subject "Automobile and tractor engineering", Lipetsk Leningrad State Technical University 2009. 52 p.* 5. *A.R. Igamberdiev, S.Aliqulov. Mashinalarning texnik samaradorligi.O'quv qo'llanma.T.2021.97 b.*

Faculty of Agricultural Mechanization

60810300 – Technical service in agriculture and water management

Module designation	*QXTF3205 Use of transport in agriculture and water management*
Semester(s) in which the module is taught	*8- semester*
Person responsible for the module	*Professor Igamberdiyev Asqar*
Language	*Uzbek*
Relation to curriculum	*Choice*
Teaching methods	*Lecture, practical lesson, self-learning*
Workload (incl. contact hours, self-study hours)	*Total workload: 150* *Contact hours: lecture - 30, practical lessons – 30, self-learning – 90, hours*
Credit points	*4 credits*
Required and recommended prerequisites for joining the module	*Mechanism and machine theory, Materials science and technology of construction materials, Hydraulics and hydraulic machines, Mathematical modeling of information technologies and processes, Land reclamation and agricultural machines, Machine detailing and design fundamentals, Tractors and vehicles.*
Module objectives/intended learning outcomes	
Content	*Importance of using transport in agricultural and aquatic production* *Means of transport* *Agricultural and water economy loads. Types of cargo.* *Use (operational) properties of tractor vehicles*

	Features of use of motor vehicles *Transportation of agricultural goods. Basic concepts and rules.* *Transportation of agricultural and reclamation machines. Basic concepts and rules.* *Organization of transportation. Traffic routes of vehicles.* *Vehicle performance.* *Determining performance and fuel consumption standards for dump trucks and trucks.* *Technical and economic indicators of the use of vehicles.* *Technical use of vehicles.* *Vehicle performance. Characteristic manifestations of loss of performance of vehicle aggregates and systems.* *Ensuring the operational capacity of transport vehicles. Diagnosis of vehicles and identification and provision of parking resources.* *Diversity of repair work in planning and use of repair work. Vehicle maintenance and repair system.* *Determining the indicators of the use of vehicles* *Calculation of the traction characteristics of the transport tractor for the given road conditions* *Calculating the composition of the transport tractor train and determining the operating mode.* *Calculation of the performance of the vehicle in motion* *Calculation of the main performance indicators and construction of the movement route graph according to the pendulum movement method of vehicles* *Calculation of the main performance indicators and construction of the movement route graph according to the method of circular movement of the vehicle* *Effective use of vehicles in hydromelioration works, their correct selection for various conditions* *An understanding of science.* *Analysis of the activities of farmers operating in foreign countries through the Internet, the availability of equipment and the level of their use.* *Studying the types and technical indicators of tractors and agricultural vehicles manufactured in foreign countries via the Internet* *To study the technical specifications, tasks, and fields of application of high-powered tractors and trucks produced in foreign countries and in our country.* *Analysis of the innovative transport process used in agricultural production processes* *To study the mechanical and chemical methods used in the elimination of weeds between rows of plants.* *Learning the types, innovative methods and tools of technical service for modern tractors and trucks.* *Study of modern systems of management of production processes.*

	Studying the technical performance indicators of modern tractors produced by foreign companies. *Prospects for improving the efficiency of the use of means of transport. To study recommendations for increasing the efficiency of the use of transport and other equipment by increasing the reliability of machines.* *The importance and role of transport works in the economy of the Republic* *Classification of roads. Speed of traffic on highways, passing ability. Synopsis or summary preparation* *History of development of highways. Analysis of the current state of roads.* *Traffic of cars on roads. Forces affecting the movement of cars. A dynamic factor. Bite rate data collection* *Completing operations of calculating the composition of the tractor train, preparing conclusions* *To study the functions and basics of the TXK system for cars.*
Exams and assessment formats	*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.*
Study and examination requirements	*Students of successful transition from science* *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. In order to successfully pass the subject, the student must score 60% of the allocated points and collect a high score in it.*
Reading list	1. *Igamberdiev A.K. Transport in agriculture and water management. Tashkent. 2020.-283 b (study guide)* 2. *Igamberdiev A.K. Use and technical service of tractor Iofinov S.A., Syrin A.A. Use of cars and tractors for transport work in agriculture. L: Kolos, 1968.-280 p.* 3. *Mirnyuk S.K. Use of transport in agriculture. Moscow, Kolos, 1982.-287 p.* 4. *Lobodaev V.D., Udovenko V.M. Road transportation of agricultural goods. Minsk, Harvest, 1987.-279 p.aggregates. T., TIQXMMI, 2021. – 430 b (textbook);*

