Study modules for bachelor's degree programmes

Name	Credits	Purpose	Description	Chapters and topics
Environmental Radiant Energy Sources	6	To obtain knowledge of the principal types of radiant energy sources properties and the potential. Knowledge of radiant energy usage potential and prospects.	Environmental radiant energy sources. Potential of radiant energy and usage possibility. Technologies of the conversion of solar radiation into electrical energy.	1. Radiation. Dimensions and units. 2. Laws of radiant energy 3. Sources of radiant and light energy, their classification and usage. 4. Use of the Sun radiant energy and technology of conversion to electric power. 4,1. Potential of Solar energy in Lithuania. 4,2. Direct conversion of solar radiation into electricity. 4,3. Technologies of application of Solar radiation for heating. 4,4. Solar thermal electricity power technologies. 4,5. Basics of Solar power plant design. 4,6. Selection of photo-voltaic modules. 4,7. Selection of inverters of Solar power plants. 5. Efficiency and prospects of use radiant energy.
Environmental Protection in Construction	3	To provide knowledge about environmental protection, the primary international, European and Lithuanian environmental legislation, environmental impact control, and methods of reducing environmental pollution and to develop skills in evaluating the sustainable usage possibility of natural resources in civil engineering.	Theoretical and practical knowledge necessary for scientific research and design is acquired about environmental pollution during construction and building operation, about the environmental impact monitoring and pollution reduction methods. Knowledge is acquired about valid environmental legal acts. The ability to solve pollution reduction and pollution treatment issues of atmosphere, soil, water, and domestic and industrial wastewater is acquired.	1. The concept of environmental protection. Impact on the environment in civil engineering 2. Environmental legal acts 2,1. International protocols, conventions and agreements 2,2. European legal acts 2,3. Lithuanian environmental legislation 2,4. Environmental issues in the existing technical regulations for construction in Lithuania 3. Complex environmental pollution 3,1. Pollution of the atmosphere, soil and water and its reduction methods 3,2. Chemical and physical pollution 3,3. Reduction of physical pollution in civil engineering 4. The evaluation of the effects on the environment 4,1. Monitoring of environmental factors 4,2. Pollution monitoring 4,3. The evaluation and control of the effects on the environment 5. Interaction with the environment in civil engineering 5,1. Environmentally friendly materials 5,2. Renewable energy usage for buildings' heating and cooling 5,3. Development of sustainable use of natural resources in the civil engineering 6. Prevention of ecological disasters
Waste Management and Recycling Technology	3	Gaining knowledge about the sources of waste generation, waste quantities and influencing factors, and the main characteristics of the waste handling and recycling methods, equipment and technology	Knowledge of types and composition of waste, its generation, sources, physical, chemical and biological properties of waste, principles of waste management, legal framework and priorities for waste management, landfilling, mechanical, biological and thermal treatment, hazardous waste and its sources, reuse the use of secondary raw materials.	1. Waste management of legal regulation and management priorities for the EU and Lithuania 2. Waste generation, nature, collection and transportation 3. Mechanical treatment of waste 4. Biological treatment of waste 5. Mechanical-biological treatment of mixed waste 6. Thermal Waste Treatment and Disposal 7. Waste landfilling 8. Hazardous waste sources, types and properties, processing 9. Main streams of secondary raw materials processing technology 10. Metal, rubber waste, used oil recycling technology 11. Glass, plastic and paper recycling technology 12. Re-use of waste for the manufacture of construction products 13. Radioactive waste storage
Waste Management and Recycling Technology	6	Gaining knowledge about the sources of waste generation, waste quantities and influencing factors, and the main characteristics of the waste handling and recycling methods, equipment and technology	Is able to identify the types and composition of their formation, the sources of waste ,, physical, chemical and biological properties of waste management principles, legal framework and priorities for the management, storage of waste in landfills, mechanical, biological and thermal treatment of hazardous waste and their sources, re the use of secondary raw materials.	1. Waste management of legal regulation and management priorities for the EU and Lithuania 2. Waste generation, nature, collection and transportation 3. Mechanical treatment of waste 4. Biological treatment of waste 5. Mechanical-biological treatment of mixed waste 6. Thermal Waste Treatment and Disposal 7. Waste landfilling 8. Hazardous waste sources, types and properties, processing 9. Main streams of secondary raw materials processing technology 10. Metal, rubber waste, used oil recycling technology 11. Glass, plastic and paper recycling technology 12. Re-use of waste for the manufacture of construction products 13. Radioactive waste storage
Renewable Energy Technologies	6	To acquire knowledge of technologies for transforming of renewable energy into thermal and electric energy, to know their advantages and disadvantages and to evaluate their economic parameters.	The students are taught to understand renewable energy technologies, areas of their utilization and efficiency of them as well as to understand peculiarities of technologies for transformation fo primary energy into electric or thermal energy and both technical and economical reasoning of those technologies.	1. Politics of usage of renewable suerce and energy technologies 2. Solar, wind and hydropower 2,1. Solar collectors for preparation of hot water 2,2. Technologies for heating of buildings using solar energy 2,3. Solar photoelements for generation of electric energy 2,4. Technologies of wind power plants 2,5. Hydroturbines 2,6. Small scale hydro power plants 3. Technologies for utilization of low temperature and geothermal energy 3,1. Technologies of heat pumps 3,2. Geothermal power plants 4. Technologies for utilization of biofuel 4,1. Biogas power plants 4,2. Technologies for combustion of waste wood 4,3. Technologies for combustion of straw 5. Other technologies of renewable energy sources 5,1. Thermo electric power plants 5,2. Fuel cels
Renewable Energy Systems in Buildings	6	To gain knowledge about renewable energy technologies in buildings, to analyze these systems as well as integrate it into heating ventilation and air conditioning systems of buildings.	To obtain theoretical and practical knowledge about renewable energy technologies in buildings, its principal schemes, purpose, functioning, equipment used, control and maintenance. To obtain skills in design of these systems, performing energy supply analysis for buildings. To be able to participate in discussions and seminars about case studies of good practice of renewable energy systems' integration into heating, ventilation and air conditioning systems of buildings.	1. Renewable energy technologies in buildings 1,1. Heat pumps and geothermal heating systems 1,2. Solar energy systems in buildings 1,3. Wind energy systems in buildings 1,4. Combined heat and power and biofuel technologies 1,5. Hot water disposal heat exchanger systems 1,6. Natural and hybrid ventilation systems 2. Passive energy technologies in buildings 2,1. Passive cooling of buildings 2,2. Heat storage 2,3. Solar shading and solar insolation control systems 3. Design of renewable energy systems in buildings 4. Methods of energy performance analysis for buildings 5. Financial evaluation of renewable energy systems
Design of Renewable Energy Sources System	6	To provide students with knowledge and acquired skills to help carry out design work on the integration of renewable energy sources into energetics.	In final projects, students must show their basic knowledge of renewable energy systems, their properties and potential practical applications not only in Lithuania but also in other countries, and to know the political concept of renewable energy resources and development.	1. Introduction 2. The Calculations of Thermal Energy System 3. Heat Energy from Wind and Solar 4. Thermal Energy from Biomass 5. Heat Pumps 6. The Calculations of Fuel Cell Energy 7. The Calculations of Storage Systems 8. The Calculations of Electrical Power System 9. Electricity from Wind, Solar and Water 10. Electric Power System Operation Conditions 11. The selection of Hybrid Power System
High Voltage Engineering of Renewable Energy Sources	6	To give profound knowledge about discharge processes in gaseous, solid and liquid insulation. Specific aims: study the structure of insulation of electrical devices; analyze overvoltages formation reasons and levels; study the principle of work of protection means against overvoltages; analyze methods of prophylactic tests of devices insulation; analyze principles of insulation coordination.	Electrical processes in gas, fluids and hard insulating materials. Discharge in different kind of fields. The co-ordination of insulation, electric resistance and its characteristics. Atmospheric overvoltages: regime and switching. Protection devices. High voltage laboratory equipment for generating, measuring and recording. Electric systems equipment and apparatus, their protection. Maintenance check-up and testing of insulation.	1. Electro-physical processes in dielectrics 1,1. Discharge in homogeneous electrical field in air 1,2. Discharge in markedly nonhomogeneous electrical field 1,3. Impulsing resistance of insulation 1,4. Corona discharge 1,5. Discharge on dielectric surface in air 1,6. Electrical resistance of solid, liquid and combined insulation 2. Insulation of electrical devices 2,1. Insulation of air and cable power lines 2,2. Insulation of substation and devices mounted in it 2,3. Insulation of electrical machines and transformers 2,4. Constructive means for improving of electrical resistance 2,5. Prophylactic tests and measurements of insulation 3. Electromagnetic processes in lines 3,1. Classification of overvoltages 3,2. Lightning overvoltages. Lightning protection of lines and substations 3,3. Lightning protection of buildings and electrical devices 3,4. Internal overvoltages 3,5. Protection means against overvoltages 3,6. Regimes of transformers neutral and neutral regimes influence to systemic insulation, voltages and overvoltages 3,7. Coordination of systemic insulation

Electrical Machines of Renewable Sources	6	To teach the students for servo motors, machines of information systems, synchro systems, automatic control systems and renewable energy sources, their characteristic features, performance characteristics, modes of operation. The specific aims are: to analyse constructions of renewable sources electrical machines, to learn the methods of parameters and characteristics measuring of the machines, to learn mathematical models and software of simulation of steady state and dynamic work modes, to use data bases and catalogues of the machines.	Classification of renewable sources electrical machines. Transformers. Specifications of induction machines of renewable energy sources. Direct current electrical machines and methods of their control. Electrical machines with permanent magnets. Synchronous machines, methods of their control and main characteristics. Machines of control systems: tachogenerators, resolvers, rotary amplifiers. Electrical machines of synchro systems - synchros. Steppers, brushless and special electrical motors.	1. Classification of renewable sources electrical machines, the fields of their application 2. Transformers of renewable sources 3. Induction machines 4. Alternating current servo motors 5. Induction capacitor machines 6. Synchronous electrical machines of renewable sources 7. Special purpose synchronous machines 8. Stepping motors 9. Encoders of rotation speed and position 10. Direct current electrical machines 11. Electroniccaly commutated direct current motors 12. Tachogenerators, resolvers, rotary amplifiers
Renewable Natural Resources	6	To provide knowledge about renewable natural resources, their availability, and to familiarize with the features of extraction, transportation, primary processing, selection of suitable resources/raw materials and possibilities of practical use.	Knowledge is provided about renewable natural resources, their availability, and the peculiarities of their extraction, transportation, pre-processing, selection of suitable resources/raw materials and possibilities of practical use are introduced.	1. Renewable Natural Resources: Origin, Classification and Availability 2. Sustainable Principles of Extraction and Transportation of Renewable Natural Resources 3. Political, Economic and Environmental Aspects of Renewable Natural Resource Management 4. Plant-based Resources/Raw Materials, Their Composition, Properties, Extraction and Primary Processing Technologies 5. Resources/Raw Materials of Animal Origin, Their Composition, Properties, Extraction and Primary Processing Technologies 6. Resources/Raw Materials of Marine Origin, Their Composition, Properties, Extraction and Primary Processing Technologies 7. Raw Materials of Microbiological Origin, Their Composition, Properties, Extraction and Primary Processing Technologies 8. Selection of Renewable Natural Resources/Raw Materials Suitable for the Production of Biomedical Materials and Principle
Biofuel and Biomass	6	Getting knowledge about characteristics of biofuel, production and using technologies. Attaining knowledge about using of wastes for energy production, of air pollution and emissions reduction	Getting knowledge about biofuel property and biofuel using technologies. Learning of calculation of fuel consumption and another technological parameters. Learning of biogas production and biogas using technologies for energy production. Getting knowledge about energy potencial of wastes and utilization possibilities. Learning pollutant generating by combustion process, reduction of pollutants generating and flue gas cleaning methods.	1. Biofuel 1,1. Basic of fuel combustion theory 1,2. Sorts of biofuel and characteristics 1,3. Combustion technologies for biofuel 1,4. Boilers design 1,5. Gasification of solid biomass 2. Biomass 2,1. Production of biogas and characteristics 2,2. Technologies for biogas utilization 3. Fuel from waste 3,1. Wastes energy potential 3,2. Waste burning technologies 4. Environmental protection 4,1. Formation of gaseous pollutants 4,2. Prevention of pollutants generation 4,3. Cleaning of flue gases
Sustainable Transport System	6	To know through understanding of influence of transport system on sustainable development. To teach through understanding of development of transport system from occurrence of transport demand to modern, in the main strategical documents of European Union and Baltic Sea region mented aims of sustainable develoment adequate technological levels.	Students are thought to understand the characteristics of transport system, to describe and analyse the relation between elements, relations with environment, principles of sustainable transport system and to apply in transport engineering practice, to evaluate peculiarities of transport systems, new strategies and aspects of transport policy and sustainable development.	1. Sustainable development 2. Occurrance and realization of transport demand 3. Influence of technical progress on development of sustainable transport system 4. Design, production and implementation of fyzical and functional components in to system of sustainable transport 5. Aims of Lithuanian and Baltic sea region by realization of global policy of sustainable transport develoment
Sustainable Architecture	3	The aim of the module is to present the students with the concept of sustainable development and its application in the formation of environment devoting the main attention to the architecture of the buildings.	The module encompasses the theoretical knowledge, architectural research, and the development of architectural concepts and provides the students with the fundamentals of application of the principles of sustainability in architectural design.	1. Sustainable development and environmental ethics. Main international and national documents 2. History of ecological and sustainable architecture 3. Sustainable architecture assessment criteria and certification 4. Concept and typology of sustainable architecture 5. Technologies, materials and aesthetics of sustainable architecture 6. Sustainable development of territories 7. Biophilic design 8. Future visions of sustainable architecture. Decarbonized architecture
Sustainable Architecture	6	The aim of the module is to present the students with the concept of sustainable development and its application in the formation of environment devoting the main attention to the architecture of the buildings.	The module encompasses the theoretical knowledge, architectural research, and the development of design ideas and provides the students with the fundamentals of application of the principles of sustainability in development of environment. General principles are explained by analyzing the examples of contemporary architecture. The Design Thinking method is integrated in the module for the understanding of the social dimension of sustainability.	1. Introduction. Concept of sustainable development 2. Sustainable development, environmental ethics and architecture 3. Sustainable development: international and national documents 4. Sustainable architecture assessment criteria 5. Biophilic design 6. Typology and expression of sustainable architecture 7. Technologies, materials and aesthetics of sustainable architecture 8. Sustainable development of territories
Sustainable Chemistry	6	To provide knowledge about main principles or sustainable chemistry and necessity to apply them in chemical industry and scientific laboratories.	Students are introduced to the principles of sustainable chemistry and the importance of their application in the chemical industry. They will learn to evaluate the atom economy and E factor beside the product yield.	1. Relevance and History of Sustainable Chemistry 2. Fundamentals of chemicals toxicity and legislation 3. Atom Economy and E Factor 4. The benefits of catalytic process application for chemical industry 5. Reducing number of steps in synthesis 6. Safer Solvents and Auxiliaries 7. Increasing energy efficiency whic is applied for reactions 8. Waste prevention, recycling and reuse 9. Safer Chemicals 10. Less Hazardous Chemical Syntheses 11. Use of Renewable Feedstocks 12. Design for Degradation 13. Real-time analysis for Pollution Prevention 14. Inherently Safer Chemistry for Accident Prevention
Sustainable Food Systems	6	To acquire knowledge on sustainable food system concept, social, economical, environmental and technological issues of their implementation and development, and the importance in the changing society and environment	The knowledge is acquired about the sustainable food systems, the social, economic, environmental and technological aspects of their implementation and development, and their importance in the modern changing society and environment	1. Sustainable food system concept, principles and compliance to UN Sustainable Development and European Green Deal goals 2. Social, economic and environmental impacts in sustainable system development and implementation 3. Food sovereignty and food waste reduction strategies 4. Life cycle assessment of food systems 5. Carbon footprint in food industry and its reduction strategies 6. Water footprint in food industry and its reduction strategies 7. Food waste reduction and valorization opportunities for different food industries 8. Innovative manufacturing and packaging technologies in sustainable food systems 9. Application of cleaner production and green supply chain principles in the food industry
Introduction to Sustainable Development	6	To acquire knowledge about and understand the sustainable development concept, principles, its relationship to life quality, be able to apply the acquired knowledge in practice in typical situations.	Essential sustainable development concept knowledge is acquired, main sustainable development principles are understood and are able to apply the acquired knowledge in practice, analysing the impact of the decision of specialists in economic, social and environmental terms.	1. The concept and history of sustainable development 2. Sustainable development challenges 3. Sustainable development strategy and implementation principles 4. Dimensions of sustainable development 5. Global environmental problems and threats 6. Interdisciplinarity of sustainable development implementation 7. Sustainable development perspective 8. Directive documents of sustainable development
Artificial Intelligence Ecosystems	6	To provide knowledge of the concept, ethics, scope, social and economic impact of Artificial Intelligence (AI) and to develop the skills to implement simple tasks in Pyfhon.	Gains knowledge of the concept of artificial intelligence, the essential differences with automated and robotic systems. The types of "narrow", "general" and "super" artificial intelligence are explained through real examples. AI benefits, potential threats, ethics and transparency are explained in details. As well as the ethics of robots, their role in society and responsibilities. Practical skills to create simple AI problems realization using Python programming language are developed.	1. History and origins of artificial intelligence 2. Python programming language - an introduction to the solution of artificial intelligence problems 3. Modernization of technologies: automatic, robotic and intelligent systems 4. The concept, types and application goals of artificial intelligence 4,1. Narrow artificial intelligence 4,2. Super artificial intelligence 4,3. General artificial intelligence 5. Ethics of artificial intelligence 6. The era of robotics 6,1. Robots: Responsible machines or more? 6,2. Autonomous machines and hybrid systems 6,3. Robots and their rights 6,4. Robots' behavior protocols 6,5. The ethics of robots 7. Artificial intelligence - social and economic challenges 8. Transparency in the use of artificial intelligence: hidden algorithms 9. Intelligent and resource-efficient systems 10. The future of artificial intelligence
Electronics Systems of Electric Vehicles	6	To provide an introduction to the electric vehicles power-, control- and the battery charging electronics systems and innovative electronics components and technologies.	This course is a introduction to electric vehicle electronic systems and architecture. The course explores the electrical power, management and control electronic systems in electric vehicles: inverters, converters, rectﬁers, smart battery chargers, scalar and vector control based electric vehicle motor drives, embedded signal processing systems, electronics components of electric vehicles, emerging devices technologies, optimal power management and distribution in electric vehicle system, advanced energy storage systems. Provides knowledge of modeling and simulation of electric vehicles power electronics systems.	1. Introduction to the module, terminology, information sources. History of electric vehicles 2. Overview of electric vehicle systems 3. Combination HEV, regenerative braking systems, hybrid power systems 4. Inverters 5. Speed and torque control method of electric vehicles 6. Control systems 7. Electric current and voltage converters