Name of the module/subject and password in the curriculum	*Technologies of reclamation and water management works*

Semester in which science is taught	*Semester 10-11*
Responsible teacher for the module/subject, degree and title	*Candidate of Technical Sciences, docent A.R. Muratov*
In which language to be taught	*State, Russian*
Its place in the curriculum	*Main*
Teaching methods	*Lecture, practical training, independent education.*
Study load (by types of classroom hours and independent study hours)	*General download:* *Auditorium Hours:* *Lecture - 60 hours;* *Practical training 60 hours*
Number of credits allocated to science	*10 credits*
This is a list of prerequisite subjects	*Land reclamation and construction machinery, Hydraulic structures, Engineering structures, Irrigation and land reclamation.*

Expected Learning Objectives	*-water management and land reclamation construction tasks and types of construction works, material and technical resources that serve to ensure the efficiency and quality of water management and land reclamation works at low cost from the economic point of view, nature protection measures in the construction of hydromelioration systems, constructions and production measures in the execution of works to have an idea about the hydromelioration system, engineering-ecological system and water management system, including and natural components, the technologies of the main works in the construction of water management and melioration facilities, irrigation hydrotechnical structures, the quality of the work performed with them, and the soil and other construction materials requirements, the basis of labor organization, payment to workers and technical standardization, the methodology of determining the material equipment and financial resources required for the performance of work, the use of technical and normative literature related to the field, the best practices achieved in the performance of work in our country and abroad on the basis of mechanized technologies, science and have an idea about the application of technical achievements;. (knowledge) to determine the structure of the work processes used for the construction and operation of the main structures, objects, to perform calculations on the selection of the necessary construction, land reclamation and special machines, equipment and devices for the mechanization of the construction work, to make selection calculations based on the comparison of options, to draw up the technological cards of the work execution and work processes ; they must have the skills to determine the amount of labor and machine time required to perform the work and the required amount of manpower, materials, machines, and equipment, to work on construction, land reclamation machines and equipment, and to carry out geodetic and other measurements directly , must have skills in the ability to organize construction contract tenders based on the new version of the Law of the Republic of Uzbekistan dated April 22, 2021 "On State Procurement". (qualification) carrying out technical expertise in the construction and reconstruction projects, selection of hydrotechnical structures, buildings, their parts and engineering equipment, assessment of technical condition, tasks, technical conditions, enterprise standards, instructions for the use of tools, new materials, technological processes and equipment and doing methodological work.*

The content of science	*A brief history of irrigated agriculture. Organization of hydromelioration works, development of technology. Management of water management is organized by regional, basin system, district organizations and the main funds under their control (structures, canals, reservoirs, etc.).* *Technologies of construction, reconstruction and reconstruction works in the field of water management and reclamation, the importance of drawing up a work organization project. The main requirements for the production of hydromelioration construction, the main directions of increasing the production productivity, reducing the construction period and cost. Ensuring the quality of work. The main types of work performed, construction materials used. The main resources in construction and repair work, current issues of mechanization of construction work.*
Exams and assessment format	*One mid-term examination (30 minutes) and a final oral exam (40 minutes) are provided.*
Study and examination requirements	*Requirements for passing the course* *The total maximum points will be the sum of the points allocated to the final exam (40%), Midterm control (60%), including independent study. In order to successfully pass the subject, a student must score 60% or more of the allotted points.*
Literature	1. Muratov A.R., Muratov O.A. IKN V16.1-2016 "Departmental construction norms for hydromechanized cleaning and repair-restoration works in ABMK. ISMITI under TIMI 2016. Tashkent sh. 2016 year. 48 pages. It was printed in the offset method at the printing house of "Global Solar Print" LLC. 2. Muratov. A.R. Methodological instructions for completing a course project in the science of complex mechanization of irrigation and reclamation works; TIMI publishing house, 2013. - 64 p. 3. Muratov. A.R. Complex mechanization of irrigation and reclamation works. Study guide; TIQXMMI printing house, 2019. -187 p. *4.* Muratov. A.R. Organization and technology of hydromelioration works. Textbook; TIKXMMI printing house, 2022. -587 p.

Name of the module/subject and password in the curriculum	*Technology of new ceramic materials*
Semester in which science is taught	*10 semesters*
Responsible teacher of the module/subject F.I.Sh, degree and title	*Doctor of Technical Sciences, Professor B.B. Hasanov* *Candidate of Technical Sciences, docent F.R.Yunusova*
In which language to be taught	*State*
Its place in the curriculum	*Main*

Teaching methods	*Lecture, practical training, independent education.*
Study load (by types of classroom hours and independent study hours)	*General download:* *Auditorium Hours:* *Lecture - 30 hours;* *Practical training 30 hours*
Number of credits allocated to science	*5 credits*
This is a list of prerequisite subjects	*Hydraulic structures, Engineering structures, Irrigation and land reclamation.*
Expected Learning Objectives	*to have an idea about the theoretical foundations of the technology of ceramic materials, the selection of raw materials in production, the study of the laws of grinding, mixing and ripening, the role and importance of crystallization and hydration processes in obtaining a finished product; (knowledge)* *transportation, storage and use of ceramic materials while preserving their physical and mechanical properties and quality, taking into account dry and hot climate conditions and energy efficiency when using materials, knowing and being able to use them; (qualification)* *Having knowledge of the properties of ceramic materials, analytical thinking and application, planning and changing the properties of ceramic materials to the desired aspects.*
The content of science	*Development of students' intellect, formation of logical thinking ability; providing students with solid fundamental knowledge, teaching them to apply the acquired knowledge to solving modern practical problems; is to develop the skills of students to apply the knowledge they have acquired in mastering specialization and general professional subjects in the curriculum of "Technology of New Ceramic Materials".*
Exams and assessment format	*One mid-term examination (30 minutes) and a final oral exam (40 minutes) are provided.*
Study and examination requirements	*Requirements for passing the course* *The total maximum points will be the sum of the points allocated to the final exam (40%), Midterm control (60%), including independent study. In order to successfully pass the subject, a student must score 60% or more of the allotted points.*
Literature	*1. Baino F. Tomalino M. Tulyaganov D. (eds.) Ceramics, Glass and Glass-Ceramics: From Early Manufacturing Steps Towards Modern Frontiers. Springer, 2021. — 348 p.* *2. Usupova M.N. Ismatov A.A. Technology of ceramics and refractory materials. Textbook. T: "Science and Technology", 2011, 396 p.*

Module / course syllabus

Graduate Department

70730904 – Organization and technology of construction of hydraulic structures

Module designation	Resources of construction equipment and structures-energy technologies QBK-52106
Semester(s) in which the module is taught	*2*
Person responsible for the module	*Abduvaliyev A* *Hasanov B*
Language	*Uzbek*
Relation to curriculum	diurnal
Teaching methods	*Lecture, practical training, laboratory work*
Workload (incl. contact hours, self-study hours)	*Total load: 180* *Auditorium hours: 60* *Lecture - .30 hours;* *Practical training. 30...hours* *Laboratory work-20 hours:* *Independent education - 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*: Physics, Chemistry, mathematics.*
Module objectives/intended learning outcomes	**To know and understand:** To have an idea and knowledge of the terminology in the field of modern building materials, the principles of resource and energy conservation in the development and application of building materials, the basic properties of modern building materials **To be able to:** The correct assessment of the conditions for the use of materials in objects, structures and structures and the selection of the optimal material in terms of reliability and long-term use; the fact that modern building materials have the skills to determine the optimal conditions for their use in the field depending on their properties **To form competences in:** The student must have clear qualifications on the basics of resource and energy-efficient technologies in the production of building materials, objects and structures; methods of optimizing the composition, structure and properties of building materials