Geothermal Energy and Heat Pumps	6	To acquire knowledge about sources and systems of geothermal energy, heat pumps, principles of calculation and simulation, to analyse environmental and energy saving problems.	Students are accuired the knowledge about sources and systems of geothermal energy, geothrmal power plants and heat pumps. They are able to understand nature of geothermal energy systems and processes, fulfilling requirements of safety, reliability and efficiency. Students are acquired the methodology of heat pump system design. They are able to analyze working cycles, to make a decision using new technologies and saving energy.	1. Resources and utilization of geothermal energy 1,1. Resources of geothermal energy 1.2. Potential of utilization of geothermal energy 2. Geothermal plants 2.1. Functioning principles of geothermal plants 2.2. Systems and equipment of geothermal plants 3. Heat pumps 3,1. Types of heat pumps 3,2. Characteristics of heat pumps 3,3. Systems of heat pumps 4. Energy saving and ecology
Geothermal Energy and Heat Pumps	3	To acquire knowledge about sources and systems of geothermal energy, heat pumps, principles of calculation and simulation, to analyse environmental and energy saving problems	Students are acquired the knowledge about sources and systems of geothermal energy, geothermal power plants and heat pumps. They are able to understand nature of geothermal energy systems and processes, fulfilling requirements of safety, reliability and efficiency. Students are acquired the methodology of heat pump system design. They are able to analyze working cycles, to make a decision using new technologies and saving energy.	1. Resources and utilization of geothermal energy 1,1. Resources of geothermal energy 1.2. Potential of utilization of geothermal energy 2. Geothermal plants 2.1. Functioning principles of geothermal plants 2.2. Systems and equipment of geothermal plants 3. Heat Pumps 3,1. Types of heat pumps 3,2. Characteristics of heat pumps 3,3. Refrigerants and Brines 3,4. Systems of heat pumps 4. Energy saving and ecology
Hydraulics and Hydropower Plants	3	To provide knowledge of the laws of fluid equilibrium and flow, hydraulic machines, systems and hydro-power plants; to develop skills in applying of the knowledge in practice: in the fields of hydraulic systems, drives and hydropower.	The laws of fluid equilibrium and flow are assimilated. Students acquire to apply theoretical knowledge for solution of engineering problems. Knowledge about hydraulic and pneumatic machines and their practice using is obtained. The fundamentals of hydropower are assimilated. Students acquire to find optimal working place for hydropower plant in country general energy supply system. Knowledge about hydraulic turbines, types of hydropower plants, their structure and operation principle is obtained. Students get knowledge about hydropower plants in Lithuania and perspective of new hydropower plants buildings	1. Hydraulics. 1,1. Introduction. 1.2. Fundamentals of hydrostatics. 1,3. Main parameters and laws of fluid flows. 1.4. Fluid flow in pipelines. 1,5. Fluid flow through the orifices and nozzles. 1,6. Fluid flow in channels. 2. Hydropower plants. 2,1. Fundamentals of hydropower. 2.2. Hydropower plant in the energy supply system. 2.3. Hydraulic turbines. 2.4. Types and structures of hydropower plants. 2.5. Lithuanian hydropower plants. 3. Introduction to hydraulic (pneumatic) power drives. 3,1. Hydraulic pumps and actuators. 3,2. Directional control valves, pressure valves, hydraulic accumulators and other devices.
Language Ecology	6	Provide with the knowledge of language ecology and the skills of the proper use of the Lithuanian language referring to the linguistic environment. Teach to create a lithuanian text of different styles and genres, notice and correct the shortcomings of technical texts and mistakes of linguistic expression.	Educate to foster versatility of language environment, its regularity and clearness referring to language usage interface with a social context and a particular situation. They are able to write correctly and edit publications related to their future activity, are able to perform linguistic analysis of a technical texts. Foster skills to analyze various aspects of a language and linguistic phenomena of language standards.	1. Concept and the main principles of language ecology. Paradigm of language ecology. 2. Social aspects of language usage. Language and its varieties. Language policy. 3. Editing theory and practice. Editor ethics. Proofreading marks and their application. 4. Language standardization and regularity, linguistic prescriptivism. 5. Principles of Lithuanian language management, codification criteria and their application. 6. Adaptation of borrowings 7. Principles of using foreign words, grammar, adaptation. 8. Text composition: structure, coherence, functions and expression of text linking tools 9. Creation of Lithuanian text of different types, styles and genres. Text structure flaws. 10. Formal requirements for computer-typed text.
Sustainability of Materials and Environmental Protection	6	To provide knowledge about the possible impact of the production and use of biomedical materials on the environment, the principles of sustainable development of materials, to acquire the ability to assess the sustainability of materials.	Knowledge is gained about the potential impact of traditional and advanced biomedical materials and their packaging production methods on the environment. Ability is gained to comprehensively understand the impact of a sustainable design strategy on the development of products and technologies. The assessment of the life cycle, which includes the impact of the product and the technological production process on the environment from the extraction of raw materials to the disposal of the final product, is assimilated.	1. Sustainable production and sustainable consumption in society. 2. Regulation of sustainable products in the European Union. 3. The impact of the production and use of biomedical substances on the environment. 4. Types of packaging, features of their processing, impact on the environment. 5. Material sustainability criteria. 6. Design strategies for sustainable biomedical preparations and their packaging. 7. Materials sustainability assessment methods and tools. 8. Life cycle assessment of biomedical substances
Non-renewable Natural Resources	6	To provide knowledge of non-renewable natural resources, their origin, availability, and their extraction, transport, pre-processing, selection of suitable resources/raw materials and their practical	It provides knowledge of non-renewable natural resources, their availability, and introduces the specifics of extraction, transport, pre-processing, selection of suitable resources/raw materials and practical applications.	1. Non-renewable natural resources: origin, classification and availability 2. Sustainable principles for the extraction and transport of non-renewable natural resources 3. Political, economic and environmental aspects of managing non-renewable natural resources 4. Petroleum, coal and natural gas resources, extraction, properties and processing technologies 5. Mineral resources containing metal compounds. Extraction, properties and pre-processing technologies of raw materials 6. Non-metallic and refractory compounds and their resources. Raw material extraction, properties and processing technologi 7. Selection of non-renewable raw materials suitable for the production of biomedical materials and their application
Solar Energy	3	To give the fundamental information about solar energy. To learn the projecting of solar station conections to electricity networks. The specific aim is to learn the projecting of solar stations parks.	The students are taught to understand the purpose and structure of solar stations using, to select solar stations types, to calcute the amounts of electricity , bus voltages and current, to design projects of solar stations connecting to networks.	1. Solar energy conversion technologies 2. Solar energy potential in Lithuania and Europe 3. Parameter selection of photovoltaic modules and converters 4. Design and connection of solar power plants to electrical grids 5. Solar power plant modeling with software packages 6. Solar thermal power plants and technology 7. Hybrid and island mode solar plant systems 8. Solar power installation problems and prospects for the future
Civil Engineering Structures and Environment Protection	3	To acquire knowledge about environment protection and main legal acts of that and interaction between structures and environment during structure's life cycle. To know the main methods to reduce the pollution.	Assimilate theoretical and practical knowledge needed for scientific researches and design, knowledge about the environmental pollution during the construction and building maintenance processes and the methods of the reduction of pollution. Obtain knowledge about valid environmental legal acts. Obtain the ability to solve the engineering tasks of soil, water, household and industrial wastewater cleaning. Obtain the ability to choose environmentally friendly building materials and organize the constructional waste management.	1. The concept of environmental protection. Control and assessment of environmental impact. 2. Environmental legal acts. 2.1. International protocols, conventions and agreements. 2.2. European legal acts. 2.3. The legislation of Lithuania. Environmental issues in the existing technical regulations for construction in Lithuania. 3. Complex environmental pollution. 3,1. Pollution of the atmosphere and its reduction methods. 3.2. Soil pollution. Soil cleaning, management of constructional and municipal waste. 3,3. Contamination of the surface water, groundwater and underground water. Water cleaning. 4. Environmental pollution during the life cycle of the building. 4,1. The production and transportation of building materials to the building lot. 4.2. Construction. 4,3. The maintenance of the building. 4,4. Technological processes carried out in or related to the building. 4,5. Repair and renovation of the building. 4,6. Destroy and demolish of the building. 4,7. Constructional waste management. 5. Clean construction and ecological buildings.
Sustainable Transport: Technologies, Environment and Interaction	6	To gain thorough understanding of road, railway, air, water and pipeline transportation technologies, transportation operations, organization and planning of transport flows, peculiarities of transportation by road, rail, water, air and multimodal transport, structure of terminals and organization of operations, necessary regulating documents, transport management systems. The specific aims are: to analyze advantages and disadvantages of transportation technologies, analysis of transport statistics, choice of appropriate transportation mode according the requirements of the clients and transportation technologies, perform the planning of transportation operations.	The student is thought to know main transportation operations, transport statistics, regulating documents, and to apply it in transport engineering practice, to apply general methods of transportation technology choice meeting the requirements, to estimate peculiarities of the passenger and freight transport, new strategies and aspects of transport policy, to form transportation plans.	1. Sustainable Transport Systems, elements and models 2. Mathematical Transport Models 3. Pricipals of Traffic Organization 4. Inligent Transport Systems 5. Organization and Technologies of Cargo Transportation 6. Transport logistics 7. Statistical Analysis of Transport Data 8. Transport Policy 9. Characteristics and Dynamics of Traffic Flows 10. Economical and Ecological Analysis of Traffic 11. Engineering Means of Traffic Organization 12. Traffic Safety 13. Coordianted Traffic Control
Circular Economy and Law	6	To acquire circular economy principles and legal requirements in environmental management.	Mechanism of environmental economics are known, as well as economic calculations and estimation of alternative environmental solutions are performed. Substantial circular economy principles in environmental management are learned. General knowledge about European Union legal structure are obtained. The students will be able to apply the main European Union and Lithuanian environmental law search and analysis.	1. Development of environmental economics and its main principles. 2. Environmental resources management models. 3. Principles of circular economy. 4. Economic and administrative environmental measures. 5. Alternative environmental politics options. 6. Economic estimation in environmental protection. 7. European Union legal structure. 8. The main legal environmental requirements of European Union and Lithuania. 9. European Union legal requirements in national law. 10. The main environment protection laws of Lithuania.

Sustainable Safety in Construction	3	To acquire theoretical background of occupational safety and health; to acquire the abilities to apply it practically in planning, implementation and operation of contruction projects.	Acquired knowledge about integrated planning, organization and management of occupational safety and health in construction; occupational safety and health requirements, mandatory documents and procedures on the construction site. Acquired an understanding of the concept of total quality, quality management components, ISO and OHSAS standards of quality essence, their application in construction enterprise. To assess the safety and health measures to make rational health and safety, the environmental decision to carry out construction projects in view of sustainable security aspects and influences people.	1. Occupational safety and health aspects of construction sites 2. Occupational health and safety legal regulation in the construction sector 3. Structural, technological and security solution synthesis 4. General and specific requirements for workplace installation on construction site 5. Ensuring environmental solutions in construction work 6. Social dialogue in the enterprise by providing safe and healthy working conditions 7. Accidents and occupational disease study 8. Occupational stress and its treatment 9. Sustainable safety management system continuous improvement
Sustainable Safety in Construction	3	To acquire theoretical background of occupational safety and health; to acquire the abilities to apply it practically in planning, implementation and operation of construction projects.	Acquired knowledge about integrated planning, organization and management of occupational safety and health in construction; occupational safety and health requirements, mandatory documents and procedures on the construction site. To assess the safety and health measures to make rational health and safety, the environmental decision to carry out construction projects in view of sustainable security aspects and influences people.	1. Occupational safety and health problems 2. Occupational safety and health aspects of construction sites 3. Occupational health and safety legal regulation 4. Sustainable Construction Safety 5. Environmental ensuring in construction work 6. Structural, technological and security solutions 7. General and specific requirements for workplace installation on construction site 8. Strategic objectives and tasks of sustainable construction supervision 9. Conditions by providing safe and healthy working conditions in the enterprise 10. Accidents and occupational disease investigation 11. Sustainable safety management system continuous improvement
Human, Building and Environmental Safety in Construction	6	To provide knowledge of the theoretical foundations of environmental, occupational safety and health and practical application in the planning, implementation and operation of construction projects.	Acquired knowledge about integrated planning, organization and management of occupational safety and health in construction; occupational safety and health requirements, mandatory documents and procedures on the construction site. Acquired an understanding of the concept of total quality, quality management components, ISO standards of quality essence, their application in construction enterprise.Obtain ability to choose environmentally friendly building materials and organize the co To assess the safety and health measures to make rational health and safety, the environmental decision to carry out construction projects in view of sustainable security aspects and influences people.	1. The concept of environmental protection. Control and assessment of environmental impact. 2. Environmental legal acts. 2,1. International protocols, conventions and agreements. 2.2. European legal acts 2.3. The legislation of Lithuania. Environmental issues in the existing technical regulations for construction in Lithuania. 3. Integrated environmental pollution. 3,1. Pollution of the atmosphere and its reduction methods. 3,2. Soil pollution. Soil cleaning, management of constructional and municipal waste. 3.3. Contamination of the surface water,groundwater and undergroundwater.Water, household and industrial waste water cleaning 4. Environmental pollution during the life cycle of the building. 5. Clean construction and ecological buildings. 6. Occupational safety and health aspects of construction sites 7. Occupational health and safety legal regulation in the construction sector 8. Structural, technological and security solution synthesis 9. General and specific requirements for workplace installation on construction site 10. Ensuring environmental solutions in construction work 11. Social dialogue in the enterprise by providing safe and healthy working conditions 12. Accidents and occupational disease study 13. Sustainable Construction Safety Modeling and continuous improvement
Natural Resource Processing Technologies	9	To provide knowledge about the sustainable processing of natural resources of various origins into biomedical materials or theirs components using standard and modern methods and technologies, multi-level biorefining concept and principles of circular economy.	Knowledge is gained about the suitability of natural resources of various origins and processing technologies into biomedical materials or their components. Ablility to select suitable technological processes, equipment and conditions for various conditions to isolate components from biomass of plant, animal and marine origin and non-renewable natural origin sources. It is possible to evaluate the efficiency and sustainability of processes, to identify parameters for process and product control for safety, to solve current problems of sustainable processing of natural resources, promoting society with sustainable processes protect the environment.	1. Suitability of natural resources (NR) of various origins to produce biomedical materials (BM) or their components 2. GI preparation for processing following environmental, microbiological pollution and human health protection principles 3. Standard and modern GI processing methods and technologies of various origins, their economic justification 4. Processing of starchy and lignocellulosic GIs of plant origin into biomedical materials or their components 5. Processing of GIs of animal origin into biomedical materials or their components 6. Processing of microscopic and macroscopic algae and cyanobacteria into biomedical naterials or their components 7. Processing of oil and oil products into biomedical materials or their components 8. Processing of metal compounds of mineral origin into biomedical materials or their components 9. Processing of non-metallic and hardly melting compounds into biomedical materials or their components 10. Properties of biologically active components, isolation from various biomasses using complex extraction technologies 11. Optimization of process parameters for the isolation of biologically active components 12. Sustainable processing of GI into BM or their components applying multi-step biorefining and circular economy principles 13. Control and safety requirements of GI processing processes, and principles of ecological design
Solid Waste Management and Resource Recovery Technologies	6	To obtain consistent knowledge about the sources of the solid waste, its quantities and influencing factors, properties of solid waste, the main methods and facilities for treatment of solid waste, resources recovering feasibilities in waste management process.	Sources, types and composition of solid waste. Physical, chemical and biological properties of waste. Collection and transportation of solid waste. Solid waste pre-treatment, mechanical treatment and recycling. Biological and mechanical-biological waste treatment. Thermal waste treatment. Disposal of waste to landfills. Landfills exploitation and after care. Waste management legislation and strategies. Feasibilities for resources recovering from waste,	1. Main engineering, economic and legal aspects for solid waste management and resources recovering 2. Waste Generation Prevention and Minimization 3. Waste Collection and Transport Methods in Terms of Resource Recovery Feasibilities 4. Mechanical Waste Separation and Treatment 5. Waste Recycling 6. Biological Waste Treatment 7. Waste Mechanical-Biological Treatment (MBT) System and Procured Materials 8. Thermal Waste Treatment and Residues Disposal 9. Chamical Waste Stabilisation 10. Recovering and Extraction of Materials from Waste 11. Waste Landfilling and Landfills Exploitation 12. Principles for Creation of Waste Management System
Semester Project	6	To obtain practical skills in environmental impact assessment of planned economic activity.	Students are acquainted with the principles of environmental impact assessment process. Information about the main stages of environmental impact assessment process as well as procedures, participants and their functions is gained. Skills to predict impacts, to choose and analyze alternatives for impact minimization are built. Practical abilities to apply obtained knowledge while preparing environmental impact assessment documentation are gained. By accomplishing group tasks teamwork skills are formed.	1. The concept of the environmental impact assessment, its object, process and participants. 2. Procedures of environmental impact assessment for planned economic activity. 3. General information about planned economic activity (products, fuel and energy consumption, raw materials, etc.). 4. Technological processes. Comparison of techniques suggested for planned activity with best available methods. 5. Waste generation and treatment at planned economic activity. 6. Evaluation of possible environmental impact on water. 7. Evaluation of possible environmental impact on the ambient air . 8. Evaluation of possible environmental impact on soil, underground environment, biodiversity and landscape. 9. Evaluation of possible impact on the socio-economic, ethnic-cultural environment and public health. 10. Analysis of alternatives (time, place, technological, environmental, etc.) for environmental impact minimization. 12. Description of problems.
Pollution Prevention and Management	6	To acquire theoretical knowledge related to pollution prevention and risk management by integrating the principles of sustainable engineering, legal and managerial measures. To develop practical skills enabling to perform the product or manufacturing process life cycle assessment and their modifications.	Knowledge on the concept of pollution prevention, requirements of the environmental management system, principles and tools of the industrial pollution control and risk management is acquired. Ability to carry out product or process life cycle assessment using a computer software is build. Acquired knowledge enables to carry out improvement of products and manufacturing processes.	1. Sustainability principles in industry and society. 2. Environmental Management System. 3. Concept of Pollution Prevention. 4. Pollution Prevention Techniques. 5. Industrial Pollution Control and Risk Management. 6. Eco-design Strategies and Implementation. 7. Methodology of Life Cycle Assessment. 8. Application of Life Cycle Assessment for Pollution Prevention and Conservation of Resources. 9. Performance of Life Cycle Assessment Using Software.
Environment and Society	6	To develop the understanding and ability to discuss the environmental changes of modern societies, the social consequences and causes of climate change, the social causes of the emergence of environmental problems and the prospects for possible solutions.	Student is able to discuss the socio-biological societal identity, main environmental problems, their anthropogenic causes and solutions , main characteristics and ethical principles of sustainable development; is able of systematic, critical thinking and using social statistical databases for preparation and presentation of reasoned topical reviews.	1. SOCIAL INQUIRY ON ENVIRONMENTAL TOPICS: INTRODUCTORY LECTURE 2. ENVIRONMENTAL GOVERNANCE 2.1. Natural resources and collective action problems 2.2. The history of global environmental governance 2.3. Global biodiversity governance 2.4. Global climate governance 2.5. Institutions and environmental sustainability 2.6. Structural causes of environmental degradation 3. ENVIRONMENTAL WORLDVIEWS AND PARADIGMS 4. INTERPRETATIONS OF ENVIRONMENTAL – ECOLOGICAL QUESTIONS IN SOCIAL SCIENCES AND HUMANITIES 4,1. Environmental ethics 4.2. Environmental anthropology 4,3. Behavioral economics 4,4. Nature narratives in the arts and literature 4,5. Communicating environmental problems I 4,6. Nature narratives in the arts and literature II 5. PRO-ENVIRONMENTAL BEHAVIORS AND ENVIRONMENTAL ACTIVISM
Building Energy Performance Predictions and Design	6	To develop abilities to analyze complex solutions of building architecture, indoor climate, energy consumption by applying numerical modelling tools.	The module provides knowledge and skills that allow assessing the building's heat balance, selecting a combination of engineering systems and renewable energy sources, assessing the essential principles of sustainability. Knowledge of the basic principles of designing engineering systems and skills in designing these systems are provided.	1. Energy efficiency of buildings, energy supply and consumption 2. Essential performance indicators of the building 3. Heat balance of buildings, determination of energy needs 4. Indoor climate of buildings 5. Types and main elements of heating systems (case studies, examples of solutions) 6. Types and main elements of ventilation systems (case studies, examples of solutions) 7. Air cooling and conditioning, basic elements of systems (case studies, examples of solutions) 8. Design of HVAC systems 9. Water management systems (case studies, examples of solutions) and their design 10. Integration of renewable energy sources in building 11. Passive energy saving measures in buildings 12. Methods of dynamic energy and indoor climate assessment of buildings 13. Theory of systems thinking, solving complex tasks with the help of systems engineering 14. Parameter optimization functions for energy efficiency of buildings

Additive Manufacturing and Prototyping	6	To provide knowledge about additive manufacturing and other prototyping technologies, to develop the ability analyze rapidly changing conditions in manufacturing environment, and to evaluate the advantages and disadvantages of these technologies in economic and environmental protection aspects	Students learn to understand principles of application of modern manufacturing processes. Provided knowledge about additive manufacturing technologies and other prototyping methods. Skills for independent modelling of new products and them production by using additive manufacturing are developed.	1. Principles of additive manufacturing technologies and used materials 1,1. Additive technologies, principles, terminology, standards 1.2. Classification of technologies (polymers, metals, ceramic, composites) 1,3. Stages of additive manufacturing 1,4. Used materials and their properties 1,5. Design for additive manufacturing 2. Additive manufacturing technologies 2.1. Binder jetting processes 2.2. Direct energy deposition processes 2.3. Material extrusion processes 2.4. Material jetting processes 2.5. Powder bed processes 2.6. Sheet lamination 2.7. Vat photopolymerization processes 3. Circumstances of the application of additive technologies 3,1. Rapid tooling technologies 3.2. Direct digital manufacturing 3.3. Additive manufacturing in medicine 3.4. Economic justification for the use of prototyping technologies 3.5. Environmental protection requirements using additive technologies 3.6. Supply chains in additive manufacturing organizations 3,7. Reverse engineering
Alternative Fuels and Hybrid Powertrains in Vehicles	6	To gain knowledge about the green, safe and quietly operating vehicles deployed technologies and capabilities to assess their impact on the operation of the engine, emissions and energy efficiency.	Acquired knowledge of alternative fuel and powertrains, their types, features, characteristics and technological aspects of use in vehicles.To apply methodics of reserach by alternative fuels and trains powered vehicles and estimations impact of the technological solutions on the dynamics, engine performance and energy efficiency.	1. The harmonious development of the technology behind the vehicle 1,1. Green, safe and quietly running various types of vehicle 1,2. Intelligent transport systems and services 2. Sustainable strategie of alternative fuels in the transport systems 2.1. Alternative fuels: types, properties, characteristics and use in vehicles 2.2. Compressed natural gas 2.3. Liquefied petroleum gas 2.4. Liquefied natural gas 2.5. Types of gaseous systems, requirements to gas equipment 2.6. Analysis of operation of internal combustion engine using gas 2.7. Structural control diagrams of gas delivery systems 2.8. Biofuels and hydrogen: production, properties, characteristics and use in vehicles 2.9. Analysis of operation of internal combustion engine using biofuels and hydrogen 3. Electric vehicles: types, technologies and infratsructure 3,1. Technologies and development trends of electric vehicles 3.2. Hybrid Electric Vehicle 3.3. Battery Electric Vehicle 3.4. Range Extended Vehicle 3.5. Plug-in Hybrid Electric Vehicle 3.6. Urban vehicles 3.7. Hybrid vehicles on the basis of a conventional vehicles 3.8. Dynamics of electric vehicles and energy efficiency 3.9. Infrastructure management models of electric vehicles
Production Technologies of Biotechnological Products	6	To provide an understanding with a focus on advanced industrial biotechnology achievements, to explain industrial integrated bioprocess stages and bioeconomy current developments, to analyze the production of organic acids, amino acids, sugar alcohols, vitamins, bioantioxidants, biopolymers, biochemicals, to gain understanding of natural phytochemicals extraction and fractionation, to become aware of bioproducts technologies from renewable resources, to analyze technologies of biodiesel production and to evaluate future technologies.	This course is concerned with the advanced industrial biotechnology achievements and perspectives, the students are taught to understand the stages of industrial integrated bioprocess, the production of organic acids, amino acids, bioantioxidants, biopolymers, biochemicals, extraction of natural phytochemicals and fractionation from plant materials, are taught to gain an understanding of bioproducts production technologies from renewable resources, students are able to obtain further information about production technologies of biodiesel and to evaluate future technologies.	1. Development and perspectives of advanced industrial biotechnology. 1,1. Valuable bioproducts of industrial biotechnology. 1.2. Industrial integrated bioprocess stages. 1.3. Production technologies of biochemicals, biomaterials, biopolymers. 2. Organic (propionic, sorbic, citric, ascorbic) acids, amino acids production. 3. Production of sugar alcohols (manitol, xylitol, sorbitol) and scented materials. 4. Production of vitamins, antimicrobial components/bioproducts, bioantioxidants, functional proteins. 5. Extraction and fractionation of natural bioactive components from plant materials. 6. Production technologies of bioproducts from renewable resources. 7. Technologies of biodiesel production and future technologies.
Electric Drives	6	To provide knowledge about basic principles of electric drives work and to develop skills necessary for chooseing elements and systems according to the basic requirements of the technological process using standards of electrical equipment, the latest achievements of engineering, licences, evaluating importance of drives quality, reliability, energy saving and ecology.	Acquires knowledge of electric drive mechanics (drive structure and statics and dynamics of mechanical systems), mechanical characteristics and speed control of DC, AC and stepper drive structures and speed control, statics, dynamics and control (open and closed systems) of "converter-motor" systems. The students will be able to create load diagrams of an electric drive, to select and design an electric drive that uses electricity, saves electricity, is safe and ecological in accordance with the requirements of the technological process.	1. Main conception. 1,1. Conception of electric drive (ED) and history of development. 1.2. Functions and struction of ED. 1,3. Tendencies of ED development. 1,4. Tasks of electric drive course. 2. Mechanics of electric drive. 2.1. Kinematic diagrams of motion transmission for electromechanical systems. Mechanical coordinates and parameters of ED. 2.2. The main equation of ED motion. 2.3. Reffering of static torque and inertia moment for ED. 2.4. Models of ED mechanical part. Mechanical part of ED as a control object. 2.5. Work conditions and speed-torque characteristics of industrial mechanisms. 2.6. Compare principles for speed-torque characteristics of electric motors. Motor and industrial mechanism common work ch-k. 2.7. Load diagrams and their constructing. 2.8. Acceleration and deceleration times of ED . Graphic and graphoanalitic solution of ED motion. 3. Conditions of ED work and their characteristics. 3,1. Conditions of ED work and distribution of energy. Dimensional and relative characteristics. 3.2. Peculiarities of DC ED speed-torque characteristics in motoring and braking conditions. 3.3. A motor of DC ED as a control object. 3.4. Appliance of DC ED in different technologies. 3.5. Peculiarities of AC ED in motoring and braking conditions. 3.6. A motor of AC ED as a control object. 3.7. Appliance of AC ED in different technologies. 3.8. Speed-torque characteristics of multimotor ED. 4. Principles of ED coordinate control. 4,1. Control of coordinates and its purpose. Main parameters of coordinate control. 4.2. DC ED speed control, varying excitation flax, armature resistance and voltage. 4.3. Generalized voltage converter as a control object. Four types of energy flow regulators. 4.4. ED systems with controlled rectifiers: work principles, circuit diagrams, speed control speed-torque characteristics. 4.5. ED systems with choppers, speed-torque characteristics and speed control. 4.6. AC ED speed control, varying a rotor resistance, number of pole pairs, power supply frequency. 4.7. Generalized frequency converter (FC) as a control object. Kinds of FC and circuit diagrams. 4.8. Pulse control method for AC ED speed regulation, varying voltage and using cascading circuit diagrams. 4.9. Stepper and linear ED, speed torque characteristics and speed control. 5. Transient response in ED. 5,1. Shunt wound DC ED transient response during starting, braking and reversing. 5.2. AC ED transient response during startig, braking and reversing. 5,3. Work of ED with a flywheel. 6. Closed loop coordinate control systems. 6,1. Coordinate control range increase methods using closed loop systems. 6.2. Voltage, speed and current feedbacks and their influence on speed-torque characteristics. Current cut off. 6.3. Feedback loop control systems. 6.4. DC and AC drive engineering package. 6.5. Vector control systems of AC ED. 7. Energetics of ED. 7.1. DC ED energy losses. 7.2. Energetics of DC ED transient response and methods for energy losses decreasing. 7.3. AC ED energy losses. 7.4. Energetics of AC ED transient response and methods for energy losses decreasing. 8. ED motor power rating selection. 8,1. General considerations. 8.2. ED motor heating and cooling. The heating time constant and ED work conditions under different classes of duty. 8.3. ED motor rating selection for continuous work duty. 8.4. ED motor rating selection for short-time work duty. 8.5. ED motor rating selection for intermittent periodic work duty. 8.6. Calculation of permissible frequency of starting. 9. Electromagnetic compatibility of the electric drives. 9,1. The standards of the electromagnetic compatibility. 9.2. Electrical filters and principles of gear installation. 10. Summary section. 10,1. Appliance of ED for use in automatic devices and plants. 10,2. Problems for ED appliance.