Content	**Lecture** 1.Introduction to science. Basic concepts and definitions. Government policy in the energy-efficient sector and in improving energy efficiency. 2. Energy carriers. Grading, generation (production methods), transmission, distribution and consumption. In energy supply systems, the loss of ALR, grading, bases, instrumental methods of control. 3. As a resource saving science. Resource grading. Determination of the size of resources. Resource capacity of the enterprise product production. Resource Capacity Indicator. 4. The main directions of modern resource and energy conservation in design. The main directions of modern resource and energy conservation in construction. Types and directions of economy of the main resources used in construction. 5. Definition of the concept of" energy efficient building". History and development of an energy efficient building. Energy efficient building principle scheme. Systematic approach to the organization of the cycle of living energy efficient buildings. 6. Calculation of the thermal balance of staining. Rules for calculating the area of a building. Buildings energy efficiency class. 7. Resource savings when raising holistic buildings. Resource savings in construction based on the application of man-made waste in the production of building materials. Resource-efficient technology and construction systems. 8. Modern thermal protection (insulation) materials in construction. Energy-efficient facade systems. Energy-efficient floors. Energy-efficient windows. 9. The main raw materials. Technology of materials and items from wood-board waste. New technologies in the production of adhesives and dry construction mixtures. Polymer binder and new technologies in the production of compositional materials based on them. 10. Resource-saving technologies for building materials from natural stone and products based on mineral adhesives. Modern directions in the development of adhesives and concretions. The role of chemical additives in resource and energy conservation. Modern complex modifiers for concrete and mixtures. Slag alkaline bitters and the concretions on which they are based. Alkaline clinker fasteners. Low water consumption couplers. Multi-component finely ground fasteners. Concretions with the application of man-made raw materials. 11. The principles of obtaining ready-made and fast-hardening concretions, materials for the preparation. Classification of dispersion ironbeton by type of Matrix and reinforcing fibers. Reinforced concrete. The main areas of application. 12. Hollow concrete. Light concretions with the application of natural and artificial light fillers. Features of the choice of concrete composition, application area. Porous peno and gazobetons. Materials for preparation, additives, foaming substances, gas-forming additives and pastes. Modern technologies of preparation, application. Dispersion reinforced concrete porous concrete. Asphalt concrete. 13. Requirements for materials for the preparation of concrete and reinforced concrete on unheated and underheated technologies, additives added to the concrete mixture, hardening mode, strength Assembly Kinetics, properties, application. 14. Resource-efficient technology of the window. Technology for the production of ceramic materials and items with the application of secondary and man-made raw materials.

Exams and assessment formats	*There are two mid-term tests (20 minutes each) and a final oral exam (40 minutes), as well as homework in the form of written or creative work.*
Study and examination requirements	*Students to successfully pass science* *The total maximum score will be the sum of the points allocated to the final exam (40%), Midterm (20%), homework (10%) and classroom activity (10%). To successfully pass the subject, a student must score 60% or more of the allotted points.*
Reading list	1.Khosankhadzhaev A'., Davrov G'., Akhmedov A. - Performance of hydrotechnical work. Tashkent. TIMI. 2008. 369 b. 2.Khosankhadzhaev A'., Davrov G'., Akhmedov A. - Hydraulic construction technology. Episode 2. Tutorial.Tashkent. EXTREMUM PRESS. 2010. 152b. 3.Ahmedov I.A. - Organization, planning and management of the construction of a water farm. Tashkent. National Society of philosophers of Uzbekistan. 2010.268 P. 4.Muratov A.R., Firlina G.L. Organization and technology of hydro-reclamation works:Educational rosobie, -T.: Publishing House of the National Society of Philosophers of Uzbekistan.-2007.-160 pages. 5.G.T.Davrav., L.X.Irmukhamedova, G.L. Firlina-organization and technology of water farm construction work. Tashkent. 2012 p.168. 6.Nanazashvili I.H., Nanazashvili V.I. Resource conservation in construction: Textbook. M.: Publishing house ASV -2012, - 488 p. 7.T. M. Petrova, N. A. Jashi, N. N. Shangina. Resource-saving technology of concrete and feasibility study of the choice of materials. Part 1 : Assessment of the impact of environmental aggressiveness on the durability of concrete and reinforced concrete structures and the choice of protective measures. Textbook / - Saint Petersburg : FGBOU VPO PGUPS. - ISBN 978-5-7641-0814-8. - 2015. - 39 p. 8.Energy Efficiency in Buildings: The CIBSE F Guide. Chartered Institute of Civil Service Engineers, 2006, 2651 p. 9.Arshad Ahmed, John Sturges, Materials Science in Construction: An Introduction. Rutledge, London, 2015, 387 p. 10.J. C. C., George C. C., A. Carpinteri. Advanced technologies for the design and manufacture of composite materials and structures: application in the automotive, marine, aerospace and construction industries. Springer, Netherlands, 1995, 438 p.

Module / course syllabus

Graduate Department

70730904-Methods of solving scientific and technical tasks in construction

Module designation	Methods of solving scientific and technical tasks in construction QEU-52104
Semester(s) in which the module is taught	*2*

Person responsible for the module	*Abduvaliyev A* *Hasanov B*
Language	*Uzbek*
Relation to curriculum	diurnal
Teaching methods	*Lecture, practical training, laboratory work*
Workload (incl. contact hours, self-study hours)	*Total load: 120* *Auditorium hours: 60* *Lecture - .30 hours;* *Practical training. 30...hours* *Laboratory work-20 hours:* *Independent education - 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*: Physics, Chemistry, mathematics.*
Module objectives/intended learning outcomes	**To know and understand:** Ability to professionally manage modern research equipment and tools, collect, analyze and systematize information on the subject of research, prepare scientific and technical reports, reviews of publications on the subject of research, organize, improve and master new technological processes of the production process, control compliance with technological discipline in an enterprise or plot, have imagination and knowledge about the maintenance of technological equipment and **To be able to:** Organization of the launch of facilities, testing and commissioning of samples of new and modernized products produced by the enterprise, the organization of safe Labor, ownership of methods for the Prevention of production injuries, occupational diseases, environmental offenses, the ability to analyze the technological process as a management object, conduct marketing and prepare business plans for production activities **To form competences in:** It is necessary to have qualifications to conduct a technical examination of construction projects, assess the technical condition of buildings, structures, parts and engineering equipment, develop design tasks, technical conditions, enterprise standards, instructions and methodological guidelines for the use of tools, technologies and equipment, draw up instructions for the use of equipment and check the technical condition and residual resource of construction objects and equipment,

Content	lecture 1.Subject and methods of science" methods of solving scientific and technical tasks in construction". Objects and subjects of the science" methods of solving scientific and technical tasks in construction". The essence of scientific and Technical Research. 2.Stages of solving the problem. Statement of goals. Preliminary and a Priori Data Analysis. The role of opposites and their types. 3.Concepts of research methodology. Scientific and technical progress. Nanotechnology. Organization and planning of scientific research. 4.General descriptions of mathematical modeling. The essence of mathematical modeling. A general approach to building a mathematical model. Choosing a mathematical model. 5.Level of technical solutions. Trial and error method. Using the technical solutions fund. Heuristic methods of solving problems (method of"mental attack", method of Synectics, role of similarity and experience). Formalized problem solving methods (morphological method, logical search method, combinatorial methods, etc. 6.Multiple criterion problems in decision theory. Disadvantages of the deterministic approach. The concept of a systematic approach. The method of analyzing the hierarchy and its application. Optimization methods in engineering. Optimization criteria and factors. 7.Requirements of safety standards in the design of structures. Legal basis of mandatory requirements for hydraulic structures. International systems that set safety standards for hydraulic structures and the level of their coordination with national requirements. 8.The established procedure for conducting engineering research. Analysis of problems that may arise when organizing and conducting engineering research. 9.Environmental legislation. Environmental requirements for objects. Control of compliance with environmental requirements. Cases of violations of environmental requirements and solving these problems. 10.Automated (computer-aided) design methods and tools in construction. Advantages and possibilities of Computer-Aided Design in construction. 11.Technique of technical and economic justification of engineering solutions. Methods of reducing the cost of construction, the effect of the time factor. Methods for finding Optimal technical and economic solutions. Planning the possibilities of choosing a rational scheme for the distribution of material and investment resources during the construction period. 12.Analysis of methods for calculating hydraulic structures. Selection of optimal solutions for the results of the calculation of hydraulic structures. 13.Analysis of the field of application of methods of finite elements, finite differences and boundary elements for the calculation of hydraulic structures. 14.Setting goals and objectives for selecting optimal solutions in Object Design. Optimization concepts. 15.Problems of choosing technological solutions in construction. Construction management projects. Problems of organizing construction production. Methods and efficiency of reducing the production cycle. Construction planning. 16.International quality management systems. Principles and methods of Personnel Management. Quality Management in construction.