Financial Technology Solutions	6	To provide knowledge about financial technology solutions for business and develop skills: to analyze the socio-economic impact of financial technology to financial services and financial markets; introduce financial regulation and the ecosystem.	During the course, the methods of financial technologies, the peculiarities of their application and evaluation in practice are analyzed, the ecosystem, regulatory environment, and the principles of money laundering prevention are analyzed.	1. Socio - economic impact of financial technologies. Ethics 1,1. Financial management and planning in the context of digital change 1.2. Dimensions of Fintech Career Change 2. Blockchain technology for finance 2.1. Blockchain technology for financial services and financial markets 2.2. Blockchain, cryptocurrencies, financial decentralization 2.3. Blockchain transformation of financial services 3. Big business data management systems for finance 3,1. The impact of big business data on financial decisions 3.2. Application of big business data analysis in finance 4. Artificial intelligence solutions for finance 4,1. Corporate finance / financial risk management through artificial intelligence 4.2. The impact of artificial intelligence on financial market decisions 5. Regulation. Financial Technology Regulatory Ecosystem. Anti-money Laundering Prevention 6. Fintech ecosystem. Analysis of the development case of Lithuania as a Fintech Hub
Introduction to Applied Chemistry	6	To acquire knowledge about the essence of higher education, study process in the field of chemistry and the specifics of the Applied Chemistry program at the university. To develop abilities to study and general competences, allowing to understand content of studies, career possibilities, requirements of academic literacy. To acquire the minimum of concepts, methods and approaches defining the essence of scientific research. To get acquainted with the structure and peculiarities of the chemistry industry, the range of products, future trends, principles of green chemistry.	Knowledge about higher education and studies essence in the field of chemistry and the specifics of the Applied Chemistry program is acquired. Content of studies is seized. Is possible to understand value of scientific information. Student is introduced to scientific research, career possibilities. Student is capable of preparing study tasks with accordance to requirements. Competences, needed to work in a team and studying individually are nurtured.	1. Philosophy of Higher Education 1,1. Specifics and vision of studying at the university. Differences from learning at school or college. 1.2. KTU academic culture and ethics. 2. Specifics of chemistry field studies 2.1. Content, aims, logic of the study program Applied Chemistry 2.2. Spectrum of chemical activity 2.3. Recent practical areas of chemical activity, trends, achievements, challenges, range of problems to be solved 2.4. Recent research, achievements, developments and perspectives in the field of chemistry 3. Career 3,1. Visits of practitioners to the lecture 3.2. Career days wanted. Career planning. 3.3. CV content. Formation of a portfolio of jobs or competencies 4. Academic writing 4,1. The structure, language and style of academic written works 4.2. Problem, goal, task formulation, argumentation, generalization 4.3. Library. University forms and templates. Citation requirements. 5. Learning to learn competencies 5.1. Organization of learning: setting learning objectives, time planning 5.2. Principles of effective delivery 6. Learning reflection
Quality Management	6	To be able to apply essential knowledge of quality management, quality planning, implementation and evaluation abilities to develop organizations, to solve practical quality problems, analyzing the environment of the organization.	Essential knowledge of quality management and the ability to apply it in the practice of organizations' activities in the development and implementation of quality management systems is acquired, i.e. identify quality management problems and their possible causes, analyze processes and select appropriate problem solving methods.	1. The essence and evolution of quality management 1,1. The essence of quality management 1.2. Evolution of quality management 1.3. The role of quality management in strategic planning 2. Customer orientation and satisfying the stakeholders' needs 3. Continuous quality improvement and problem solving 3,1. Methods of quality continuous improvement 3.2. Quality problems 4. Employee participation 4,1. Employees empowerment 4.2. Team work 5. TQM implementing 5.1. The principles and introduction for TQM implementing 5.2. The stages of TQM implementing 6. Quality management systems and perspectives 6,1. The family of quality management standards 6.2. Non-certifiable quality management systems 6.3. Perspectives of quality management 6.4. Quality management and sustainability
Communication Product Development Project 1	6	To develop the ability to identify relevant problem areas of communication or identify tasks to be addressed, to develop the idea of a product / service in the field of communication and to carry out a preliminary sustainability assessment	The module develops creativity, systemic thinking, teamwork competencies, students are taught to generate and select ideas relevant to the communication specialist's work, to effectively present them, to evaluate sustainability and viability; design thinking is used as main teaching/learning approach.	1. Team building and teamwork principles 1,1. Team building; Role sharing; Decision making models. Team creativity and innovation factors 1.2. Interpersonal competence: Communication Psychology; Motivation; Conflict resolution 1.3. Leadership; Teamwork management; Communication in the group; IT tools for group work organization 1.4. Ethics in working with people: Respect for diversity, tolerance, and non-discrimination 1.5. Ethics and methods of team performance evaluation. Attributes and activities of virtual teams. Team upgrades 2. IDEAS GENERATION AND SELECTION 2.1. Overview of problems or tasks to be addressed in the field of communication 2.2. Generating ideas, brainstorming, creativity technologies 2.3. Analysis of consumer and other interests and expectations, analysis of types and characteristics of communication produc 2.4. Collection, organization and selection of information; Narrowing the problem and choosing ideas / ideas 2.5. Search for optimal solutions 3. Selected ideas SUSTAINABILITY ASSESSMENT 4. Description and pitching of an idea
Food Biochemistry	3	To provide essential knowledge of the digestion, metabolism and biosynthesis of specific food compounds, including their relationship to the environment, technology and nutrition, and to develop the ability to apply knowledge about the location, principles and mechanisms of digestion and metabolism of food ingredients, mechanisms of regulation, metabolic disorders, the role and potential of intestinal microbiome and technological microorganisms.	Essential knowledge of the digestion, metabolism and biosynthesis of food compounds is acquired, including their relationship with the environment, technology and nutrition. The students will be able to apply knowledge of the location of digestion and metabolism of food components in the human or animal body, the uptake of food by microbial cells, the principles and mechanisms of metabolism under aerobic or anaerobic conditions in cells, the mechanisms by which these processes are regulated, the disorders of metabolism, and the role and potential of intestinal microbiome and technological microorganisms.	1. Introduction. The importance of photosynthesis in the food chain. 2. Metabolism of substances and energy in the body and their relationship to the environment 3. Carbohydrate digestion, metabolism, metabolic disorders, the role of the microbiome and technological micro-organisms. 4. Specifics, problems and regulation of lipid digestion and metabolism, synthesis of specific fatty acids. 5. Specifics of protein digestion, metabolism, synthesis, regulation, problems, the role of genetic mechanism. 6. Specifics of cellular energy production by autotrophs and heterotrophs, relevance to sustainability of food resources. 7. The interplay and regulation of metabolic processes, and the potential to alter the properties of a food or organism.
Urban Sociology	6	To develop knowledge about the interaction of human and environment in urban context, the historical formation of cities, theories of urban sociology, and to gain competencies in analysis of social processes of contemporary cities, applying sociological research in the process of urban development planning.	Student will understand the interaction of human and environment in urban context, will have know and understand historical development of cities, will get acquainted with the theories of urban sociology, will be able to analyze social processes of contemporary cities, will get acquainted with applied sociological research in urban developlent and planning and be able to discuss the future perspectives of contemporary cities.	1. Object, preconditions of beginning and meaning of urban sociology 2. The origins and development of cities: historical perspective 2.1. Antique cities 2.2. Roman empire 2.3. Origins of industrial cities 3. Theories of urban sociology 3,1. Ecological trend. Chicago school 3.2. Historical trend. Weber, Simmel 3.3. Socio-psychological trend 4. Social processes of contemporary city 4,1. Global urbanization 4.2. Migration: causes and consequences 4.3. Urban identity, urban culture 5. Problems caused by urbanization 5,1. Criminal situation 5.2. Social classes, marginals 5.3. Environmental condition, transportation 6. Applied sociological research in the process of urban development 7. Vision of future cities
Protective Relaying and Automation of Distributed Generation Systems	6	To teach comprehensive knowledge about protective relaying and automatic devices of distributed generation systems that allow integration renewable sources into power system, become acquainted with requirements, principles, structure and realization means of these devices. The specific aims are: ability to select devices of relay protection and automation for power lines, transformers, generators, motors and distributed generation system (active distribution network) and estimate their influence on reliability and quality of power supply.	Students are taught to understand the purpose and functions of relay protection and automation devices and their role in distributed generation systems (active distribution networks). The knowledge are delivered on specific principles and conditions of operation structure and schematic realization. The abilities are developed in choosing relay protection, automatics and control devices that are applied for power lines, transformers, generators and motors connected to active distribution network. The abilities are strengthened in choosing calculation methods of operation conditions of active distribution networks that are necessary for selection of relay protection and automation devices.	1. Peculiarity of functioning of distributed generation system and the role of relay protection and automation/ 2. Requirements applied to relay protection and automation devices. 3. Relay protection of power lines of distribution networks with different configuration. 4. Relay protection of transformers. 5. Relay protection of non traditional electricity generators (solar collectors, fuel cell et. al.). 6. Relay protection of transmition lines 7. Automatic of power supply sistem 8. Automatics and relay protection of generators and motors. 9. Voltage controllers of transformers. 10. Normal and faulted operating conditions in distributed generation systems and methods of their calculations. 11. Substation control systems 12. Conection protocols and SCADA systems

Building Services Systems	3	To obtain competent about heating, ventilation, water supply and sewage networks, renewable energy systems and their operation and design principles.	The knowledge about engineering systems of the building and surrounding, their destination and functions, also standard requirements are obtained. The ability to select optimal type and structure of heat and water supply, also sewerage nets and systems, to design and complete all elements of the systems is developed. Information about peculiarities of outdoors engineering systems designing, the main normative requirements, used equipment and functions of them is accumulated and reclaimed.	1. WATER SUPPLY AND SEWERAGE 1,1. Buildings water supply and sewage systems, schemes, equipment and materials. 1.2. The building water supply and sewage network design. 1,3. Outdoor water supply and sewage systems, schemes, materials, equipment, water sources, water treatment plants. 2. HEATING SYSTEMS OF THE BUILDINGS, CENTRAL HEATING SUPPLY 2,1. Types of the building heating systems, schemes and installations. 2.2. Building heating load calculation. 2.3. Heat generation systems. Heat distribution in buildings. 2.4. Design of heating system. 2.5. Renewable energy sources. 3. VENTILATION SYSTEMS OF THE BUILDINGS 3,1. Classification of ventilation systems. Equipment and materials for ventilation systems. 3.2. Ventilation systems for various types of buildings. 3.3. The ventilation system facility. 3.4. Design of ventilation system. 3,5. The purpose of air conditioning systems, classification, structure, design steps.
Polymer Materials and Technologies	6	To introduce basic knowledge concerning basic definitions of polymer science and nomenclature; to study different methods of polymer synthesis, physical and chemical properties of polymers; to introduce knowledge concerning degradation and stabilization of polymeric materials as well as polymers in solution and recycling of polymeric waste; to introduce knowledge concerning application of polymers for devices of organic electronics.	Students are taught to understand and be able to explain basic definitions of polymer science, polymer classification and nomenclature, polymer synthesis (addition, step-growth polymerization, copolymerization), reactions of polymers, physical and chemical degradation of polymers, phase and physical states of polymers, the structure of crystalline polymers, properties of polymeric materials, applications of polymeric materials for devices and technologies of organic electronics.	1. Basic definitions of polymers science and nomenclature 2. Radical polymerization 3. Ionic polymerization 4. Step-growth polymerization 5. Copolymerization 6. Reactions of macromolecules 7. Degradation and stabilization of polymers 8. Phase and physical states of polymers 9. The supramolecular structure of crystalline polymers 10. Liquid crystalline polymers 11. Solutions of polymers and their properties 12. Polymer composites 13. Mechanical properties of polymeric materials 14. Dependence of properties of polymers on their structure 15. Recycling of polymeric waste 16. Application of polymeric materials in devices and technologies of organic electronics
Methods of Prototyping	3	To provide knowledge about prototyping methods, to develop practical prototyping skills through different prototyping methods and materials, to implement the culture of recycling, re-using, re-making obsolete objects in prototyping the new ones.	Students will be able to apply different prototyping methods and materials for primary and advanced manufacturing technologies. The practical abilities to mock up and prototype using a mix of prototyping tools and materials - from traditional prototyping tools for wood, cardboard, wax, cement and clay elaboration to the latest 3D printing and CNC technologies supporting the re-invention and re-use of leftovers as new materials is acquired. The manual capability and the re-make, re-use mindset in developing design concepts driven by prototyping is developed; therefore, it is practice-oriented.	1. Introduction to the course 2. Prototypng methods and materials 3. Prototyping with paper, cardboard, foam 4. Prototyping with clay and cement 5. Prototyping with wood 6. Prototyping with metal 7. Produce and prototyping with new types of 'unusual' materials such as enriched plastics, calcium-based biocomphatible ma 8. Combining additive and subtracting prototyping technologies using CNC softwares
Smart Electric Power Systems	6	To give the skills of calculations the balancing of powers and controlling demand in smart electric power system to with a variuos number and power capasity renewable power sources generation units are connncted. To learn the projecting of smart electric system's elements: energy storage units, voltage controllers, reactive power compensators with assessing technical, reliability and quality securing halves. The specific aim is to forecast the amounts of information ware and telecommunication network capacities in smart electric system.	Students are taught to understand the purpose and structure of smart power energetics systems, to calculate power floats and bus voltages using computer aid metods, to design projects of consumers demand controlling and generator connecting to networks schemes, to solve power quality and electromagnetical compatibility problems. The problems of detection and estimating of emergency regimes are solving. The amounts of information equipment and communication networks are calculating.	1. Conception of smart systems and networks 2. Smart energy meters 3. Smart controling of electricity demand 4. Microgrid networks and i'ts control 5. Distance control of power system and comunication systems 6. Electric power system comunication standards 7. Load controlling software and hardware 8. Balancing of renewable energy sources 9. Direct current systems 10. Compensation of reactive power (STATCOM compensation) 11. General schematic of controlling of smart systems 12. Environmental protection
Healthy Lifestyle	6	To provide knowledge about lifestyle interventions, the role of nutrition and physical activity in health, the interaction of a healthy lifestyle with the environment and to develop healthy lifestyle skills.	Achieving knowledge about lifestyle interventions and its changing methods, about nutrition role for health, principles related to metabolism of nutrients and energy expenditure in human organism, food products' values and food nutrition rating principles. Assimilation forms of physical activity in health education techniques, the impact of physical activity influence on body functions and disease prevention. Able to analyze and choose the means to lifestyle interaction with the environment.	1. Introduction. Healthy living conception, composition 2. Theories and methods of lifestyle change 3. Influence of diet and physical activity on lifestyle 4. Forms of physical activity in health education 5. Reasons of irregular posture and health effects 6. Pose. Safe physical exercises and their performance 7. Healthy diet of a physically passive person, nutritional physiology 8. Neuroscience-based nutrition 9. Micronutrients and water as much as our body needs 10. Preventive nutrition and its products 11. Development of memory and attention through active physical activity 12. Health psychology and its influencing factors 13. Ecological education of society 14. Life style interaction with environment 15. Influence of Economical indicator to Health. Health uneven 16. Factors in health-promoting behavior
Technologies for Industrial Design	9	To provide knowledge of the processing, joining and surface coating technologies for metals, plastics, ceramics, composites, and to develop the competences required to select materials and production technologies in relation to product design, function, process cost and circular economy principles.	The knowledge about main processing, joining and finishing technologies for various materials is acquired. The student will be able to select equipment and production methods depending on product design, quality, process cost and environmental impact. The student will be able to describe recycling technologies of materials in order to interpret their environmental impact.	1. INTRODUCTION 1,1. Materials and design 1.2. Advanced metals in product design 1,3. Advanced plastics in product design 1,4. Compositions of materials and their formation 2. METHODS OF MATERIALS SHAPING 2,1. Cut from solid 2.2. Products from sheets 2.3. Continuous products 2.4. Thin and hollow products 2.5. Methods from powder or blank into solid 2.6. Products of complex shape and high dimensional accuracy 2.7. Advanced products processing methods: additive manufacturing 2.8. LEAN management system in the mass production 3. JOINING OF PARTS 3,1. Mechanical fastening 3,2. Adhesion bonding 3,3. Welding processes of materials 4. SURFACE FINISHING OF PRODUCTS 5. PLASTICS RECYCLING 6. LEAN MANAGEMENT SYSTEM IN THE CONTEXT OF MASS PRODUCTION
Testing and Diagnostic Systems	6	To provide knowledge about testing and diagnostic techniques of automotive and electric vehicles electronic systems.	Provides knowledge, necessary to diagnose automotive electronic problems, to use of electrical testing equipment. Students are trained to classify and evaluate measurement methods, errors of measurement instruments and realibility of measurement systems. Learning the main electronic testing systems functions, operating techniques and features, testing of algorithms, programs and infomation systems, testing models of electronic systems, test design and coordination. Taught to identify maintenance problems, use of service and diagnostics technique and equipment.	1. Introduction to the module, terminology, information sources 2. Vehicle Technical Information Systems 3. Diagnostic Concepts and Equipment 4. OBD II, EOBD Self-Diagnostics Systems 5. Vehicle Data Interfaces 6. Powertrain control module systems diagnostic 7. Powertrain control module programming and chiptunning
Technology of Wind and Hydro Energetics	6	To provide students with knowledge about the use of wind energy and the connection of wind farms to electricity grids and to assess the conditions of electricity quality.	The students are taught to understand the purpose and structure of wind and hydro stations using, to select wind and hydro stations types, to calcute the amounts of electricity, power floats and bus voltages, to design projects of wind and hydro stations connecting networks, to solve power quality and electromagnetical compatibility problems.	1. Penetrate ofwind energy 2. Constructions of wind stations 3. The metering and forecasting of wind energy 4. Protection from lightning 5. Parameters of electrical networks 6. Parameters of electrical substantions 7. Fundamentals of electrical network calculations 8. Influence of wind stations to electrical networks 9. Storages of electrical energy 10. Calculations of voltage quality 11. Profitability of wind stations 12. Smart grids 13. Hydro power plant review and development 14. Constructions of hydro stations 15. Power and energy calculation of hydro power plants 16. Profitability of hydro stations

Psychology of Groups and Effective Teamwork	6	To provide fundamental knowledge of team work and to teach skills to apply it in practice.	Students will have acquired the essential knowledge of team activity and the process of negotiation and are able to put it into practice. They know and to understand the differences of group and team work, the stages of team formation and the elements, which influence efficiency of team and group work. They understand the factors of psychological harmony and are able to improve psychological climate of a team; understand peculiarities of individual and team decisions and are able to apply various techniques of team decision making.	1. Conception of a team. 1,1. Group and team. 1.2. The norms and values of a team. 1,3. The functions of a team. 1,4. The stages of team formation. 1,5. The roles of team members. 2. Progress of team work and psychological harmony of a team. 2,1. Criteria of an effective team. 2.2. Orientation into a task, an individual and/or a team. 2,3. Functional, psychophysiologic, psychological and social-psychological compatibility. 2.4. Psychological climate. 3. Psychological factors of team work. 3,1. Social loaf. 3,2. Social facilitation. 3,3. The change of opinion and the effect of polarization. 4. Decisions of a team. 4,1. Team and individual decisions. 4.2. Phenomenon of group thinking. 4,3. The techniques of team decision making. 5. The problem of the evaluation of team work efficiency.
Building Physics	6	To know physics processes related with construction and exploitation of buildings. To take the knowledge to design and build energy effective, healthy and comfort buildings.	Students are introduced to the basic physical processes operating to the building from outside, to the building envelope and indoor, that is, the climate effects on buildings, physical properties of building envelopes and requirements for building indoor climate. Students know to calculate the thermal properties of building envelopes and needs of thermal energy for building. Introducing energy-efficient buildings design requirements. Taught to perform the calculation of moisture behavior of building envelops. Provide a basic knowledge of building acoustics and light technical laws.	1. Object of building physics 2. Climate and it's components 3. Indoor climate 4. Thermal physics object. Thermal energy, temperature, heat transfer, air humidity 5. Thermal and moisture properties of building materials and products 6. Calculations of building envelopes physical parameters 7. Not stationary physical processes of the building envelope 8. Requirements for the energy efficiency buildings design 9. Basics of building illumination 10. Sound physical indicators 11. Principles of room design taking into account acoustic requirements 12. Noise reduction techniques in and around buildings
Building Physics	3	To know physics processes related with construction and exploitation of buildings. To take the knowledge to design and build energy effective, healthy and comfort buildings.	Students are introduced to the basic physical processes operating to the building from outside, to the building envelope and indoor, that is, the climate effects on buildings, physical properties of building envelopes and requirements for building indoor climate. Students know to calculate the thermal properties of building envelopes and needs of thermal energy for building. Introducing energy-efficient buildings design requirements. Taught to perform the calculation of moisture behavior of building envelops. Provide a basic knowledge of building acoustics and light technical laws.	1. Object of building physics 2. Climate and microclimate. 3. Heat as energy. Temperature. Heat transfer. Air humidity 4. Thermal and moisture properties of building materials 5. Calculation of physical parameters of building (envelope) elements 6. Moisture behavior of building envelope. Unstable heat transfer 7. Requirements for thermal insulation of building (envelope) elements. 8. Basics of building acoustic 9. Basics of building illumination
Refrigeration and Air Conditioning	6	To acquire basic knowledge about refrigeration and air conditioning technique, the main methods for getting low temperatures, to be able to describe the main refrigerating and heating methods, to be able to analyse air handling processes and methods, refrigeration and air conditioning systems and cycles	Students are acquired the knowledge about operation of refrigeration and air conditioning equipment, methods for getting low temperatures, thermodynamic processes and reverse cycles, about refrigerants and main equipment. Students are able to calculate and analyse refrigeration cycle, to estimate global warming effect of refrigerants, to analyse air conditioning processes, to estimate ecological and energy saving problems	1. Fundamentals of refrigeration and air conditioning 1,1. Historical overview 1.2. Methods of reaching low temperatures 1,3. Refrigerants: designation, classification, handling and fluorinated substances 1,4. Environmental problems and regulation of refrigeration and air conditioning technique 2. Refrigeration: types, cycles, equipment and systems 2.1. Gas compression equipment (air cycle) 2.2. Vapour compression refrigeration equipment and cycles 2.3. Compressors, heat exchanges and auxiliary equipment 2.4. Alternative refrigeration equipment 2.5. Efficiency analysis of refrigeration and heat pump cycle 2.6. Fundamentals of cold load calculation 2.7. Principles of automation and control 3. Basics of air conditioning 3,1. Processes of change of humid air state 3.2. Air conditioning systems and equipment 3.3. Heating systems and appliances 3,4. Thermal processes of ventilation systems
Fundamentals of Refrigeration	6	To acquire knowledge about refrigeration technique, the main methods for getting low temperatures, the main types of refrigerating, refrigeration systems and cycles.	Students are accuired the knowledge about operation of refrigeration equipment, methods for getting low temperatures, thermodynamic processes and reverse cycles, about refrigerants and main equipment. Students are able to calculate and analyse refrigeration cycle, to estimate properties of refrigerants from diagrams and tables, to estimate global warming effect of refrigerants.	1. Theoretical fundamentals of refrigeration 1,1. Historical review 1.2. Thermodynamics of refrigeration 1,3. Methods for getting low temperatures 1,4. Refrigerants - designation and classification 1,5. Refrigeration environmental problems 2. Refrigeration technique: types, cycles, equipment, design 2,1. Gas compression refrigeration (Air cycle) 2.2. Vapour compression refrigeration 2.3. Compressors, heat exchangers, auxiliary equipment 2.4. Alternative refrigeration 2.5. Heat pumps 2.6. Efficiency analysis of refrigeration cycle 2.7. Basic of refrigeration load calculations 2.8. Fundamentals of automation and control
Architectonic Development 2	12	To deepen the theoretical knowledge and practical skills in the design of public buildings, to be able to capture the essential aspects of the object: the need for function, aesthetics, context, etc.	Architectonic development 2 research the architecture, forms, constructions and functional relationships of monofunctional public buildings. The design of a public building project combines the knowledge and skills of architectural design, landscape design and graphic design. The architectural solutions that are generated during this course are based on the pre-project research, which seeks to clarify not only the needs of consumers, but also the context of the environment (natural, engineering, cultural heritage, transport, etc.).	1. Architectural building design 1,1. Architectural and functional scheme analysis of building analogues. Identification of the problems 1.2. Preparation of project concept 1,3. Building functional scheme design 1,4. Search of the building shape and plan solutions 1,5. Preparation of the final design of the building and its environment 2. Modeling the building's environment 2.1. Analysis of the current state of the area and its environment 2.2. Plot design. The concept of dendrology 2.3. Plot design. Assortment of decorative plants, plant properties that are important for design. 2.4. Plot design. Plant ecology 2.5. General principles of creating public spaces 2.6. Formation of public space by dendrological means 3. Preparation the final project 3,1. Search of graphic expression for a building project: options for graphic presentation of a technical part 3.2. Portfolio preparation: compositional differences in the presentation of intermediate-sketch and final versions 3.3. Graphic expression trends, fashion. Peculiarities of the portfolio of architectural design. 3.4. Portfolio preparation technical details and tools.
Self-Contained Power Supply Systems and Equipment	6	To take an extended knowledge about self-contained power supply systems, to asquire knowledge about processes occurred in self-contained power systems, and effective power generation in such systems.	Characteristic of self-contained power supply systems. Self-contained power generating sources. Isolated power systems. Power supply systems for electrical vehicles. Integration of renewables. Use of energy accumulating equipment. Hybrid power stations in isolated systems. Stability problems of self-contained power supply systems. Frequency and voltage control. Voltage quality. AC and DC power supply systems. Effective generation of electrical power. Reliability problems of power supply.	1. Introduction. Basics of power systems 2. Peculiarities of microgrids and fields of their application 3. Technological processes and characteristics of small capacity power plants 4. Fuel cells and their energy characteristics 5. Energy storage systems 6. Backup and uninterruptible power supply systems 7. Static and dynamic characteristics of load 8. Stability of induction motor 8,1. Power characteristic of induction motor 8,2. Criterious of induction motor steady state stability 8,3. Stability of induction motor in small capacity power system 8,4. Transient stability of induction motor 8,5. Starting and selfstarting of induction motors 9. Stability of power systems 9,1. Active power characteristic of the simplest power system 9.2. Steady state stability of synchronous generator. Criterions of steady state stability 9,3. Transient stability of power system 10. Power quality characteristics 11. Voltage and frequency control
General Chemistry	6	To get students acquainted with the main chemistry laws, chemical and electrochemical processes, chemical compounds and the chemical properties of the most important technical materials, to develop the skills to solve chemical problems and independently perform chemical experiments, to provide the necessary competencies for the application of general chemistry knowledge in specialty disciplines and various technical fields.	Knowledge about the structure of matter, thermodynamics and kinetics of chemical processes is acquired. Ability to understand properties of solutions and other dispersed systems is gained. Ability to solve water softening, purification, disinfection, and some ecological problems is developed. Knowledge about redox processes in electrochemistry and functioning principles of chemical sources of electricity is acquired. Knowledge about the reasons of metal corrosion and its types is acquired. Ability to apply the effective methods of protection against corrosion is gained. Knowledge about fuel, biofuel and technically important materials is obtained.	1. General chemistry 1,1. Introduction, nomenclature of chemical compounds 1.2. Structure and properties of compounds 1,3. Thermodinamics of chemical processes 1.4. Chemical kinetics and equilibrium 1,5. Solutions and other dispersed systems 2. Technical chemistry 2,1. Chemistry of water, fuel and biofuel, problems of environment protection 2.2. Oxidation-reduction processes, 2,3. Electrochemical processes, potential of metals 2.4. Galvanic cells 2.5. Electrochemical sources of current, electrolysis. 2.6. Corrosion of metals 2.7. Protection against corrosion 2.8. Chemistry of main technical compounds 2.9. Polymers

General Chemical Technology	6	To acquire knowledge about chemical technology and chemical production, to understand the structure of production and to be able to choose suitable methods of preparation of raw materials and intensification of chemical technological processes.	Essential knowledge about chemical technology and chemical production structure are acquired. The students will be able to apply this knowledge to the design of production of a new certain chemical products, i.e. to draw up the model of technological process, properly select raw materials and methods of its preparation, to choose rational methods of intensification of homogeneous, heterogeneous, catalysis processes and analyse the ideal and industrial reactors suitability for a particular chemical process. The processing of fuel (solid, liquid, gas), the production technology of main chemical products and the basis of industrial ecology are learned.	1. Chemical technology and chemical production 1,1. The structure of chemical production 1.2. The main indexis of chemical production 1,3. Components of chemical production. Raw materials (including water) and their treatment. Industrial energy. 1,4. The models of chemical production and the types of technological streams 2. The main principles of chemical technological processes and the ways of their intensification 2,1. Homogeneous and heterogeneous processes 2.2. Catalysis 2.3. The main characteristics of industrial reactors. Ideal reactors 3. The chemical technology of main products and elements of industrial ecology 3.1. The methods of conversion of fuel (solid, liquid, gas) 3.2. The main properties, mode of production, using spheres or sulfuric acid 3.3. The main properties, mode of production, using spheres of ammonia 3.4. The main properties, mode of production, using spheres of nitric acid 3.5. The main properties, mode of production, using spheres of methanol 3.6. The main properties, mode of production, using spheres of ethanol 3.7. The binding properties and modes of production of Portland cement 3.8. The technological methods of industrial waste materials decrease. Conversion of solid, liquid, gas waste materials
Biomedical Polymers	6	To give the knowledge on the production, properties and application of biomedical polymers and the correlation between the properties and application of biomedical polymers.	The students get knowledge on the requirements for biomedical polymers, their biocompatibility and safety, the understanding of biodegradation processes of biomedical polymers, the comprehensive knowledge of production, properties and application of synthetic, biodegradable and natural polymers, the understanding of the preparation and application of biomedical polymer composites and the order of design and standardization of new biomedical polymers. The students get knowledge how to prepare and select the polymers for the target application in medicine.	1. Classification of biomedical polymers and the main concepts 2. Requirements for biomedical polymers 3. Mechanical and physical properties of biomedicla polymers 4. Sterilization 5. Biocompatibility 6. Biodegradation of biopolymers 7. Synthesis and properties of synthetic polymers and their application in medicine 8. Production and properties of biodegradable polymers and their application in medicine 9. Productions and properties of biopolymers and their application in medicine 10. Biomedical polymer composites 11. The order of the design and standardization of new biomedical polymers
Bioproducts	9	To gain knowledge about the sources of bioproducts, methods of obtainment, isolation and purification, and their regulatory requirements.	To present the concept and principles of modern industrial biotechnology. To provide knowledge about production methods, applied modern biotechnologies and processes of industrial bioproducts, raw materials and renewable resources as future perspectives. To deepen knowledge about the use of produced bioorganic materials and chemicals in various industries and energetics. To introduce strategies of bioprocesses, ecologically cleaner technologies, to discuss about reduction possibilities of resource, production waste and costs.	1. Introduction. Renewable resources - future prospects. 2. Bioeconomy. White biotechnology and green chemistry concept. 3. Biomass, bioorganic materials, bioproducts. 4. Biomass pretreatment methods. 5. Bio- and chemo-strategy of processes. Advantages and disadvantages. 5.1. Processes of catalysis and biocatalysis. Application of microorganisms. 5.2. Particularities of the fermentation process. Production of enzymes and modified proteins. 6. Methods for purification of intermediates, compounds and final materials. 7. Organic acids - synthesis and biosynthesis, costs of production. 8. Production of organic solvents and chemicals using chemical and biotechnological methods. 9. High value-added products. Raw materials, production, technologies, purification. 10. Biofuels and bioenergy. Basics of production. 11. Production control and safety requirements of bioproducts.
Organization of Occupational Safety and Health	3	To provide knowledge about the theoretical foundations of the organization and assurance of work safety and health and to develop the ability to practically apply knowledge in the planning, implementation and operation of construction projects.	Knowledge of worker safety and health requirements, mandatory documents and established procedures at the construction site is acquired. An understanding of OSH legislation, ISO quality standards, and their application in the construction organization is gained. It is learned to organize construction waste management. Able to make rational decisions regarding worker safety and health, from an environmental point of view, to carry out construction projects taking into account the aspects of sustainable safety and impact on people.	1. Occupational safety and health aspects 2. Occupational health and safety legal regulation in the construction sector 3. Structural, technological and security solution synthesis 4. General and special requirements for the installation of workplaces at the construction site 5. Ensuring environmental solutions in construction work 6. Social dialogue in the enterprise by providing safe and healthy working conditions 7. Accidents and occupational disease study 8. Sustainable Construction Safety Modeling and continuous improvement
Electric Drives	6	Acquire knowledge of the basic elements and their systems, operation and design principles of electric drives.	Learning to understand the mechanics of electric drive (drive structure and static and dynamics of mechanical systems), static, dynamics and control of DC, AC and step-by-step drives, and the adjustment of the speed of the systems "engine" (open and closed systems). The ability to compose the electric drive load diagrams, selected or designed according to the requirements of the technological process. to be developed in electric drive with efficiency, reliability and environmental friendly.	1. Introduction - the main conception 1,1. Conception of electric drive (ED) and history of development 1.2. Functions and struction of ED 1,3. Tendencies of ED development 2. Operating modes of electric drives and their characteristics 2.1. Operating modes and energy distribution of electric drives. 2.2. Peculiarities of mechanical characteristics of DC drives in motor and brake modes. 2.3. Peculiarities of mechanical characteristics of AC drives in motor and brake modes. 3. Control equipment for DC electric drives 3.1. Semiconductor elements in electric drives 3.2. DC drive based on a single-phase rectifier 3.3. DC drive based on a three-phase rectifier 3.4. Rectifier-based drive operation in inversion (regenerative braking) mode 3.5. Four-quadrant drive on a rectifier basis 3.6. Interaction of rectifier-based drives with the power distribution lines 3.7. DC drive based on a pulse converter 4. Control equipment for AC electric drives 4,1. Equipment for speed regulation by changing the number of pole pairs 4.2. Equipment for impulse adjustment of rotor resistance 4.3. Speed regulation by changing the stator winding voltage and equipment for this purpose 4,4. Single-phase half-bridge frequency converter with intermediate DC circuit 4,5. Single-phase full-bridge frequency converter with DC intermediate circuit 4,6. Three-phase frequency converter with intermediate direct current circuit 4,7. AC drives based on multilevel converters 4.8. AC drives based on matrix converters 4.9. AC drives based on cycloconverter 5. Electronic switches in electric drives 5,1. Electronic switches based on a bipolar transistor 5.2. Electronic switches based on the MOSFET transistor 5,3. Electronic switches based on the IGBT transistor 5,4. Unidirectional and bidirectional electronic switches 5,5. Selection of components for electronic switches of electric drives 6. Closed-loop electric drive control systems 6.1. Closed-loop DC drive control systems 6.2. Closed loop AC drive control systems
Electric Power Systems and Microgrids	6	To provide students with knowledge about the structure of electrical systems, the use of energy resources and electricity consumption as well as generation balancing, electrical system voltage regulation and control of power flows in normal and post-emergency states, to form the abilities to calculate the best commitment of gererators and regimes of direct current lines.	Knowledge acquired about the properties of power systems. Formed ability to perform the analysis of frecuency deviations and powers balansing, to calculate levels of system voltages and angles of electronical devices of direct current lines, and to evaluate the influence of energetics to the environment.	1. The structure of power systems 2. The controling of active power balance 3. Control of the system frequency 4. The reactive power balance 5. The selecting of compensation devices 6. The controlling of voltages state 7. Direct current inserts and power lines 9. Control of back to back inverter 10. Power system stability 11. The influence of distributed generation 12. Microgrids and their control 13. The influence of enegetics to environment
Electrical Materials and Measurements	6	To provide knowledge abaut electrical materials and electrical measurements. To develop competence, skills necessary for required in the selection of electrotechnical materials and methods of electrical measurements.	The students are taught to understand the structure and classification of electrical materials, their general electric and magnetic properties, to know their main parameters and characteristics, to evaluate the state of electrical materials under the impact of environmental conditions, to know techniques, methods and equipment for measuring electric and magnetic parameters, to use measurements data acquisition systems, to know how to choose electrical materials and devices of electrical measurements depending on environmental and exploitation conditions.	1. Preface. Classification of electrical materials, the problems of materials analysis. 2. General electric and magnetic properties of materials. 3. Methods of materials analysis. 4. Dielectrical materials, their properties, phenomena, aplication. 5. Conducting materials, their properties, phenomena, aplication. 6. Semiconductors materials, properties, phenomena, aplication. 7. Magnetic materials, their properties, phenomena, aplication. 8. Superconductors, liquid crystals. 9. Charakteristics of electrical measurements insrumentations, errors. 10. Electromechanical measurements instrumentation. 11. Methods and insrumentation of voltage and current measurement. 12. Frequency, time period and phase shift measurement. 13. Measurement of power, energy and power factor. 14. Measurement of parameters of electrical materials with bridges and using compensation methods. 15. Measurment of resistances of electrical materials 16. Measurement of magnetic parameters of electrical materials. 17. Measurements with osciloscopes. 18. Measurements data acquisition systems and smart meters

Electrical Materials and Measurements	3	Provide in-depth knowledge of the classifications and structures of electrical materials, methods of electrical measurements and the ability to understand phenomena occurring in electrical equipment and the principles of electrical measurements	Knowledge of the structures of electrical engineering materials, their general electrical and magnetic properties is acquired, and the basic electrical parameters and characteristics of electrical materials are absorbed. The capacity to determine the status of electrical engineering materials shall be developed by assessing the effects of the environment. Allowance for the testing of electrical and magnetic properties, the selection of measurement methods and instruments, the classification of electrical materials, the general characteristics of their groups and automated measurement systems.	1. Preface. Classification of electrical materials, the problems of materials analysis 2. Charakteristics of electrical measurements insrumentations, errors 3. Electromechanical measurements instrumentation 4. Measurment of resistances of electrical materials 5. Measurement of parameters of electrical materials with bridges and using compensation methods 6. General electric and magnetic properties of materials 7. Methods of materials analysis 8. Dielectrical materials, their properties, phenomena, aplication 9. Conducting materials, their properties, phenomena, aplication 10. Superconductors, liquid crystals 11. Semiconductors materials, properties, phenomena, aplication 12. Magnetic materials, their properties, phenomena, aplication 13. Methods and insrumentation of voltage and current measurement 14. Frequency, time period and phase shift measurement 15. Measurement of power, energy and power factor 16. Measurement of magnetic parameters of electrical materials 17. Measurements with osciloscopes 18. Measurements data acquisition systems and smart meters
Fire Safety	3	To give with the leading trends of fires, buildings fire safety demands, to select building materials after the most resistance to fire.	Building construction, technical clasification of building and construction rate of fires. Fire prevention requirements for public, industrial, dwelling, farm houses. Normative technical documentation of fire safety. Construction methods for determining the flammability of products, flammability classification system. Organic and inorganic building materials and products essential characteristics and use. Construction products in buildings fire safety general principles. Ensuring the sustainability of building materials, their effective use.	1. Documents regulating the fire safety in building 2. Fundamental fire prevention demands for construction 3. Fire technical classification of building production and structures 4. The requirements for fire spread limiting 5. The security of safe evacuation of people from building 6. The fire prevention demands for social constructions 7. The fire prevention demonds for industrial and depot repository constructions 8. The fire prevention demands for living constructions 9. The fire prevention demands for outhouse constructions 10. The premises smoke removal systems 11. The automation of constructions and premises 12. Fire water supply 13. The fire prevention demands for heating systems 14. The lightning protection for constructions and premises
Fire Safety	3	To give with the leading trends of fires, buildings fire safety demands, to select building materials after the most resistance to fire.	Building construction, technical clasification of building and construction rate of fires. Fire prevention requirements for public, industrial, dwelling, farm houses. Normative technical documentation of fire safety. Construction methods for determining the flammability of products, flammability classification system. Organic and inorganic building materials and products essential characteristics and use. Construction products in buildings fire safety general principles. Ensuring the sustainability of building materials, their effective use.	1. Documents regulating the fire safety in building 2. Fire technical classification of building production and structures 3. The requirements for fire spread limiting 4. The security of safe evacuation of people from building 5. The fire prevention demands for social constructions 6. The fire prevention demonds for industrial and depot repository constructions 7. The fire prevention demands for living constructions 8. The automation of constructions and premises 9. Fire water supply 10. The fire prevention demands for heating systems 11. The lightning protection for constructions and premises
Product Aesthetics	6	Acquiring technological sciences inherent aesthetics of science and engineering knowledge of psychology projected needs of the product development process.	The course provides knowledge about historical development of engineering aesthetics, products and their environmental characteristics, principles of composition, ergonomics and bionics and decorative elements and principles of colors usage, importance of of object illumination and aesthetics meaning of products in variuos groups society.	1. Review of histirical aspects of Engineering Aesthetics 2. Esthetics' dimensions of engineer-artists G.Patackas and A.Palevičius in their art creations 3. Composition principles of product 4. Ergonomics and antropometrics 5. Bionics 6. Product color and interaction with environment 7. Product texture and facture 8. Light, color and illumination in product design 9. Design applications of sensory perception 10. Design for Safety and Efficiency 11. Modern industrial design 12. New product development concepts 13. Sustainable design
Natural and Synthetic Polymers Technologies	6	To provide knowledge of main polymer types, properties, moulding technologies and to develop the competences needed to select materials and manufacturing methods for a product, taking into account product design, performance requirements and process costs.	The knowledge of biopolymers and synthetic polymers technology, polymer types and properties, the equipment and main moulding methods is acquired. The student will be able to select methods for the manufacture of polymer products depending on the shape, cost and environmental impact of the product. General knowledge of the recycling of plastic waste is acquired.	1. POLYMERS IN THE SUSTAINABLE DEVELOPMENT CONTEXT 2. POLYMERS SRUCTURE, TYPES, PROPERTIES AND APPLICATION 2.1. Biopolymers: natural, synthetic, microbial 2.2. Natural and synthetic rubbers 2.3. Synthetic polymers - thermoplastics and thermosets 2.4. Natural and synthetic fibres 2.5. Properties of polymer 3. MOULDING METHODS OF POLYMERS 3.1. Additive manufacturing with plastics 3.2. Polymers melts moulding 3.3. Thermoforming of plastic sheets 3.4. Polymer powder, dispersion and solution processes 3.5. Peculiarities of thermoplastics and thermosets moulding 3.6. Methods of manufacture of synthetic fibres 3.7. Fundamentals of paper engineering 3.8. Polymer matrix composites and methods for their manufacture 4. RECYCLING AND SECONDARY USE OF NATURAL AND SYNTHETIC POLYMER WASTE
Hydraulic Structures	6	To get knowledge on purposes and basic design principles of hydraulic structures. To develop the ability to collect and evaluate the required data or to perform the necessary research for the design of the dam, embankment, channel and other hydraulic structure or equipment.	Students are taught to understand the purposes and basic design principles of hydraulic structures. Students should be able to collect and evaluate the required data, to perform the necessary research, to design the dam, the embankment, the channel and another hydraulic structure and equipment in compliance with requirements defined in legal documents and provide for operating conditions. Students should be able to identify and evaluate the interaction of hydraulic structures and the environment.	1. Introduction to hydrology. Purposes and Types of Hydraulic Structures 2. Dams 2.1. Earth Dams. 2.2. Concrete Dams. 2.3. Dams from Other Materials. 2.4. Spilways. Watergates. 3. River engineering 3.1. Channels. 3.2. River Shipping. 3.3. Ponds. 3.4. Sluices. 3.5. Pump stations. 3.6. Hydropower Stations. 4. Hydraulic Structures for Fishery 5. Marine Hydraulic Structures 6. Interaction of Hydraulic Structures and Environment
Innovative Materials	3	To get acquainted with the prospects and challenges related to the development of advanced building materials and application.	Acquires knowledge of the latest building materials and technologies integrated into residential or commercial building infrastructures to make them smarter, more sustainable, and efficient. Structural solutions are discussed by evaluating the advantages of innovative materials.	1. Legal regulation - the EU's regulatory environment 2. Smart and innovative building materials are being classification 3. Reducing CO2 emissions by building materials and articles 4. Building materials and photovoltaic systems 5. Intelligent (Hi Tech) thermal insulation materials, coatings and systems 6. Innovative (smart) concrete, specific building blends 7. Environmental Friendly (Eco Friendly) Building Materials 8. Hybrid construction materials 9. Materials for passive fire protection systems 10. Spray coating (elastomeric waterproofing, diffusion, hydrophobic) 11. Application of nanotechnology in the construction industry
Innovative Building Materials and Products	6	To acquire knowledge about the development of advanced building materials, their properties, the main methods of use, equipment and technologies. To analyze the prospects and challenges related to the application of innovative construction materials and products in practice.	The knowledge about the latest building materials and technologies integrated into residential or commercial building infrastructures to make them smarter, more sustainable and effective. Considered design solutions assessing the benefits of innovative materials.	1. Legal regulation - the EU's regulatory environment 2. Smart and innovative building materials are being classification 3. Reducing CO2 emissions by building materials and articles 4. Building materials and photovoltaic systems 5. Intelligent (Hi Tech) thermal insulation materials, coatings and systems 6. Innovative (smart) concrete, specific building blends 7. Environmental Friendly (Eco Friendly) Building Materials 8. Hybrid construction materials 9. Materials for passive fire protection systems 10. Spray coating (elastomeric waterproofing, diffusion, hydrophobic) 11. Application of nanotechnology in the construction industry
Smart Electrical Systems of Buildings	3	To acquire knowledge about new smart electrical energy systems and technologies used in various buildings	The basic knowledge of electrotechnical engineering is provided for students studying non electrical energy subjects. The knowledge gained during studies of smart energy systems and the equipment used in a variety of buildings and their application possibilities in household or energy systems, internal and external lighting and it's selection options. Students are able to understand the application of renewable energy sources, to choose a place for renewable energy systems, lightning protection systems, electric vehicle charging stations and other smart electrical equipment, which are necessary for construction, installation and reliable operation of these systems	1. Introduction 2. Buildings and their classification 3. Categories, groups and characteristics of electrical consumers 4. Sources of distributed generation (renewable systems) and storage systems of electrical energy 4.1. Solar power station 4.2. Wind power station 4.3. Storage systems 5. Electrical vehicle and their charging stations 6. Schemes and equipment of electrical supply (electrical network schemes to 1000V) 6.1. Installation of electrical equipment 6.2. Room and territory required for operation of electrical equipment 7. Protective measures 7.1. Protection from electrical discharge 7.2. Lightning protection 8. Smart grid systems and their installation requirements 9. Lighting systems and their requirements