Exams and assessment formats	*There are two mid-term tests (20 minutes each) and a final oral exam (40 minutes), as well as homework in the form of written or creative work.*
Study and examination requirements	*Students to successfully pass science* *The total maximum score will be the sum of the points allocated to the final exam (40%), Midterm (20%), homework (10%) and classroom activity (10%). To successfully pass the subject, a student must score 60% or more of the allotted points.*
Reading list	1.Sevrikov V.V. Methodology and organization of scientific research. Stipend. Minsk, "Dicta", "Misanta", 2012, -371 p. 2.Saati T.L. Decision-making with dependencies and feedbacks: Analytical networks. Textbook for universities – Moscow: LKI Publishing House, 2010. – 360 p. 3.Grebennik R.A. Organization and technology of construction of buildings and structures: Studies.manual for universities. - M.: Higher School, 2009. - 303s. 4.Buzyrev V.V. Economics of construction. Textbook - St. Petersburg, St. PETERSBURG, 2009. – 324s.

Module / course syllabus

Hydromelioration faculty

70730904- Organization and technology of construction of hydraulic structures

Module designation	Modern methods of research of building materials QTIEZU-52104
Semester(s) in which the module is taught	*3*
Person responsible for the module	I.A.Kadirov.
Language	Uzbek/russian
Relation to curriculum	diurnal
Teaching methods	*Lecture, practical training,*
Workload (incl. contact hours, self-study hours)	*Total load: 120* *Auditorium hours: 60* *Lecture - .30 hours;* *Practical training. 30...hours* *Laboratory work-20 hours:* *Independent education - 60 hours*
Credit points	*4*
Required and recommended prerequisites for joining the module	*: Physics, Chemistry, mathematics.*
Module objectives/intended learning outcomes	**To know and understand:** about modern research methods and laboratory equipment developed and successfully used by leading foreign scientific centers in the field of building materials research; **To be able to:** to use modern physico-mechanical and physico-chemical methods used in the experimental study of building materials and the principles of operation of modern laboratory equipment used in them; **To form competences in:** in using new laboratory equipment that meets modern requirements in the field of building materials research, plan and independently conduct experimental studies based on modern laboratory equipment, measuring instruments and instruments.

Content	**lecture** Topic№1. Basic concepts and definitions of the discipline. Topic№2. Basic information about measurement errors. Topic№3. Methods of investigation of mechanical properties of building materials by destructive and non-destructive methods. Topic№4. Modern methods of non-destructive investigation of mechanical properties of building materials. Topic№5. Mechanical methods of non-destructive testing of mechanical properties of building materials. Topic№6. Physical methods of non-destructive testing of mechanical properties of building materials. Topic№7. Magnetic and radiation methods of non-destructive testing of mechanical properties of building materials. Topic№8. Methods of porosity research of building materials. General information about porosity. Topic№9. Methods of investigation of thermophysical properties of building materials. Topic№10. Thermal methods of research of building materials. Topic№11. Methods of X-ray analysis Topic№12. Methods of spectral analysis Topic№13. Optical and electron microscopy. Topic№14. Methods of colorimetric analysis. Topic№15. Methods of investigation of rheological properties of building materials. **practical training** 1.Drawing up a classification of methods for studying the properties of building materials. 2.Basic rules for monitoring and evaluating the strength of concrete 3.Methods for determining the shrinkage and creep of concrete. 4.Mechanical methods of non-destructive testing of concrete strength. 5.Ultrasonic methods for determining the strength of concrete. 6.Methods for determining the abrasion of concrete. 7.Methods for determining the protective layer of concrete and the diameter of reinforcement in structures. 8.Methods for determining the water resistance of concrete. 9.Methods for determining the water absorption of concrete. 10.Methods of investigation of the chemical composition of materials. Methods of studying the phase composition of materials. 11.Methods of studying the frost resistance of concrete. 12.Methods of studying the porosity of concrete. 13.Processing of the results of differential thermal analysis 14.Processing of the results of X-ray phase analysis. 15.Methods for determining the heat transfer coefficient of thermal insulation materials **Topics for independent work:** 1.Drawing up a classification of methods for studying the properties of building materials. 2.Basic rules for monitoring and evaluating the strength of concrete 3.Methods for determining the shrinkage and creep of concrete. 4.Mechanical methods of non-destructive testing of concrete strength. 5.Ultrasonic methods for determining the strength of concrete. 6.Methods for determining the abrasion of concrete. 7.Methods for determining the protective layer of concrete and the diameter of reinforcement in structures. 8.Methods for determining the water resistance of concrete. 9.Methods for determining the water absorption of concrete. 10.Methods of investigation of the chemical composition of