Smart Electrical Systems of Buildings	6	To acquire knowledge about new smart electrical energy systems and technologies used in various buildings	The basic knowledge of electrotechnical engineering is depened for students studying non electrical energy subjects. The knowledge gained during studies of smart energy systems and the equipment used in a variety of buildings and their application possibilities in household or industry. Students are able to understand the application of renewable energy sources, to choose protection equipment from current discharge, internal overvoltages, lightning protection systems. The knowledge gained during studies of smart electrical systems, what electric vehicle charging stations, wireless electrical equipment management and other smart new electrical equipment	1. Introduction into electrical engineering 2. DC and AC power networks 3. Categories, groups and characteristics of electrical consumers 4. Sources of distributed generation (renewable systems) and storage systems of electrical energy 5. Schemes and equipment of electrical supply (electrical network schemes to 1000V) 6. Electrical vehicle and their charging stations 7. Protective devices from internal and external overvoltage (lightning protection) 8. Smart grid systems and their installation requirements
Fuel Cells and Electrochemical Energy Storage Devices	6	To acquire the basic knowledge of operating principles, design features, use in electric power generation, accumulation and supply of the various fuel cells and electrochemical energy storage devices.	Knowledge about diversity and construction characteristics of different types of fuel cells and electrochemical energy storage devices and their application in the various areas of technique, domestic, and power systems is acquired.Ability to understand operating principles and electrochemical processes taking place in the different types of fuel cells and electrochemical energy storage devices is gained.Knowledge how to calculate parameters of different types of fuel cells and electrochemical energy storage devices is obtained.Knowledge about technologies of fuel cells and electrochemical energy storage devices applicable in various fields and their impact on the environment is assimilated.	1. Fuel cells 1,1. The basics of fuel cells 1.2. Operation of fuel cells 1,3. Advantages and disadvantages of fuel cells 1,4. Types of fuel cells 1,5. Fuel cell technology 1,6. Fuel used in fuel cells 1,7. Fuel cells and the environment 2. Electrochemical energy storage devices 2,1. The basics of electrochemical processes 2.2. Types of electrochemical energy storage devices and the processes in them 2.3. The main characteristics and parameters of electrochemical energy storage devices 2.4. Advantages and disadvantages of various types of electrochemical energy storage devices 2.5. Electrochemical energy storage devices and environmental protection 3. Use of fuel cells and electrochemical energy storage devices 3,1. The systems with fuel cells 3.2. Operation of electrochemical energy storage devices in the system 3.3. Hybrid systems 3.4. Operating characteristics of the hybrid system 3.5. Economical evaluation of the hybrid system
Monolithic and Masonry Construction Technologies	6	To acquire knowledge and practical skills in the field of construction technologies of concrete monolithic and masonry structures.	It provides a general knowledge of monolithic and masonry structures, their installation technologies, technical solutions, and their selection features. Students are able to select the appropriate technology and organization of construction works for the installation of relevant monolithic and masonry structures, apply modern construction techniques and equipment in the construction process, ensure the quality and safety of works, and take into account the sustainable use of natural resources.	1. The role of monolithic and masonry structures in modern construction 2. General requirements for concrete and masonry mixtures 3. Transportation, placement and compaction of the concrete mix 4. General requirements for reinforcement 5. Installation and positioning of reinforcement and fixing in formwork 6. General requirements for formwork 7. Formwork systems for various types of structures 8. Concreting various types of monolithic structures 9. Concreting and bricklaying in cold and hot weather, maintenance 10. Masonry from bricks 11. Masonry from blocks 12. Shotcrete concreting 13. 3D concrete printing technology 14. Quality control of concrete and masonry works 15. Safety in the installation of monolithic and masonry structures
Packaging Materials and Technologies	3	To provide knowledge about packaging materials and technologies and to develop the necessary competencies for their application in the food industry	Essential knowledge of packaging materials, their purpose and classification,food packaging (glass, metal, paper, plastic and composite), packaging technologies (processes) and packaging closure is acquired. Able to apply innovative and sustainable packaging in different areas of the food industry.	1. Introduction to packaging materials and technologies 2. Purpose of packaging materials and their classification 3. Packaging technologies (processes) and their classification 4. Glass food packaging and their production technologies 5. Metal (aluminum) food packaging and their production technologies 6. Paper (cardboard) food packaging and their production technologies 7. Plastic food packaging and their production technologies 8. Packaging closure 9. Innovative packaging and its application in the food industry 10. Sustainable packaging materials and their application in the food industry
Operation and Renovation of Building Services Systems	6	Acquire knowledge on the operation of building services systems, their durability, monitoring, and management. Develop skills to plan the renovation and reconstruction of services systems in accordance with applicable standards, solve hydraulic and aerodynamic system balancing tasks, evaluate changes in system loads and performance, as well as economic indicators.	This course is aimed at developing skills to solve renovation and modernization tasks of buildings and their services systems. The service life of these systems is significantly shorter than that of buildings themselves, therefore, for sustainable development, existing buildings must be renovated to ensure compliance with the latest standards. The study module focuses on heating, ventilation, air conditioning, water supply and wastewater disposal systems, as well as the integration of renewable energy sources. It introduces building management (BMS) systems and the concept of digital twins.	1. Operation and maintenance of building services systems 2. Depreciation of services systems and renovation strategy 3. Maintenance and retrofitting of heating, ventilation and air conditioning systems 4. Maintenance and retrofitting of water supply and wastewater disposal systems 5. Deep renovation and integration of renewables 6. Selection of renovation scenarios and feasibility analysis
Polymer Chemistry	6	To introduce knowledge on basic definitions of polymer science and nomenclature of polymers, methods of synthesis, physical and chemical properties of polymers and their solutions, methods of stabilization and processing.	The basic definitions. Polymer classification and nomenclature. Synthesis of monomers. Polymer synthesis. Chain growth polymerization (radical, anionic, cationic). Step-growth polymerization (polycondensation, polyaddition). Copolymerization. Copolymer equation. Influence of different factors on monomer reactivity ratios. Reactions of polymers, their calssifications, physical and chemical degradation of polymers. Flexibility of macromolecules. Phase, aggregation and physical states of polymers. The structure of crystalline polymers. Polymers in solution. Properties of polymers. Polymer recycling.	1. Basic definitions of polymer science and nomenclature 2. Methods of the synthesis of monomers and polymers 3. Step-growth polymerizations 4. Chain-growth polymerization 5. Ionic and coordination polymerizations 6. Synthesis of copolymers 7. Isomerism of polymers. Reactions of macromolecules and stabilization of polymers 8. Morphology of polymers 9. Additives of polymers. Liquid crystalline polymers 10. Solutions and blends of polymers. Rheology of polymers 11. Mechanical properties of polymers. Structure-properties relationship 12. Recycling of polymers 13. Electroactive polymers and molecular glasses
Regional Economics	6	To understand the features of economic development of regions, be able to analyze the economical and political problems of regions, be able to evaluate the effectiveness of regional politics and to develop the ability to analyze, evaluate and form the strategies of regional economic development and competitiveness improvement.	The focus is oriented to how geographic space can impact economic activity. The basic questions are why does economic activity take place where it does, why businesses choose to locate where they do, why some regions thrive and others don't. The course covers issues related to regional economy and regional level of economic activity; the impact of economic policy on the regions; the concepts of convergence, divergence and regional growth; methods in regional economics and in particular for analyzing the impact of economic activity on the regional economy; the impact of innovations, circular economy, artificial intelligence, social, professional networks, other factors on regional development	1. FRAMEWORK FOR UNDERSTANDING 1,1. Concepts of a region and city 1.2. Regional development mechanism 1,3. Theories of regional economic development 1,4. Dynamics of regional economy 1,5. Conceptualization of regional economic activity, attractiveness, competitiveness and resilience 1,6. Specifics of local economic development 2. INSTRUMENTS OF ANALYSIS AND ASSESSMENT 2.1. New methodological approaches for analysis and assessment 2.2. Analysis by index 2.3. PESET and SWOT analysis 2.4. Regional economic base analysis 2.5. Input-Output analysis 2.6. Counterfactual impact evaluation 2.7. Economic Cost-Benefit analysis 2.8. Scenarios building 2.9. Development impact for local economy assessment 3. IMPLEMENTATION IN PRACTICE 3.1. Strategic planning of regional development 3.2. Compiling a regional economic profile 3.3. Regional Policy Effectiveness
Thermal Measurement and Control of Technological Processes	9	To acquire knowledge of measurement of thermal parameters, composition and operation of control and regulation systems of technological processes and to master methods and tools of measurement.	Knowledge of the main methods and tools for measure of thermal parameters is understood. Requirements of international standards system for measure of thermal and energy parameters are mastered. Abilities to measure with various devices and to harmonize teoretical and practical knowledge are obtained. At an ecology request level abilities of application of analysis methods and tools for scavenge are obtained. Knowledge on composition of logical control and automatic regulation of technological processes, principles of operation and synthesis, mathematic models of processes and systems, programmed logical control devices and automatic regulators and basics of their programming is acquired.	1. Metrology basics 1,1. General knowledge on measurements 1.2. Evaluation of measurement results 1,3. Measurement tools and their characteristics 2. Measurement of thermal and energy parameters 2.1. Measurements of temperature 2.2. Measurements of flow 2.3. Measurements of pressure 2.4. Measurements of heat flow 2.5. Measurements of density and level of liquids 2.6. Analysis of liquids and gases 3. Basic definitions of control systems of technological processes (CSTP) 3,1. Principles and schemes of CSTP 3.2. Presentation and examples of CSTP 4. Elements of CSTP 4,1. Composition, operation and characteristics of sensors 4.2. Composition, characteristics and selection principles of execution devices 4.3. Composition and use of signal converters 5. Systems of logical control (SLC) of technological processes 5,1. Elements, composition and operation of LCS 5.2. Basics of synthesis and analysis of logical control devices 5.3. Composition and selection of programmed logical controllers (PLC) 5.4. Programming languages of PLC

				6. Automated regulation systems (ARS) of technological processes 6,1. Operational principles and structural schemes of ARS 6.2. Mathematical models of ARS and their elements 6,3. Mathematical models of processes 6.4. Automated regulators 6,5. Programmed automated regulators and their programming 6,6. Quality of ARS and tuning of automatic regulators 6,7. Packages of digital programming and their application for modelling of CSTP
Thermodynamics and Heat Generation	6	To acquire basic knowledge of applied thermodynamics. To acquire basic knowledge of heat generation systems and equipment, to understand their constructional and operational peculiarities.	Basic knowledge of applied thermodynamics is acquired and methods for generation, transformation, transfer and consumption of heat energy in heat generation equipment, heat engines, heat exchangers and other apparatus are understood. Methods of similarity theory for calculation of heat transfer are mastered. Basic knowledge of heat generation systems is acquired, constructional and operational peculiarities of heat generation systems and equipment are understood. Knowledge of design of heat generation systems is obtained through balancing of price, efficiency, safety, quality, reliability and environmental impact and knowledge of technical evaluation of their operation is obtained.	1. Thermodynamics 1,1. Basic concepts and definitions 1,2. The first law of thermodynamics 1,3. Basic thermodynamic processes of ideal gases and vapor 1,4. The second law of thermodynamics 1,5. Cycles of power engines 2. Heat transfer 2,1. Basic theory of heat transfer 2,2. Steady heat conduction 2,3. Heat transfer by convection 2,4. Radiation heat transfer between two bodies 2,5. Overall heat transfer, heat transfer intensification and reduction 2,6. Heat exchangers, their types and calculation 3. Heat generation 3,1. Classification of heat generation technologies 3,2. Description of fuel and classification 3,3. Equipment for combustion of gaseous fuel 3,4. Equipment for combustion of liquid fuel 3,5. Equipment for combustion of solid fuel 3,6. Auxiliary equipment of boiler house 3,7. Heat balance of heat generation device 3,8. Design and selection of heat generation systems 3,9. Utilization of renewable sources for heat generation
Development and Deployment of Network Based Services	6	To provide knowledge about network based distributed information systems, the principles, methods and technologies used for component interactions in such information systems and to provide skills for implementing interactions of components of distributed information systems via network services.	Knowledge about architecture of distributed information systems, remote procedure calls, web services, message queues, enterprise service busses, workflows, distributed transactions, systems scalability and availability is acquired. Practical skills in creating network services using .NET ecosystem are acquired.	1. Architecture of network based distributed information systems 2. Interaction methods of distributed information system components 2,1. Traditional inter process communication and remote invocation mechanisms 2,2. Web services 2,3. Message queues 3. Principles of component orchestration 3,1. Distributed transactions 3,2. Enterprise service buses and other means of component orchestration 4. Solutions for scalability and high availability in distributed information systems 4,1. Architecture and principles of scalable solutions 4,2. Architecture and principles of high availability solutions
Transport Systems	3	To learn thorough understanding of transport system: physical and functional components, transport management systems, structure of road, railway, air, water, pipeline transport systems, relationships, organizational and technical peculiarities of multimodal transport policy, realization principles, activities and aims of International transport organizations. The specific aims are: to introduce the selection methods of transportation routes and means estimating the transport system and requirements for freight transportation, analysis of transport policy aspects and situations, application of transportation methods and algorithms.	The students are thought to understand the characteristics of transport system, to describe and analyse the system, relations with environment, principles of sustainable transport system and to apply in transport engineering practice, to apply general methods of transportation routes selection, algorithms of transportation planning, regulating documents, to evaluate peculiarities of transport systems, new strategies and aspects of transport policy.	1. Transport system theory 1,1. Transport system structure 1,2. Transport management systems 1,3. Transport policy. Internationa transport organizations 1,4. Transport networks. Traffic flows 1,5. Sustainable transport and development 1,6. Transport safety 1,7. Transport and environment 2. Transport systems 2,1. Road transport 2,2. Railway transport 2,3. Water transport 2,4. Air transport 2,5. Pipeline transport 2,6. Multimodal transport 2,7. Urban transport
Basics of Urbanism	3	To gain the knowledge and to apply them to solve problems in city planning and urban processes.	In the study module, students gain knowledge about the trends of modern urbanism, the challenges of urbanization and globalization for the city, cultural heritage protection, planning of communication, greenery, territories and in the urban environment. Students gain the ability to analyze the urban environment and solve problem-based tasks is provided.	1. Introduction to urban planning 2. Urbanization and globalization 3. Planning of urbanized environment 4. City structure 5. City motorized transport spaces 6. Urban greenery and non-motorized communication spaces 7. The concept of cultural heritage and its protection 8. Modern theories of urbanism
Business Process Management	6	To understand management of business process, creating value to customer, to be able to model business processes, aiming for efficient use of different kinds of resources.	The knowledge of business processes and their management in the context of added value is acquired. Students gain knowledge of business process characteristics, are able to identify and analyze processes from environmental and internal perspectives. Students are able to argue on the peculiarities of business processes in manufacturing and service companies, critically evaluate and improve processes.	1. DEFINITION OF BUSINESS PROCESS MANAGEMENT 1,1. Process definition and the main characteristics 1,2. Processes in the Organization, Creating Added Value for Customer 2. MANAGEMENT OF PRODUCTION PROCESS 2,1. Production Processes in the Supply Chain 2,2. Types of Production Processes and their Effectiveness 2,3. The Concept of Lean Manufacturing 2,4. Management of Production Processes in the Context of Sustainability and Circular Economy 3. THE PECULIARITIES OF SERVICE PROCESS MANAGEMENT 4. MANAGEMENT OF AUXILIARY PROCESSES 5. MANAGEMENT OF WORK PROCESSES 5,1. Work Organization and Productivity 5,2. Work Standards and Payment 5,3. Workflow Analysis 6. BUSINESS PROCESS MODELING AND IMPROVEMENT
Business Process Management	6	To understand management of business process, creating value to customer, to be able to model business processes, aiming for efficient use of different kinds of resources.	The knowledge of business processes and their management in the context of added value is acquired. Students gain knowledge of business process characteristics, are able to identify and analyze processes from environmental and internal perspectives. Students are able to argue on the peculiarities of business processes in manufacturing and service companies, critically evaluate and improve processes.	1. DEFINITION OF BUSINESS PROCESS MANAGEMENT 1,1. Process definition and the main characteristics 1,2. Processes in the Organization, Creating Added Value for Customer 2. MANAGEMENT OF PRODUCTION PROCESS 2,1. Production Processes in the Supply Chain 2,2. Types of Production Processes and their Efectiveness 2,3. The Concept of Lean Manufacturing 2,4. Management of Production Processes in the Context of Sustainability and Circular Economy 3. THE PECULIARITIES OF SERVICE PROCESS MANAGEMENT 4. MANAGEMENT OF AUXILIARY PROCESSES 5. MANAGEMENT OF WORK PROCESSES 5,1. Work Organization and Productivity 5,2. Work Standards and Payment 5,3. Workflow Analysis 6. BUSINESS PROCESS MODELING AND IMPROVEMENT
Local Economic Development	6	To provide knowledge about the essence, principles and strategies of local economic development and practical implementation methods and to develop the ability to apply them in the formation, implementation and evaluation of local economic development.	By offering theoretical models and practical methods mastered essential knowledge and skills within the field of designing, implementing and evaluating sustainable local development strategies suitable for the local socio-economic environment aiming to improve quality of life within the local area.	1. Introduction to Local Economic Development 1,1. Local Economical Development in the Context of Globalization and Decentralization 1,2. Evolution of Local Economic Development 1,3. Concepts and Theories of Local Economic Development 1,4. Conditions and Principles of Local Economic Development 2. Management of Local Economic Development Process 2,1. Analysis of Local Economic Development Process Models 2,2. Analysis of the Context in the Local Economic Develpment 2,3. Develoment, Implementations and Evaluation of Strategies in Local Economic Development 2,4. Organizational Structures in the Process of Local Economic Development 3. Strategies and Tools in Local Economic Development 3,1. Structure and Operating Principles of Economy 3,2. Local economic development tools and application conditions 3,3. Local economic development strategies classification 4. Perspectives of Local Economic Development Evolution

Architecture of Public Buildings 2	12	To deepen the theoretical knowledge and practical skills in the design of public polyfunctional buildings, to be able to capture the essential aspects of the object: the need for function, aesthetics, context, etc.	Course research the architecture, forms, constructions and functional relationships of polyfunctional public buildings. The design of a public polyfunctional building project combines the knowledge and skills of architectural design, environmental formation and design of communication systems in the city. The architectural solutions that are generated during this course are based on the pre-project research, which seeks to clarify not only the needs of consumers, but also the context of the environment (natural, engineering, cultural heritage, transport, etc.).	1. Architectural building design 1,1. Architectural and functional scheme analysis of building analogues. 1.2. Modeling of building functional relationships 1,3. Search of the building shape and plan solutions 1,4. Detailing of the planned solution of the building and the plot 1,5. Search and detailing of building construction and interior solutions 1,6. Preparation of the final design of the building and its surroundings 2. Development and detailing of the building environment 2,1. Analysis of the current condition of the territory and its environment 2.2. Plot design. The concept of dendrology 2.3. Plot design. Assortment of ornamental plants, plant properties that are important for design. 2.4. Plot design. Plant ecology 2.5. General principles for the creation of public spaces 2.6. Formation of public space by dendrological means 3. Basics of urban communication system design 3,1. The structure of the city and the importance of transport systems 3.2. Need and possibilities of communication systems 3,3. Design of a motorized transport network in the city 3,4. Design of bicycle paths 3,5. Pedestrian traffic in the city 3,6. Design of parking spaces
Architectural Experiment 3	12	To deepen the theoretical knowledge and practical skills in public polyfunctional complex design, to be able to capture the essential aspects in the object: the need, function, aesthetics, context, etc.	Architectural Experiment 3 investigates the urban structure, in which is designed multifunctional public building, its relationship with the natural environment and transportation systems; public polyfunctional building functional links, forms, structures. Subject integrates the following modules: architectural design, transportation systems, landscape design. In the study process are generated architectural solutions, taking into account the projected building dynamic environment and spatial conditions.	1. Architectural design of the territory and buildings 1,1. Urban environment and public buildings function analysis 1.2. The concept of the designed territory 1,3. Functional and volumetric concept of building 1,4. Polyfunctional public building design 1,5. The graphic fulfillment of the designed territory and building project 2. Fundamentals of Transport systems 2,1. Transport systems needs and opportunities 2.2. Desing of motorized transport network 2.3. Design of bicycle paths 2.4. Pedestrian traffic in the city 3. Fundamentals of landscape architecture 3,1. The concept and expression of public space. Signs of good public space 3,2. Green infrastructure and application of its principles in the formation of territory 3,3. Terrain and water use in the area. Creating a microclimate 3,4. Formation of visual spaces of public building by dendrological means 3,5. Technical infrastructure for public spaces.
Security Dimensions of the Baltic Region	6	To develop critical thinking and understanding of a wide spectrum of security challenges as pertaining to the Baltic sea region, also through raising awareness of historical developments, awareness of social, cultural, economic and geo-political contexts, that influenced the current security profile of the Baltic region.	Students analyze the security situation and main security challenges of the Baltic Sea region, analyze how the security profile has been determined by historical social, economic or geopolitical contexts, students discuss security challenges in various fields, for example, geopolitical, social, environmental threats. Students are able to compare the security situation of the Baltic States and other countries in the Baltic Sea Region.	1. Historical security contexts and their theoretical interpretation 1,1. Historical social, cultural, economic, political, geopolitical security context of the Baltic region 1.2. Interpretation of the security context of the Baltic region using security theories 2. Baltic Sea region security situation and main challenges 2,1. Geopolitical processes relevant to the Baltic region 2.2. Socio-demographic processes in the Baltic Sea Region related to security challenges 2,3. Economic processes in the region and dependence on global economic shocks 2.4. Energy security in the region 2,5. Climate change and challenges for the Baltic Sea region 2.6. Pandemics, public health and security challenges 2.7. Fake news and information wars 2.8. Technological development, digitalization and security 3. Partnerships to maintain security in the region 4. Comparative analysis of the security situation in the Baltic region and other regions of the world
Sustainable Human Development	6	To develop deeper understanding about sustainable human development, main challenges and problems related to demographic, technological, environmental, etc changes.	Develops the ability to apply the knowledge of the socio-economic contexts within the professional activity area; knowledge is related to the main developmental patterns and trends within contemporary societies, such as demographic changes, changes in social structure of societies, economic welfare, social impact of technologies, changes induced by environmental challenges. Develops the ability to operate within social and professional contexts following the principles of sustainable development, principles of non-discrimination and cultural diversity appreciation. Student is able to draw on necessary data to prepare data-informed situation reviews.	1. INTRODUCTION TO STUDIES OF HUMAN DEVELOPMENT 2. SOCIOLOGICAL INTERPRETATION OF HUMAN DEVELOPMENT 3. CONCEPTION AND MEASUREMENTS OF HUMAN DEVELOPMENT 4. PARADIGM OF SUSTAINABLE DEVELOPMENT 4,1. Developmental dysfunctions and contexts for emergence of new developmental paradigm 4,2. Fundamental ideas and principles of sustainable development paradigm 5. MAIN DIMENSIONS OF HUMAN DEVELOPMENT 5,1. Literacy, education and public health 5,2. Economic welfare and sustainable human development 6. CHALLENGES AND ISSUES OF HUMAN DEVELOPMENT 6,1. Demographic processes 6,2. Income, unemployment and p 6,3. Equal opportunities and cultural variety 6,4. Global environmental problems, environmental policy and technological solutions 6,5. Challenges of climate change for sustainable human development 6,6. Science and technologies in the context of human development 6,7. Social impact of technologies 6,8. Civil society and its empowernment 7. ALTERNATIVE SCENARIOS FOR FUTURE HUMAN DEVELOPMENT
Sustainable Development	6	To develop global, critical and reflexive awareness of the social, economic, cultural and environmental context, in which the graduate will act, conception and the ethical position based on the principles of sustainable development.	Obtaining the basic knowledge of social, economic, cultural and environmental tendencies; developing value thinking and systematic thinking, critical ability to evaluate and apply mastered knowledge in the personal, civic or professional activities.	1. The relevance of sustainable development 2. Philosophy and Sustainable Development 2.1. What is sustainable development? 2.2. Philosophical Reflection of Contemporary Societies 3. Welfare, happiness and safety 3,1. What is Social Welfare? What is individual happiness? 3.2. What are the factors of happiness and welfare? 3,3. What are the future challenges and trends? What can I do? 4. Circular Economy 4,1. What does determine the Macroeconomic Environment? How does the economics relate to ethics? 4.2. What is the Circular Economy? What are the circular business models? 4,3. What are the solutions that lead to Sustainable Economy? What can I do? 5. Climate Change 5,1. What are the reasons of climate change? What are the signs of climate change in the world? 5.2. What are the scenarios and forecasts of climate change? 5,3. What is the policy of climate change? 6. The design for sustainable development. Cultural Diversity and Digital Culture. 6,1. What cultural transformations do we experience? What are the benefits of cultural diversity? 6.2. What is the role of design in the constantly changing and evolving world? 6,3. What is the future of design? How does it relate to sustainable development? 7. Achieving Sustainable Development Goals. From the global level to personal initiative
Engineering Economics	6	To provide knowledge about the principles of the market mechanism at the micro and macro levels and to develop the ability to assess the impact of economic factors in engineering decisions.	Gaining knowledge about the mechanism of functioning of the engineering product market. Ability to analyze market changes, recognize the factors determining product price changes, analyze consumer behavior in the market. Acquires knowledge and acquires skills to evaluate the economic efficiency of development and implementation of engineering solutions in micro- and macro-environments.	0. INTRODUCTION TO "ENGINEERING ECONOMICS" 1. DEMAND AND SUPPLY. EQUILIBRIUM IN THE MARKET 1,1. Demand and supply 1,2. Equilibrium in the market 1,3. Types of market structure 2. ELASTICITY: THEORY AND APPLICATION 2,1. Elasticity of demand and supply 2.2. Elastingumo teorijos praktinis pritaikomumas 3. CONSUMER BEHAVIOR 3,1. Utility theory 3.2. Budget line and indifference curve 4. PRODUCTION FACTORS 4,1. Factors of product manufacturing 4.2. Intellectual capital 4,3. Substitution of factors of production 4,4. Production in the short and long term 5. PRODUCTION COSTS AND PRICE 5,1. Production costs in the long and short term 5,2. Price and value of product 5,3. Pricing methods 6. PROFIT AND PROFIT MAXIMIZATION CLAUSE 6,1. Principles of profit maximization 6,2. Profit maximization in a perfect competition market 6,3. Profit maximization in a monopoly market 7. INNOVATION IN ENGINEERING 7,1. Innovation of engineering product and economic value of creation 7,2. Costs of engineering product innovation 7,3. Socio-economic assessment of innovation 7,4. Commercialization of innovations 8. NATIONAL INCOME ACCOUNTING 8,1. Basic elements of the economic system and interconnections 8,2. Gross domestic product and gross national product 8,3. Ways to determine gross domestic product

				9. MACROECONOMIC POLICY AND ITS FEATURES 9,1. Fiscal policy: essence and objectives 9,2. Monetary policy: essence and objectives 10. BUSINESS CYCLES AND LONG - TERM ECONOMIC GROWTH 10,1. Business cycle 10,2. Long term economic growth 11. UNEMPLOYMENT AND INFLATION 11,1. Employment, unemployment and its economic consequences 11,2. Inflation, its forms, rates, causes and economic consequences 12. INTERNATIONAL TRADE 12,1. Structure of international trade 12,2. Benefits and harms of international trade 12,3. Forms and tools of international trade policy 13. THE CHALLENGES OF THE MODERN ECONOMY 13,1. Digital economy and artificial intelligence 13,2. Circular economy 13,3. Climate change and the economy 13,4. Shadow economy
Introduction to Biotechnologies	6	To acquire knowledge about development of biotechnology, modern biotechnology, industrial microbiology, new technologies (genomics, transcriptomics, proteomics, metabolomics) as well to obtain knowledge about the main biotechnological principles and processes.	Knowledge about higher education and studies in university, particular field of study, it's specifics is acquired. Content of studies is seized. Is possible to understand value of scientific information. Student is introduced to scientific research, career possibilities. Student is capable of preparing study tasks with accordance to requirements. Competences, needed to work in a team and studying individually are nurtured.Students are taught to understand the main biotechnology processes and principles. The students are obtaining knowledge about biotechnological methods, processes and application possibilities.	1. Philosophy of higher education 1,1. Vision and specifics of studying in university. 1,2. KTU academic culture and ethics. 2. Field of studies specifics 2,1. Development stages of biotechnology. modern biotechnology. 2,2. Principles of microbial biotechnology. 2,3. Application of biological systems in industrial biotechnology. 2,4. Application of microorganisms in industrial biotechnology. 2,5. Studies of genomics, proteomics, metabolomic in biotechnology. 3. Career. 3,1. Career days "wanted". Career planning. 4. Academic writing and presentation skills. 4,1. Types, structure and content of written academic works. It's language, style and vocabulary. 4,2. Library. University's forms and templates.Quoting requirements. 5. Competencies of being able to study. 5,1. Organizing studies: raising learning objectives, time planning. 5,2. Learning methods: types of group and team work,stages of formation, decision making. 6. Economic growth and sustainable development 6,1. Flows of materials 6,2. Energy flows and climate change 6,3. Environmentally-friendly production 6,4. Product life cycle and eco-design 6,5. Sustainable chemistry and EU chemicals management policy REACH.
Introduction to Chemical Technology and Engineering	6	To gain knowledge about the principles of Sustainable Engineering and the general regularities of chemical technology and engineering, to get acquainted with the structure, peculiarities of the chemical industry, product range, future trends.	Knowledge about higher education and studies essence in the field of chemical and process engineering and the specifics of the chemical technology and engineering program is aquired. Content of studies is seized. Is possible to understand value of scientific information. Student is introduced to scientific research, career posibilities. Student is capable of preparing study tasks with accordance to requirements. Competences, needed to work in a team and studying individually are nurtured.	1. Studies of higher education in Kaunas University of Technology: vision, specifics and organisation 1,1. Study and research at faculty of chemical technology 1,2. Philosophy of higher education 2. Student academic competency 2,1. Academic writing 2,2. Orginising of student's learning process, studies methods and learning reflection 2,3. Principles of effective presentation 3. Principles of sustainable engineering 3,1. Economic growth and sustainable development 3,2. Material flows 3,3. Energy flows and climate change 3,4. Environmental friendly production 3,5. Product life cycle and eco-design 3,6. Sustainable chemistry and EU chemicals policy REACH 4. Advances in inorganic chemistry industry and science 4,1. Significance of research, essential achievements and further development 4,2. Organisation and planning of research work 4,3. Definition of research. Classification, significance and functions of the research 4,4. Global trends in silicate technology development 4,5. Silicate industry in Lithuania 4,6. Recent scientific advances 5. Achievements in the organic chemistry industry and science 5,1. Innovative polymer materials and products 5,2. Polymer industry in Lithuania 5,3. Advances in science in polymer chemistry and technology 5,4. Innovations and trends in oil refining in the world 5,5. Oil, oil production and processing in Lithuania 5,6. Oil research at KTU, Department of Organic Chemistry
Modern Electronics Technologies	6	To get to know electronics technology basics, parameters and facilities, as wel as to know development and future of the modern high technology electronics.	The students are taught to understand the consumer electronics design methodology, audio and video signal and data processing, recording to media input and output techologies, control, communications and future developments.	1. Leisure 1,1. Public events: image and sound 1,2. Games 1,3. Sense and pleasure 1,4. Hobby: radioamateur, books, photography, video, music 2. Travel assistance 2,1. Travel planning 2,2. Transport 2,3. Personal assistanse 2,4. Shopping 3. Healthcare 3,1. Preventive medicine 3,2. Noninvasive medicine 3,3. Intervention surgery 3,4. Quality of life improvement 4. Business 4,1. Management 4,2. Production and services 4,3. Logistics 4,4. Security 5. Household 5,1. Home multimedia 5,2. Comfort maintenance systems 5,3. Security and surveillance 5,4. Meters 6. Research 6,1. Measurement conception 6,2. Micro scale research 6,3. Mid scale research 6,4. Macro scale research 7. Environment 7,1. Ecology and battling the global warming 7,2. City infrastructure maintenance 7,3. Public security 7,4. Public information systems 8. Military equipment 8,1. Situation awariness 8,2. Weapons 8,3. Protection and armour 8,4. Military logistics

Organizational Communication	6	To analyze the characteristics of internal and external organizational communication, to organize communication management, to assess and foresee the impact of the internal and external communication on the employees, the different stakeholders and on the image of the organization.	Appropriate internal and external communication is necessary for the successful functioning and image management of an organization. Organizational communication module seeks to achieve that students who complete this subject would be able to analyze, assess and prepare the internal and external communication strategies.	1. Organizational communication conception 1,1. Internal and external organizational communication 1.2. Organizational communication processes. Communication management in an organization. 1,3. Communication target groups, channels, barriers 1,4. Communication flow management 2. Organizational culture and climate: the impact on an internal communication system. 2,1. NeedScope method 2.2. Teams and managing differences 3. Public communication in image formation. Organization's identity, image, and reputation management. 3,1. The role of a leader in forming the organization's image. 3.2. Leader as a role model. Leader's reputation management. 4. Public relations and the media. 4,1. Opinion management, impact, influence, manipulation. 4.2. Crisis communication and preventing crises. 5. Media research (the types and usage in communication planning and while making decisions). 6. Organizational communication audit. Strategic communication management.
Air Conditioning and Environment Protection	9	To acquire knowledge about heating, ventilation, air conditioning processes and systems, methodologies for identification, calculation and reduction of environmental pollution in thermo energetic.	Knowledge about heating, ventilation, air conditioning systems and equipment are obtained. Calculations of air state changing processes, design of air conditioning systems and relation with building engineering systems are understood. The reasons of environmental pollution and principles of formation of pollutants are understood; abilities for identification of pollution reduction possibilities and environmental impact reduction measures are obtained. Methodologies for calculation of environmental impact of thermoenergetic and thermotechnological systems and equipment, their selection and modernization are mastered. Abilities for independent finding and usage of information are acquired.	1. Heating 1,1. Parameters of humid air 1.2. Thermal characteristics of buildings 1,3. Indoor heat balance 1,4. Heating equipment 1,5. Heating systems 2. Air conditioning 2,1. Air parameters and processes of air state variation 2.2. Equipment of air conditioners and their calculation 2.3. Systems of air conditioning 3. Ventilation 3,1. Methods of ventillation and determination of air flow 3.2. Ventilation systems 4. General questions on enironmental pollution 4,1. Understanding pollution 4.2. Reducing pollution 4,3. Chemical toxicity 4,4. Chemical exposures and risk assessment 5. Environmental pollution and methods for lowering of environmental impact 5,1. Air pollution 5,2. Acidic deposition 5,3. Global climate change 5,4. Stratosheric ozone depletion 5,5. Water pollution 5,6. Pesticides and metals 5,7. Pollution at home 5,8. Energy
Architecture of Building Complexes	12	To deepen the theoretical knowledge and practical skills in public polyfunctional complex design, to be able to capture the essential aspects in the object: the need, function, aesthetics, context, etc.	The building architecture complex course examines the urban space in which a multi-functional complex of buildings for public, commercial or other purposes is designed. A complex of buildings is prepared taking into account the natural, cultural, historical and other context of the environment, the functional relations, forms and constructions of multi-functional buildings. The subject combines the following topics: architectural design, landscape architecture and architectural-social space design. In the process of studying these areas, architectural solutions are generated, taking into account the environment and spatial conditions of the designed building.	1. Architectural design of the territory and buildings 1,1. Urban environment and public buildings function analysis 1.2. The concept of the designed territory 1,3. Functional and volumetric concept of building 1,4. Polyfunctional public building complexes design 1,5. The graphic fulfillment of the designed territory and building project 2. Ecology of public spaces 2,1. Plant ecology 2.2. Green infrastructure and application of its principles in the formation of the environment 2,3. Terrain and water use in the area. Creating a microclimate 2,4. Formation of visual spaces of public buildings complexes by dendrological means 2,5. Technical infrastructure for public spaces. 3. Design of architectural-social space 3,1. Architecture as a social space 3,2. Social construction of urban public space 3,3. Dimensions of experience in architectural space 3,4. Creating narrative by architectural means
Product Development Project	12	To acquire interdisciplinary knowledge of the product or service development while solving scientific and practical problems taking into consideration the needs of the market and society and gain practical product development skills.	Essential product development knowledge is acquired and practical teamworking, engineering design, prototyping, testing and engineering documentation preapration skills are gained. Knowledge and understanging in engineering ethics, environmetal sustainability and project risks, benefit and cost estimation are acquired.	1. PRESENTATION OF THE MODULE AND WORK METHODOLOGY 2. GENERATION OF IDEAS 2,1. Team work principles. 2.2. Generation and selection of design ideas. 2,3. Product creation/development methods 2,4. Clarifying of the problem 3. BUSINESS/CASE ANALYSIS 3,1. Analysis of customer's needs and wants 3,2. Detailed technical assessment of the product 3,3. Integrated product definition 3,4. Analysis of competitors and market analysis 3,5. Assessment of the product concept according to the consumer's expectations 3,6. Assessment of production (possibilities) and suppliers (if available) 3,7. Financial and cost benefit analysis 3,8. Preparation for the next stage of the action plan and identification of the resources required for the implementation of 4. CREATION OF THE PRODUCT 4,1. Technical project preparation; Engineering ethics, environmental sustainability 4,2. Product's composition and principle of its functioning 4,3. Materials selection for the designed components, justification of the amount; selection of manufacturing technologies 4,4. Revision of production budget and financial plan 4,5. Product function prototype 4,6. Testing and validation of the product 4,7. Product visualization/packing/sustainability 4,8. Preparation of the project's technical documentation 4,9. Planning of product entering the market; Production and supply planning
Heating, Cooling, Ventilation and Air Conditioning	6	To provide knowledge about the types, equipment, installation, control, operation of heating, cooling, ventilation and air conditioning systems in buildings, and to develop the design competencies of such systems.	Theoretical and practical knowledge are obtained about heating, cooling, ventilation and air conditioning (HVAC) systems in residential, administrative and small industrial buildings, schemes of HVAC systems, its functioning, used facilities, installation, setting, adjustment and service of operating. Knowledge and skills are obtained in design HVAC systems as well as selection of its elements, technology of installation and management.	1. Indoor climate 2. Evaluation of building heating and cooling demand 3. Principles of sustainable design of heating, cooling, ventilation and air conditioning systems 4. Types of ventilation and air conditioning systems 5. Equipment and processes of air treatment, Mollier (h-x) diagram 6. Air jets and air distribution in rooms 7. Ductwork design (aerodynamics, balancing, regulation and auxiliary equipment for systems) 8. Ventilation of industrial premises. Air filtration and environmental protection 9. Smoke and heat control systems 10. Types of heating and cooling systems 11. Energy sources, heat generators and refrigeration 12. Equipment of water heating and cooling systems 13. Pipeline design (hydraulics, balancing, regulation and auxiliary equipment for systems) 14. In-direct heating and cooling systems 15. Fundamentals of research in heating, cooling, ventilation and air conditioning systems 16. Installation, control and operation of heating, cooling, ventilation and air conditioning systems
International Organizations	6	To develop a broad theoretical and empirical understanding of the role that international organizations play across various issue areas in international politics.	International organizations (IOs) are a defining feature of international politics and global governance. The proliferation and functional expansion of IOs sets the post-1945 international order apart from any previous period in international history. This course provides a broad theoretical and empirical overview of IOs. Theoretically, the course covers both classic as well as more-recent conceptual approaches to understanding the role of IOs in international politics. Empirically, we will discuss the history, evolution and operation of major IOs from within the United Nations system and beyond.	1. International institutions, regimes and organizations 2. How do international organizations operate? 3. International organizations and international law 4. Performance and effectiveness 5. Principal-agent theory 6. Orchestration 7. The World Trade Organization 8. The Bretton Woods system: World Bank and International Monetary Fund 9. The World Health Organization 10. The Framework Convention on Climate Change 11. From international organizations to transnational organizations