Exams and assessment formats	*There are two mid-term tests (20 minutes each) and a final oral exam (40 minutes), as well as homework in the form of written or creative work.*
Study and examination requirements	*Students to successfully pass science* *The total maximum score will be the sum of the points allocated to the final exam (40%), Midterm (20%), homework (10%) and classroom activity (10%). To successfully pass the subject, a student must score 60% or more of the allotted points.*
Reading list	1 Hall M. Materials for Energy Efficiency and Thermal Comfort in Buildings. 2 Вернигорова В.Н. Современные химические методы исследования строительных материалов / Учебное пособие.- М.: АСВ, 2003 г. 3 Баталин Б.С. Методы испытаний, исследований и контроля строительных материалов / Учебное пособие. – Перм, 2004. 4 Волоктин Г.Г. Физико-химические основы строительного материаловедения / Учебное пособие – М.: АСВ, 2004 г. 5 Адилходжаев А.И., Махаматалиев И.М., Цой В.М., Кадыров И.А. Современные методы исследования пористости строительных материалов. – ТашИИТ, 2019 г. 6 Адилходжаев А.И., Махаматалиев И.М., Каримова Ф.Ф., Кадыров И.А. Современные методы исследования строительных материалов. Т.: Транспорт, 2023 – 190 с. 7 Adylkhodjaev A.I., Mahamataliev I.M., Karimova F.F., Kadyrov I.A. Modern methods of research of building materials. T.: Transport, 2023 – 190 p. 8 A.I. Adilxodjayev, I.M. Maxamataliyev, F.F. Karimova, I.A. Kadirov. Qurilish materiallarini tadqiqot qilishning zamonaviy usullari. T.: Transport, 2023 y. 190 b.

Module designation	*Drilling works BI2105*
Semester(s) in which the module is taught	*6 semester.*
Person responsible for the module	*1.Nurjanov S.E* *2.Abdullayev B*
Language	*uzbek*
Relation to curriculum	*compulsory*
Teaching methods	*Lecture, practical lessons, self-study,*
Workload (incl. contact hours, self-study hours)	*Total work load: - 150* *Total classroom hours: - 60* *lecture - 30* *lessons - 30* *self-study - 90*
Credit points	*5 credits*
Required and recommended prerequisites for joining the module	*Higher mathematics* *Physics* *Engineering geodesy* *Hydrology and hydrogeology* *Hydraulics* *Hydrography of Central Asia* *Hydrology* *Hydrometrics*