Principles of Sustainable Development	6	To know the concept of integrated long-term natural resources use, development of economy and society; be able to implement this concept in professional work.	To know the basic principles of sustainable development in energy and material flows management. To know trends of sustainable industry and transport sectors development. To know principles of sustainable city planning and management. The specific objective: learning to analyse and critically assess problematic situations. Students acquire the Baltic University Programme (BUP) diploma certifying that the course was delivered in the frame of the BUP network.	1. Principles 2. Energy 2.1. Exergy - qualitative measure of energy 2.2. Ambient air pollution from energy sector 2.3. "Green house" gases, mechanism of "Global warming" 2.4. Kinds of renewable energy 3. Materials flows 3.1. MIPS concept and calculation method 3.2. Principle of Life Cycle Assesment (LCA) 3.3. Principles of eco-design 4. Industry 4.1. Principles of cleaner production 4.2. Technical means of pollution prevention 4.3. Environmental Management Systems (EMS) 5. Transport 5.1. Negative impacts of environment and human being 5.2. New generation means of transport 5.3. Transport and traffic systems 6. City 6.1. Concept of "Ecological footprint" 6.2. Indicators of sustainable urban development
Principles of Sustainable Development	3	Acquire integrated long-term concept of society, economy and natural resources development, and be able apply it in engineering activities.	To know the basic principles of sustainable development. To know principles of energy and materials extraction, transformation and recovery. To know trends of sustainable industry and transport sectors development. To know principles of sustainable city planning and management. The specific objective: learning to analyse and critically assess problematic situations.	1. Principles 1.1. Concept of Sustainable Development 1.2. Economical Growth and Sustainable Development 2. Energy 2.1. Exergy - Measure of Energy Quality 2.2. Energy Sector and Environmental Impacts 2.3. Greenhouse Gases and Global Climate Warming 2.4. Renewable and Alternative Sources of Energy 3. Material Flows 3.1. Product Life Cycle 3.2. Qualitative Methods of Product Life Cycle Assessment 3.3. Basics of Ecological Product Design 3.4. Sustainable Chemistry 3.5. Strategies of Material Management 3.6. REACH - EU Chemicals Management Policy 4. Industry 4.1. Principles of Cleaner Production 4.2. Technical Means of Pollution Prevention 4.3. Environmental Management Systems 5. Transport 5.1. Negative Effects of Transport on Human Being and Environment 5.2. The New Generation of Vehicles 5.3. Transport and Traffic Systems 6. City 6.1. History of Urbanisation 6.2. Concept of Ecological Footprint 6.3. Indicators of Sustainable City Development
Typology of Architectural Spaces	3	The aim of the study module is to introduce the students with the fundamentals of the typology of residential, public buildings and urban spaces.	The module combines theoretical knowledge, short design tasks and functional and compositional architectural research - interpreting general principles by analyzing specific examples of contemporary and historical architecture. the module not only provides students with the knowledge needed for design, but also develops critical thinking and introduces innovations in architectural design and architectural research.	1. Introduction; A brief overview of typology in architecture; Typology as a method of research in architecture 2. Buildings and building users from the typological point of view, classifications in different countries, cultural aspect 3. Households: residential buildings and their environment 4. Working, studying people, children: needs in the living environment 5. Elderly people, people with special needs: needs in the living environment 6. Typology of public buildings; Relationships between architectural typology and urban morphology 7. Typology of public spaces 8. New types of architectural spaces, multifunctionality and multifunctional objects; Ecological (sustainable) use of build
Typology of Occupants	3	The aim of the study module is to present the students with the fundamentals of building typology by introducing them with the main groups of building occupants and their needs.	The module integrates the theoretical knowledge and the architectural research and provides students with the fundamentals of understanding and research of architecture from the typological point of view. General principles are presented using and analyzing the specific examples of contemporary architecture.	1. Introduction. The short review of typology in architecture 2. Typology as a way of research in architecture 3. Buildings and the occupants of buildings from the typological point of view, classifications in different countries 4. Design for people: the needs, behavior, safety, health, and comfort of building occupants 5. The links between the architectural typology and composition 6. Households: residential buildings and their surroundings 7. Children: their needs in residential environment, the buildings of education and care 8. Studying people: their needs in residential environment, the buildings of education 9. Working people: their needs in residential environment, industrial, agricultural, administrational buildings 10. Elderly people: their needs in residential environment, the institutions of care, hospices 11. People with special needs: specialized residential environment and institutions 12. Ecological (sustainable use of buildings
Theory of Architecture	6	The module will help students to understand the relation between ideas and architectural forms, and will develop a skill to recognize inherent cultural context behind the architectural artifacts.	The objective of the study module is to introduce students to the theory of architecture as a phenomenon and to reveal its influence on the change architectural aesthetic conceptions. During the course students will learn the most important authors and examples of historical architectural theory, the theoretical assumptions of modernism and the prime trends of contemporary architectural theory.	1. Introduction. Discourse of architecture. 2. The birth of architectural theory. Vitruvius. 3. Architecture and mysticism of middle ages. Abbot Suger. 4. The rebirth of aesthetics of order. Leon Battista Alberti. 5. The metaphysics and optical illusions of baroque. Andrea Pozzo. 6. Romanticism and the concept of heritage. 7. Manifests of the Modern Architecture. A. Loos, Le Corbusier and others. 8. The modern language of architecture. Bruno Zevi. 9. Modernism as a social (socialist) project. 10. Alternative visions of Modern Movement. 11. Form follows fiasco. New language of modernism. 12. Critical regionalism and genius loci. 13. The theory of postmodernism. Charles Jencks, Aldo Rossi et al. 14. The Anthropocene and ecology in architectural theory. 15. Round table discussion: course reflection.
General and inclusive education	6	To provide general and inclusive education knowledge that is applied individually and in teams when implementing specific inclusive education models in an educational institution or community.	Students acquire knowledge of general and inclusive education, which is applied individually and in teams, implementing specific models of inclusive education in an educational institution or community; they can explain the system of educational science, the universality of education, analyze the problems of personality education, apply models of inclusive education in institutions or communities.	1. Educational science and practice 1.1. General educational issues 1.2. Personality education 1.3. Teaching and learning 1.4. Human socialization: concept, process, factors of socialization 1.5. Concept of Education for Sustainable Development (EDS). Educational goals and competencies 1.6. Teacher competencies in professional activities, meeting individual educational needs of students 2. Inclusive education 2.1. Concept of inclusive education. Individual educational needs of students 2.2. Adaptation of educational programs to students with individual needs. Teaching aids and support 2.3. A safe environment in the classroom: preventing violence and bullying 2.4. Communication and cooperation with educational process participants and educational institutions 2.5. Applying innovative educational methods and methods to the different needs of students 2.6. Getting to know children with individual (special) educational needs, meeting their needs
Modeling, Optimization and Control of Biotechnological Processes	6	To teach a thorough understanding of typical biotechnological processes and their technological parameters, the fundamentals of their mathematical modeling, optimization and optimal control.	Students are taught to thoroughly understand the classification of typical biotechnological processes, their technological equipment and parameters, measurement and control of the main process variables, to apply various types of process models, equation systems for mass and energy balance, kinetic expressions for specific biomass growth, substrate consumption, byproduct and product formation rates, classical and hybrid models.	1. Bioreactors and biotechnological processes 1.1. Types of bioreactors and their application 1.2. Types of biotechnological processes and their application 1.3. Measurement equipment of the main biotechnological parameters 1.4. Methods of inferential estimation of the main biotechnological parameters 1.5. Automation equipment of biotechnological processes 2. Mathematical modeling of biotechnological processes 2.1. Mass balance 2.2. Heat energy balance 2.3. Kinetic (mechanistic) models of reaction rates 2.4. Black-box models 2.5. Hybrid models 3. Identification of model parameters and structure 4. Model-based optimization of biotechnological processes 4.1. Optimization of batch processes 4.2. Optimization of fed-batch processes 4.3. Optimization of continuous processes 5. Automatic control of biotechnological processes 5.1. Open-loop control systems 5.2. Feedback control systems 6. Application of Matlab programming environment

Electromagnetic Field Technologies	6	To give knowledge about the properties and laws of electrostatic and magnetic fields, electric field in conducting space, electromagnetic field, use electromagnetic field in technologic processes.	Understanding of physical nature of electromagnetic phenomenons and mathematical fundamentals of its description is provided. Main electromagnetic field properties and laws are introduced. Ability to analyse one- and certain two-dimensional electrostatic fields, electric fields in conducting spaces, magnetostatic and time varying electromagnetic fields is trained. The skill to compute capacitances, resistances and inductances of electric equipment is given. The knowledge to employ electromagnetic field in technologic processes are introduced.	1. Preface 2. Sources of electromagnetic field and Maxwell's equations 2.1. Integral form of Maxwell's equations 2.2. Certais formulas of vector algebra 2.3. Differential form of Maxwell's equations 3. Electrostatic field 3.1. System of equations 3.2. Laplace's and Poisson's equations 3.3. Boundary conditions 3.4. Methods of analysis of electrostatic fields 3.5. Use of Gauss's law for analysis of electrostatic field of elementary sources 3.6. Principle of superposition 3.7. Method of images 3.8. Electric capacitance 3.9. Graphical method 4. Electric field in conducting space 4.1. System of equations 4.2. Boundary conditions 4.3. Laws of electric circuits 4.4. Electrical resistance 4.5. Energy of electric field in conducting space 4.6. Analogy between electric field in conducting space and electrostatic field 5. Magnetostatic field 5.1. System of equations 5.2. Boundary conditions 5.3. Scalar and vector magnetic potentials 5.4. Magnetic field of elementary sources 5.5. Use of the principal of superposition for analysis of fields of two and more elementary sources 5.6. Inductance 5.7. Energy and forces in magnetostatic field 5.8. Mathematical and physical analogy between magnetostatic and electrostatic fields 6. Time varying electromagnetic field 6.1. System of equations 6.2. Energy flux 6.3. Uniqueness theorem 6.4. Retarded potentials of electromagnetic field 6.5. Wave equations 6.6. Electromagnetic wave propagation in the space 6.7. Transition of electromagnetic wave from one media to another 6.8. Screening 7. Electromagnetic field and other physical fields 8. Methods of analysis and computation of two-dimensional fields 8.1. Functions of complex variable 8.2. Method of complex potential 8.3. Method of conformal images 8.4. Numerical methods of two-dimensional fields 9. Electromagnetic field technologies 9.1. Technologies of electrification particles and charge transport 9.2. Technologies of continuum environment, heat and mass exchanges 9.3. Electromagnetic fields technologies in chemical and biological processes 9.4. Electromagnetic fields in nanotechnologies
Electromechanical Energy Conversion	3	To impart news about electric drives principles, main elements and systems of electromechanical energy conversion.reliability.	Electromechanical systems and their energetics, energy conversion schemes and fundamental elements: electric motor, electric energy converter, electric drive. The types of electric motors, speed - torque characteristics and basic energetic indices. Mechanical coordinates (speed and torque) control using electric energy converters. Open loop and closed loop control systems. Types of converters. Drive elements rating selection. Possibilities of electric energy saving.	1. Basic definitions 1.1. Electromechanical systems and their energetics 1.2. Electrical energy conversion to mechanical energy, schemes 1.3. The fundamental elements of electric energy converting to mechanical energy 2. Electric motors and their characteristics 2.1. Conditions of motor work and distribution of energy 2.2. The types of electric motors according to degrees of protection and mounting arrangements 2.3. Electric motor graphical and letter symbols in electric schemes according to standards 2.4. AC and DC electric motors. Motor types and basic energetic indices 2.5. Torque-speed characteristics of electric motors in motoring and braking conditions 3. Mechanics of electric drives 3.1. The main equation of drive motion. Forces and torque of drive 3.2. Industrial equipment work peculiarities and speed-torque characteristics of industrial equipment 3.3. Industrial equipment work peculiarities and speed-torque characteristics of industrial equipment 3.4. Joint speed-torque characteristic of an electric motor and a driven unit 3.5. Load diagrams 3.6. Acceleration and deceleration time 3.7. Mechanical transient response conditions in electric drives when the motoring torque is proportional to motor angl 4. Principles of electrical drive mechanical coordinates control 4.1. Purpose of coordinates control 4.2. Basic indices of coordinates control 4.3. DC motors speed regulation without converters and using converters 4.4. AC motors speed regulation without converters and using converters 5. Electric energy converters 5.1. DC voltage converters 5.2. AC frequency converters 5.3. Methods of speed regulation range increasing using feedback 6. Motor power rating selection 6.1. General considerations in motor power rating selection 6.2. Motor heating in continuos, short-time and intermittent periodic duty 6.3. Selection of motor power capacity for continuos, short-time and intermittent periodic duty 6.4. Electric drive energetics in transient response conditions and means of losses reducing 7. The end 7.1. Lookout , reliability , energy saving and ecology of electric energy used in electromechanical processes
Power Transmission	6	To acquire skills for calculation of power networks, which are used for power transmission, parameters, loads and values. To apply the matrixes and computer based calculation methods. To learn principles of alternating and direct current power networks Design, including assessment of electrotechnical, financial and mechanical factors. The specific aim is to learn how to calculate and solve power electronic converters and compensators applied in transmission networks.	The students are taught to understand the purpose and structure of power transmission networks, to calculate power flows and bus voltages using computer aid metods, to design projects of networks compensation and power converting electronic devices, to solve power quality and electromagnetical compatibility problems.	1. The structure of power energetics system and its purpose 2. The main power transsmision principes 3. The power transsmision network 4. The compensation of electrical networks and compensation devices 5. The computer aid calculation of power flows 6. The calculation of power flows in electronic controling lines 7. The semiconductor hardware or power converters 8. Power elctonis equipment: rectifiers and converters 9. Poer electronic equipment: semiconductor switches, transformers and compensators 10. The regimes of direct current lines 11. The transients in power systems 12. The dampind of transients with electronic devices 13. The electonic devices of power quality improving 14. The converters of alternative energy sources 15. The standards of electromagnetic compatibility
Energy Economics	3	To obtain the basic knowledge of energy economics , to understand the interraction between energy and economics, and the content and sense of the reforms in energy	The course has been prepared which allows realise the content of energy economics. The course allows to master theoretically and practically the main concepts and their interaction; to introduce to energy efficiency category and describes reforms and changes in Lithuanian energy which essence and significance are connected with improving energy efficiency.	1. Prolegomena of energy economics science 1.1. The content,underlying propositions,achievements and conclusions of energy economics sciensc 1.2. The main notions and concepts of energy economics and their interpretation in context of economical theory 1.3. Criteria of energy systems efficiency 2. The basics of analysis and evaluation of energy economical efficiency 2.1. The concept of energy efficiency in the context of sustainable development 2.2. The essence and alteraration of the energy reforms (liberalisation,restructuring,privatisation) in Lithuania 2.3. The basics of economic analysis of energy
Innovative Construction Product Manufacturing Technology	6	To provide knowledge on innovative construction products and their manufacturing methods, and develop practical skills in applying technical digital tools for the management and quality assurance of this construction information.	Technology solutions for the manufacture of innovative construction products are acquired. Knowledge about the essential properties of construction products is acquired, which are regulated at the national level. Students will be able to create this information in managing digital exchanges. Technical solutions are discussed while evaluating the advantages of innovative construction products.	1. Smart and advanced building materials - classification 2. Construction products and photovoltaic systems 3. Intelligent (Hi Tech) thermal insulation materials, coatings and systems 4. Innovative (smart) concrete, specific building blends 5. Environmental Friendly (Eco Friendly) Building Materials 6. Materials for passive fire protection systems 7. Spray coating (elastomeric waterproofing, diffusion, hydrophobic) 8. Application of nanotechnology in the construction industry 9. Data templates for construction objects 10. General and specific characteristics of construction products throughout the life cycle 11. EU and national legal regulation of construction products 12. Sustainable and innovative construction products 13. Modern production environment and its impact on the technological process 14. Construction products that reduce the CO2 footprint 15. Interoperability between construction products and building elements 16. Classification of construction products

Basics of Engineering	6	To convey the knowledge about mechanism structure. To give knowledge about main principles of thermal and fluid analysis. To give knowledge about machine elements, and develop the ability to construct	Module is directed to develop knowledge and abilities in the area of mechanical systems structure, main types of mechanisms. Students are taught to apply knowledge to do thermal and fluid flow analysis of various constructions. This module is help to learn to choose proper standard machine elements and check its functionality, to calculate main geometrical and functional parameters of non standard machine elements.	1. Engineering principles 1,1. Keystones of design 1.2. Machines and mechanisms theory 1,3. The failure prevention perspective 1,4. Materials selection 1,5. Response of machine elements to loads and environments:stress, strain and energy parameters 1,6. The role of safety factor; reliability concepts 1,7. Geometry determination 1,8. Methods to ensure mechanical resistance and stiffness 2. The basics of technical thermodynamics and heat exchange 3. Design of Mechanical Systems 3,1. 2D modeling 3,2. 3D Modeling 3,3. Solid modelling 3,4. Assembly modelling 3,5. Computer-aided draughting 3,6. Techniques for visual realism 3,7. Reverse engineering 4. Numerical analysis
Engineering Mechanics	6	Acquire knowledge of various theoretical and experimental methods to describe the mechanical behavior of structural elements, understand the main types of mechanisms, be able to select appropriate standardized machine elements.	Students are taught to apply knowledge of mathematics, science, and engineering dealing with mechanics of materials under axial loading, torsion, bending, and combined loading, design components to meet desired needs in terms of strength and defection, identify, formulate, and solve engineering problems related to the response of materials to various types of loading. To convey the knowledge about mechanism structure. To give knowledge about standard machine elements, and develop the ability to construct	1. Engineering principles 1,1. Keystones of design 1,2. Machines and mechanisms theory 1,3. The failure prevention perspective 1,4. Materials selection 1,5. Response of machine elements to loads and environments:stress, strain and energy parameters 1,6. The role of safety factor; reliability concepts 1,7. Geometry determination 2. Design applications 2,1. Power transmission shafting 2,2. Bearings and lubrication 2,3. Pressurized cylinders 2,4. machine joints and fastening methods 2,5. Springs 2,6. Gears and power transmitions 2,7. Brakes 2,8. Flywheels and high-speed rotors 3. Completing the machine
Introduction to Biomedical Materials Industries	6	To provide knowledge about the life of the academic community of Kaunas University of Technology, the essence of the study process in the fields of chemistry and natural resource technology, and the specifics of the Biomedical materials industries program at the university. To provide knowledge about biomedical materials, their application opportunities, recent research, achievements and perspectives, companies operating in the fields of processing natural resources and production of biomedical materials, and their contribution to Lithuanian industrial sector.	Knowledge about the life of the academic community of Kaunas University of Technology, the essence of the study process in the fields of chemistry and natural resource technology, and the specifics of the Biomedical materials industries program at the university is acquired. Knowledge about biomedical materials, their application opportunities, recent research, achievements and perspectives, companies operating in the fields of processing natural resources and production of biomedical materials, and their contribution to Lithuanian industrial sector is acquired.	1. Philosophy of Higher Education 1,1. Vision and Specifics of Studying in University. Academic Culture and Ethics 2. Study Programme "Biomedical Materials Industries": Aims, Goals and Study Process Organization 3. Biomedical Materials: Classification and Applications 3,1. Recent Research, Achievements and Perspectives in the Field of Biomedical Materials 4. Application of Advanced Manufacturing Technologies in Biomedical Materials Industries 5. Natural Resources Companies, Their Contribution to Lithuanian Industry 5,1. Career Opportunities 6. Academic Writing and Presentation Skills 6,1. Types, Structure, Language and Style of Academic Writing 6,2. Problem Argumentation, Goal and Task Formulation, Data Description and Analysis 6,3. Library: Searching for Information, Citation Requirements. University Forms and Templates 6,4. Principles of Effective Presentation 7. The Learning to Learn Competence. Organization of Learning: Setting Learning Objectives, Time Planning 8. Economic Growth and Principles of Sustainable Development 9. Material Flows and Resource Productivity
Introduction to Transport Engineering	6	To acquire knowledge about higher education, field of transport engineering study and programme particularity in university studies, develop abilities to study and general competences, allowing to understand content of studies, career possibili-ties, requirements of academic literacy.	Knowledge about higher education and studies in university, particular field of transport engineering study, it's specifics is acquired. Content of studies is seized. Is possible to understand value of scientific information. Student is introduced to scientific research, career possibilities. Student is capable of preparing study tasks with accordance to require-ments. Competences, needed to work in a team and studying individually are nurtured.	1. Philosophy of higher education 1,1. Vision and specifics of studying in university 1,2. KTU academic culture and ethics 2. Field of studies specifics 2,1. Content, aims and logics of study program, spectrum of specialty activities 2,2. Sustainable transport system 2,3. The interactions between system "Vehicle - Driver - Environment" elements 2,4. Vehicles of energy-efficient and environmentally-friendly 2,5. Intelligent Transport Systems / New Movement (Unmanned) and Communication Technologies 2,6. Engineering systems of Terminals/Logistics center systems 2,7. Latest practical field of work, trends, achievements, challenges, spectrum of solved problems 3. Career 3,1. Visits of practicians to the lecture, cognitive trips to companies or organizations 3,2. Career planning. Perspective, required competences 4. Academic writing 4,1. Types, structure and content of written academic works. It's language, style and vocabulary particularities. Description 4,2. Library. University's forms and templates. Quoting requirements 5. Competences of being able to study 5,1. Organizing studies: raising learning objectives, time planning 5,2. The principles of effective presentation 5,3. Career planning, CV content, Portfolio makeup 6. Fundamentals of professional (engineering) communication
Sensors	3	To provide students with knowledge about the classification of sensors, principles of operation, their main characteristics, areas of application, to develop students' abilities to understand the physical principles of operation of sensors.	To learn to understand the main physical principles of the sensors, converters and collection of information. The abilities about sensors and converters and industrial electronic systems are given. The main application of physical phenomena, effects and their principles are learned. The methodic of information gathering is mastered.	1. Introduction 2. Sensors characteristics 3. Physical principles of sensors operation 4. Temperature sensors 5. Pressure sensors 6. Liquid and gas flow sensors 7. Velocity and acceleration sensors 8. Power and extension sensors 9. Humidity sensors 10. Magnetic and electromagnetic field sensors 11. Optical sensors 12. Sound sensors 13. Resonanse sensors 14. Radiactivity and x-ray sensors 15. Chemical sensors 16. Gas sensors 17. Sensors for electrical energy systems 18. Smart sensors and intelligent sensor systems 19. Sensors in the system "man - environment". The development tendencies
Chemistry and Technology of Cosmetics	6	To get knowledge about the main materials used for cosmetics, their characteristics, ingredients function, and to formulate a cosmetic product.	General knowledge about raw materials used for cosmetics, their characteristics and main functions in cosmetics formulations is acquired. Knowledge about chemistry and technology of cosmetics, such as hair care products, skin care products, decorative cosmetics, personal hygiene products is acquired.	1. Cosmetic products, their classification. Requirements for cosmetic products 2. Types of raw materials used in cosmetics 3. Detergents, their classification and properties 4. Formulation and preparation of hair care products 5. Hair styling products 6. Skin care products 7. Methods of emulsions preparation 8. Decorative cosmetics 9. Face powders, face make-up, lipsticks 10. Nail polish, eye make-up products 11. Personal hygiene products, deodorants, antiperspirants 12. Cosmetic manufacturing equipment. Sustainability and innovation in the cosmetic industry