Module objectives/intended learning outcomes	***To know and understand:*** *- The Earth's crust or layer must have knowledge of water resources and the laws of their movement, the peculiarity of the regime and balance of groundwater on irrigated lands;* *- It is necessary to have knowledge about the design of the drilling well, the organization and design of drilling works, the operational layer of the water intake;* *- Must have knowledge of strengthening the walls of the well;* *-It is necessary to have knowledge on the choice of pumping equipment for the well, the use of drilling techniques and technologies used in geological and hydrogeological surveys;* *- Must have an idea of drilling equipment, drilling methods;* *- Must have an understanding of the design and organization of drilling works;* ***To be able to:*** *- It can carry out the construction of a drilling well, the organization and design of drilling works.* *-Studies the choice of a pumping unit for a well, the use of drilling techniques and technologies used in geological and hydrogeological surveys.* *- Learn to drill a well by washing it with water.* *- Conduct hydrogeological observations during drilling.* *- Learns how to prepare a drilling well for operation.* ***To form competences in:*** *- Drilling works " features of geological and hydrogeological conditions, drilling methods, organization and design of drilling operations, numerical methods for assessing underground watercourses, forecasting changes in hydrogeological conditions, causes of failure and poor operational characteristics of a drilling well, hydrogeological dimensions of the aquifer and underground watercourses, standards of reinforcing pipes and their main dimensions, conducting hydrogeological observations, research and exploration work in the drilling process, must have the skills to analyze and use research results.*

Content	*- The content and essence of the science of drilling in irrigation and water supply systems. Concepts of drilling wells and their main elements. Difficulty level-2* *- Rocks and their properties. Types of rocks for drilling. Difficulty level-2* *- Data on groundwater. Their depth, quality, consumption. Difficulty level-3* *- The main factors determining the design of a drilling well. Difficulty level-4* *- Design and organization of drilling operations. Difficulty level-3* *- Justification of the choice of the water intake operational layer. Difficulty level-3* *- Types of drilling well seeps. Difficulty level-2* *-Selection of suppliers and their calculation. The Structure Of The Oil Seals. Difficulty level-4* *- Drilling of shallow wells. Difficulty level-2* *-Shock-rope drill. Difficulty level-4* *- Strengthening the walls of the well. Difficulty level-3* *- Preparation of drilling sites. Difficulty level-3* *-Technology and mode of impact rope drilling in various hydrogeological conditions. Difficulty level-4* *- Strengthening of the walls of wells when drilling in various hydrogeological conditions. Difficulty level-4* *- Rotary drilling tools. Difficulty level-4*
Exams and assessment formats	*Two midterms (40 minutes each, written and oral) and a final oral exam (80 minutes) and written homework.*
Study and examination requirements	*Requirements for successful graduation:* *The total maximum score will be the sum of the points allocated to the final exam (60%), Midterm (20%), homework (10%) and classroom activity (10%). For successfully pass the subject, a student must gather 60% or more of the allotted points.*

Reading list	*References 1. F.G. Bell – Engineering Geology 2nd edition, 2007* *2. T. Davie. Fundamentals of hydrology. Second edition. Madison Avenue, New York, 2008. 221 p* *3. Elizabeth M. Shaw Hydrology in Practice.Third Edition.2005.-145p* *4. Yusupov G.U., Holbaev B.M. Fundamentals of geology and hydrogeology. - T.: The new generation, 2003. - 301 p.* *5. Yusupov G.U., Holboev B.M. Fundamentals of geology and hydrogeology. 2nd edition. - T.: New age generation, 2005. - 380 p.* *6. Irgashev Yu., Ergashev R. Geology and geomorphology. Tashkent, Science and Technology 2013.* *7. Yusupov G.U., Nurzhanov S.E. Geology, hydrogeology and geomorphology. - T.: TIMI., 2008. - 240b.* *8. Akbarov A., Nazaraliyev D., Hikmatov F. Hydrometry. Study guide, TIMI, Tashkent, 2015.129.* *9. Akbarov A.A., Nazaraliev D.V., Khikmatov F.Kh. "Hydrometry" study guide, TIMI, Tashkent, 2008, 154 pages.* *10. Karimov S., Akbarov A., Jonqobilov U.; Correction of hydrology, hydrometry and flow volume. Textbook. - T.: Teacher, 2004.-230 p.* *11. Savkin A.V., Fedorov S.V. Hydrology. Study guide. - St. Petersburg.: 2010.-102b* *12. H.A. Viles Synergistic Weathering Processes Reference Module in Earth Systems and Environmental Sciences 2021 Journal / Available online 16 October 2021, 127065 In Press, Journal Pre-proof.* *13. Gylfi Páll Hersir, Egill Árni Guðnason and Ólafur G. Flóvenz Geophysical Exploration Techniques Reference Module in Earth Systems and Environmental Sciences Journal / Available online 7 October 2021*