Cultural Industries	6	Acquire the knowledge and skills for cultural and creative industries theoretical conceptualization, development of this sector, project creation analysis in the context of philosophy and mediality.	Student perceives the knowledge in problematics of cultural and creative industries conceptualization and development, definition of culture as the human kind creativity, specifics of the implementation of industries programmes and projects, knows and understands sectoral priorities of industries, understands the ideological, managerial, economic and political contexts, which influences cultural and creative industries, theories of cultural and creative industries, strategic steps of projects creation, recognizes links between creative industries construct, knowledge economy and leadership approach, knows the impact of media as the system on culture and the impact of culture on media.	1. The conceptual ground for cultural and creative industries. 1,1. Cultural and creative industries concept and development. 1.2. The object of cultural industries, sectoral priorities and goals. 1,3. Construct of creative industries according to knowledge economy and leadership. 1,4. The innovative/technological nature of creative industries. 1,5. Ideological, managerial, economic and political contexts, which are influencing industries. 1,6. Cultural and creative industries: individuals and interests. 2. Cultural and creative industries theories according to philosophy approach. 2,1. Culture as the human kind creativeness, philosophical principles of creativity. 2.2. The system of cultural and creative industries, value duality. 2.3. Cultural policy and art organizations theories. 2.4. Industries formation models (liberal, socio democratic, corporate, prestige and etc.). 2.5. Smart cultural and creative industries governance. 3. Cultural and creative industries sector development. 3,1. Cultural goods and services, influenced by the technological and governance reforms. 3.2. Institutional structure of cultural sector at the state level. 3.3. Strategic planning in developing the cultural and creative industries sector. 3.4. Cultural and creative industries programs and projects implementation. 3.5. Industries sector development practice at the international and national level. 4. Perspectives of cultural and creative industries development. 4,1. Success factors of industries development. 4.2. Competencies of strategic thinking and creative problem solving. 4.3. Perspectives of networking and partnership. 4.4. Possibilies and threats of technological mediality. 4.5. Sustainable and ethical development of cultural and creative industries. 4.6. Postmodern tendencies of cultural and creative industries development.
Fuel Cells and Energy Storage Systems	3	To acquire the basic knowledge of operating principles, design features, use in electric power generation, accumulation and supply of the various fuel cells and electrochemical energy storage devices.	Knowledge about diversity and construction characteristics of different types of fuel cells and energy storage devices and their application in the various areas of technique, domestic, and power systems is acquired. Ability to understand operating principles and electrochemical processes taking place in the different types of fuel cells and energy storage devices is gained. Knowledge how to calculate parameters of different types of fuel cells and energy storage devices is obtained. Knowledge about technologies of fuel cells and electrochemical energy storage devices applicable in various fields.	1. Fuel cells and electrochemical energy storage devices 1,1. The basics of fuel cells and electrochemical energy storage devices 1.2. Operation of fuel cells and electrochemical energy storage devices 1,3. Types of fuel cells and electrochemical energy storage devices 1,4. Technologies of fuel cells and electrochemical energy storage devices 1,5. Fuel used in fuel cells 1,6. Fuel cells, electrochemical energy storage devices and environmental protection 2. Energy storage devices 2,1. The technologies of energy storage 2.2. Types of energy storage devices and the processes in them 2.3. The main characteristics and parameters of energy storage devices 2.4. Operation of energy storage devices in the system 2,5. Operating characteristics of the hybrid system 2.6. Energy storage devices and environmental protection
Logistics	6	To acquire knowledge and ability to apply functions of logistics in order to solve the company's supply, production and distribution issues. To understand the goals and objectives of logistics, its importance in the product supply chain.	There are assimilated knowledge and abilities, which allow to understand the essence of logistics, logistics goals and objectives, the role of logistics in the supply chain. According to the internal and external factors, students are capable of various theoretical arguments for the selection of organizational decisions, addressing the company's supply, production, and distribution issues. Assimilating the main concepts of business logistics and their application possibilities students are able to design and evaluate critically the key elements of modern business logistics system.	1. THE ESSENCE AND PURPOSE OF LOGISTICS 1,1. The Concept and Definitions of Logistics 1.2. Goals, Objectives, Emergence Assumptions and Development Stages of Logistics 1,3. The Role of Logistics in the Value Creation Chain 2. MANAGEMENT OF LOGISTICS SYSTEMS 2.1. The Concept and Theoretical Basis of Logistics Operation 2.2. Types of Logistics Systems 2.3. Information Systems in Logistics 2.4. Logistics System Design and Planning 3. CONTENT OF BUSINESS LOGISTICS 3,1. Supply Logistics 3,2. Production Logistics 3,3. Stock Management and Warehousing Logistics 3,4. Transportation Logistics 3,5. Reverse Logistics 3,6. Green Logistics 3,7. Changes and Trends in Modern Logistics 4. Introduction to Operations Research 4,1. Demand forecasting access 4.2. Resource allocation access 4,3. Route planning access 4,4. Room layout access 4,5. Statistical modeling of processes
Mathematical Analysis 3	6	The aim is to acquire the ability to analyze the elements of linear and surface integral, field theory and complex variable function theory.	Line integrals. Surface integrals. Introduction to vector field theory. Functions of a complex variable.Contour integrals. Laurent expansion of analytic function. Residue of an analytic function.	1. Introduction to field theory 2. Line integrals of first type 3. Line integrals of second type 4. Green's theorem 5. Integration of exact integrals. 6. Two-sided surface. Surface integrals of first type and second type. 7. Properties of surface integrals. Main calculate formulas. 8. Applications of surface integrals. 9. Gauss theorem. Stoke's theorem. 10. Vector field . Vector line. 11. Flux of a vector field.Irrotational field. 12. Line in the complex plane. Domain of a map. 13. Complex-valued function. 14. Analytic function. 15. Conformal mapping. Harmonic functions. 16. Cauchy integral theorem and Cauchy integral formulas 17. Power series. Laurant' s series. 18. Classification of singularities. Residues.
Mathematical Analysis 3	6	To gain ability to analyze elements of line and surface integrals, field theory and differential equations, to apply computational formulas and logic and freely manipulate concept of these theories. To gain knowledge of methods used to solve differential equations; to gain skills in constructing solutions to first order differential equations and systems of linear differential equations with constant coefficients.	The theory of line and surface integrals of the first and second kind is taught, as well as application of such integrals in field theory. It is learned to evaluate line and surface integrals, the main numerical characteristics of field theory. The concept of differential equations as a model for real world processes is presented. It is learned to construct solutions to first order equations; the concept of the Cauchy initial value problem and the theory of uniqueness and existence of solutions is introduced; skills are gained to construct solutions to systems of linear differential equations and 2nd order differential equations with constant coefficients using several different techniques.	1. Introduction to field theory 2. Line integrals of the first kind, their properties and applications 3. Line integrals of the second kind 4. Green's formula and its corollaries 5. Integration of total differentials 6. Two-sided surfaces. Surface integrals or the first and second kind 7. Properties of surface integrals and their evaluation formulas 8. Application of surface integrals 9. Gauss and Stokes formulas 10. Vector field and vector curves 11. Flow of a vector field. Irrotational fields 12. Main concept of differential equations. First order equations 13. Implicit equations. Parametrical form of solution 14. Cauchy problem. Special solutions 15. Normal systems. Dependence of the solution on parameters 16. Systems of linear differential equations and algorithms for its integration 17. Second order differential equations
Mathematical Physics and Numerical Methods	6	To get knowledge of vectorial and tensorial fields. To gain solution methods for differential equations with partial derivatives. To obtain abilities to use obtained knowledge for solution of different mathematical physics tasks.	Gained knowledge about vectorial and tensorial fields. Gained solution ways and methods for differential equations with partial derivatives. Gained abilities to use obtained knowledge for solution of different mathematical physics tasks.	1. Scalar vectorial and tensorial fields in a plain. 2. Orthogonal vectors and tensors in 3D and multi-dimensional Euclidean spaces. Vectorial analysis. 3. Field theory in curvilinear coordinate system. 4. Derivation of main equations in mathematical physics. General integrals for these equations. 5. Finding general solutions for differential equations with partial derivatives using variable separation method. 6. Integration of mathematical physics equations in cylindrical coordinate system. Bessel functions. 7. Integration of mathematical physics equations in spherical coordinate system. Legendre polynomials. 8. Green's functions method.
Mathematical Physics and Numerical Methods	3	To get knowledge of vectorial and tensorial fields. To gain solution methods for differential equations with partial derivatives. To obtain abilities to use obtained knowledge for solution of different mathematical physics tasks.	Gained knowledge about vectorial and tensorial fields. Gained solution ways and methods for differential equations with partial derivatives. Gained abilities to use obtained knowledge for solution of different mathematical physics tasks.	1. Scalar vectorial and tensorial fields in a plain. 2. Orthogonal vectors and tensors in 3D and multi-dimensional Euclidean spaces. Vectorial analysis. 3. Field theory in curvilinear coordinate system. 4. Derivation of main equations in mathematical physics. General integrals for these equations. 5. Finding general solutions for differential equations with partial derivatives using variable separation method. 6. Integration of mathematical physics equations in cylindrical coordinate system. Bessel functions. 7. Integration of mathematical physics equations in spherical coordinate system. Legendre polynomials. 8. Green's functions method.
Design of Mechanical System	6	To provide knowledge of mechanical system design philosophy, design principles and methods, and design stages, and to develop mechanical construction analysis skills necessary for making decisions during the design, performing systematic calculations, preparing technical tasks and technical documentation, and independently designing mechanical systems.	The principles and methods of designing mechanical systems are learned. Knowledge of analysis of mechanical structures and systematic calculations and preparation of technical documentation of the product being developed is acquired. Ability to independently design mechanical systems using CAD software.	1. Conception of design 2. Standards. The stages of design and documentation 3. Application of general methods for products design and assesment 4. Product planning. Technical task. Conception 5. Methods and principles of design 6. The modular design 7. Computer aided design 8. Analysis and modernization of constructions 9. Dimensions and tolerance stacking 10. Product design, ergonomics, ecology

Fundamentals of Mechanical Systems Design	6	To provide knowledge of mechanical system design philosophy, design principles and methods, and design stages, and to develop mechanical construction analysis skills necessary for making decisions during the design, performing systematic calculations, preparing technical tasks and technical documentation, and independently designing simple mechanical systems.	The principles and methods of designing mechanical systems are learned. Knowledge of analysis of mechanical structures and systematic calculations and preparation of technical documentation of the product being developed is acquired. Ability to independently design simple mechanical systems using CAD software.	1. Conception of design 2. Standards. The stages of design and documentation 3. Application of general methods for products design and assesment 4. Product planning. Technical task. Conception 5. Methods and principles of design 6. The modular design 7. Computer aided design 8. Product design, ergonomics, ecology 9. Analysis and modernization of constructions 10. Dimensions and tolerance stacking
Basics of Media Philosophy	6	To acquire kthe nowledge about classical and contemporary media theories and find differences between traditonal media concept and the view toward media which appears from new media reflection.	Students acquire the knowledge about evolution of media and its theoretical reflections: the birth of media reflections in antiquity and modern age, the concepts of pioneers of media theory, the evolution of the concepts in second half of 20th century and at the beginning of 21th. Students are able to understand the ways of media typologization, the difference between the 'old' and the 'new media', in particular AI. Students are able to apply the concepts of media theories and understand the arguments of their critics.	1. What Is It - Media Philosophy 2. Plato - Reality, Philosophy, Truth 3. Allegory of the Cave and AI 4. What is the New Media 5. Medium Is the Message 6. Hot and Cool Media 7. Media Narcosis 8. Contemporary Pop-Culture 9. DI, Consciousness and Unconsciousness 10. The Culture in the Age of AI 11. Information Society 12. Network Ethics and AI 13. Contemporary Theories of Communication 14. Digital Humanities and Media Ecology 15. Singularity and Transcendence
Architectural Materials	3	To know the properties of building materials, exploitation conditions, material compatibility in structures and be able to recognize and to analyse popular building materials and to understand the process of developing advanced building materials and their use.	Students acquire knowledge on the classification and common properties of building materials. They are able to select and to apply building materials from natural stone and wood products, ceramic materials, glass products, metal products, mineral binding materials, concrete, mortar, concrete and concrete products, organic and synthetic binding materials and their products for buildings structures, heat insulation, decoration and other functional use. Students also acquire knowledge of building materials and architecture interface. Students understand the process of developing advanced building materials and their use.	1. Introduction 2. Classification of building materials 3. Properties of building materials 4. Building materials from natural stone 5. Timber and it's products 6. Ceramic materials 7. Mineral binding materials and their products 8. Concrete, innovative (Smart) concretes, special dry mortar mixtures 9. Precast concrete products 10. Glass products 11. Metal products 12. Polimeric materials and products 13. Thermal insulating materials 14. Building materials and products reducing CO2 emission 15. Environmental friendly (eco-friendly) building materials 16. Intelligent (Hi-Tech) materials, coatings and systems 17. Photovoltaic systems in construction
Urban and Regional Development	6	To provide theoretical knowledge and practices about urban and regional development management as well as to develop competencies needed to develop cities and regions.	During this course, participants will be introduced to theories and practices about the management of cities and regions along with aims and methods to develop a city or region. Participants will be able to identify, apply, analyse and evaluate various measures for city or region development.	1. Multi-level governance. Social-spatial systems. Definitions of "city"/"urban". Role of cities in contemporary society 2. Concepts of the city: the city as a system; as a process; as an organization; as a network 3. Origin and evolution of cities in the world and Lithuania 4. Region: concept, typology. Administrative regions: characteristics, role, functions, management 5. Urban and regional development (social & spatial) management methods 6. Financing of urban and regional development 7. Place (urban, regional) marketing: market of places, participants, their aims, exchanges, offers 8. The role of society to develop cities and regions 9. Future trends in urban and regional development; Sustainable Development; Smart cities and regions
Nutrition and Food Toxicology	6	To provide knowledge and to develop competence necessary for evaluation the role of nutrition on health, food digestion and absorption, nutrients and energy balance ar well as the possible toxic compounds in food, their effect on health and quantity reduction possibilities.	The knowledge about the role of nutrition in human health, nutrients and energy balance in human body, food digestion and absorption, as well as the knowledge about the toxic compounds in food, their origin, metabolism and influence on human health are obtained. The methodologies of dietary allowance measurement and energetic value calculation are acquired. The abilities to analyse and choose the means to avoid food contamination, to apply different instrumental methods for toxic compound analysis, to evaluate critically various dietary guidelines are acquired.	1. Classification of toxic compounds and evaluation of their biological activity. Toxicokinetics and toxicodynamics 2. Naturally inherent plant toxicants in food products 3. Naturally inherent toxins in mushrooms and animal tissues 4. Fungal toxins and their influence on human health 5. From the environment to food entering toxic compounds (food contaminants) 6. Toxic compounds formed during food processing and storage 7. Toxicological aspects of use of food additives 8. The influence of new food processing and development methods on food safety 9. Allergic reactions to foods 10. Material and energy metabolism in the human body. Energy demand and consumption 11. Food digestion and absorption of nutrients 12. The nutritional relationship with the health and quality of life. Principles of rational nutrition 13. Criteria for normalizing of food components in human nutrition 14. The role of main food components in the diet, their energy and nutritional values as well as their evaluation 15. Biologically active substances and their role in the diet
Science and Technology Studies	6	To gain knowledge about science, technology and society studies, historical development of science and techology in relation to civilisation development, understand the notion of technoscience and science policy; be able to analyse the impact of technologies upon society.	Student has gained knowledge about the concept and content of science and technology studies, its historical development, implications in the context of globalization and in comparative perspective; is able to describe and explain institutionalization of science and science policy, is able to discuss and analyze the social impact of technoscience.	1. Science, technology and society studies (STS): the object, concepts and content 2. The historical context and developmental perspectives of science and technology 3. The comparative science and innovation policy 3,1. Lithuanian science policy 3,2. Science and innovation policy in EU 3,3. Other national innovation systems (USA, Japan, etc,) 4. Structure of scientific revolutions 5. Public participation in science, technology and innovation policy 6. The evaluation methods of social impact of technologies 7. Science and technological development in the context of globalization 7,1. Ethical and legal aspects 7,2. Development of science and technology for sustainable human development
Development of New Product of Fashion	6	To get knowledge about stages of new product creation, to know principles of the choice of materials and technological processes for development of new textile product.	Will be obtained the basic knowledges about creation and development of new product, knowledges which will let to evaluate stages of development of new fashion product (from idea to textile market). During studies will be educate ability to solve textile products development tasks from the point of creative and critical view.	1. Conception of new product development 2. Stages of new product development 3. Evaluation of market and users needs 4. Review of new textile and apperal products market 5. Practical aspect of innovation in textile and apperal industry 6. Case studies - analysis of textile product development in textile company 7. Development of eco-friendly fashion product 8. Protection of product intellectual property
Aircraft Design Manufacturing Internship	12	Access to aviation the company activities and acquire skills to apply their theoretical knowledge in practical aircraft design, maintenance and producing processes tasks.	Assimilating advanced aircraft maintenance and repair technology, the ability to use existing equipment in aviation company, the assessment of safety and ecological production requirements, design of aircraft maintenance and technological processes of repair of elements, equipment and aircraft systems to improve the design of aircraft structures.	1. Functional activities of aviation enterprise 1,1. Production, performed activities 1,2. Principles of organization of working places in subdivisions 1,3. Functional activities of engineering-technical personnel 1,4. Work safety and ecology 2. Industrial work in enterprise of aircrafts maintenance 2,1. Means of production and repair of detailes 2,2. Technological processes of repair of main units and systems 2,3. Means and methods of control 2,4. Regulation of technical maintenance 3. Strategy of aviation enterprise 3,1. Technico-economic indises of enterprise 3,2. Managemental structure of enterprise 3,3. Organization of service, work with customers 3,4. Means of assuransе of secondary use of materials and units 4. Design of engineering processes in aviation enterprise 4,1. Principles of workability restoration of aircrafts 4,2. Technological processes of repair and maintenance 4,3. Contructional changes of aircrafts 4,4. Selection and use of equipment of aircraft systems

Building Services Systems	6	Will gain knowledge about main building services systems, their components, selection and operation features and will learn to design the water supply, sewage, heating and ventilation systems of an individual residential building, justify made decisions, prepare system drawings and other project documentation in accordance with the requirements of valid legal acts and good design practice.	Students acquire basic knowledge about building service systems, their types and basic schemes of these systems, operation of these systems and equipment used in residential, public and industrial buildings. Students acquire possibility to name the features of installation and operation of these systems. Students acquire design skills to design systems and select necessary devices for residential buildings, according valid legal documents.	1. WATER SUPPLY AND SEWERAGE SYSTEMS 1,1. Building water supply systems, components, equipment, materials. 1.2. Building water demand, hydraulic calculations of water supply systems, equipment selection. 1,3. Building sewage systems, components, equipment, materials. 1,4. Hydraulic calculations of building and outdoor sewage systems. 2. HEATING SYSTEMS OF THE BUILDINGS, HEATING SUPPLY 2,1. Methods of heat distribution in premises. The power of the building's heating system. 2.2. Heating system power regulation. Thermal energy accounting. Types of heat carrier distribution systems. 2.3. Purpose, types and selection of heating system components. 2.4. Design of heating system, hydraulic calculation. 2.5. Heat generation and supply systems. 3. RENEWABLE ENERGY SOURCES 3,1. Renewable energy sources. 3,2. Use of renewable energy sources in building services systems. 4. VENTILATION SYSTEMS OF THE BUILDINGS 4,1. Indoor air quality. Types of ventilation systems. 4,2. Air preparation and distribution in premises. 4,3. Purpose, types and selection of ventilation system components. 4,4. Design of ventilation system and aerodynamic calculation. 4,5. Air conditioning. Other ventilation systems.
Purchasing Management	6	To acquire knowledge on purchasing management at an organization by analyzing the process, context, and theoretical elements and, consequently, be able to practically demonstrate the skills of constructing a purchasing cycle in a contemporary business context.	The body of knowledge is built by learning the purchasing cycle and its dominant practices. The understanding of purchasing management as an important function in the context of organization management is acquired. Major concepts, principles, and conditions are clarified, specifications and activities of purchasing cycle stages are analyzed. The acquired theoretical knowledge is employed in a practical setting of developing a particular purchasing task; students' skills are revealed when an optimal purchasing cycle for a business company is constructed with the aplication of specific tools and techniques.	1. Purchasing Management as an Organizational Function 1,1. Purchasing and procurement concepts. Purchasing in organizational hierarchy 1,2. Purchasing strategy and organization. 1,3. Public procurement peculiarities. 2. Purchasing Specification and Planning: 2,1. Identifying the needs and modelling the purchasing system. Price and total cost of ownership. 2.2. Supplier analysis. Stock control. 2,3. Project procurement. 2,4. Purchasing order formulation. 3. Contracting: 3,1. Contract types and formation process. 3,2. Activities and processes of contract implementation and management 3,3. Contract negotiation. 4. Formation of the Purchasing Cycle: 4,1. Tools, supporting techniques, and platforms of cycle modelling. 4,2. Purchasing research and ethics 4,3. Managing risk in purchasing. Sustainability and latest development trends.
Basics of Industrial Biotechnology	9	To obtain knowledges about modern industrial biotechnology achievements, industrial biotechnology and bioeconomy development, to understand the production of organic acids, amino acids, sugar alcohols, vitamins, antioxidants, bioplastics technologies, to obtain knowledge about natural bioactive components extraction, biochemical processing of industrial waste, fundamentals of biodiesel production.	The students are taught to understand the conception of modern industrial biotechnology.The students are taught to understand production of organic acids, amino acids, about technology of bioplastics and biocomposite materials, about extraction of natural bioactive components and fractionation from plant materials, about biochemical processing of industrial waste, about fundamentals of production of biodiesel.	1. Modern industrial biotechnology. 1,1. Development of industrial biotechnology. 1.2. Modern technologies. 1,3. Synthetic biology, metabolic engineering. 2. Organic (propionic, sorbic, citric, ascorbic) acids, amino acids production. 3. Production of sugar alcohols (manitol, xylitol, sorbitol) and scented materials. 4. Production of vitamins, antimicrobial components/bioproducts, antioxidants, functional proteins (nucleotids). 5. Bioplastic and biocomposite materials technology basics. 6. Processing technology basics of raw materials used for bioplastics. 7. Product engineering, product recycling and composting technologies. 7,1. Biodegradability, regulation of products and legislation. 8. Extraction and fractionation of natural bioactive components from plant materials. 9. Biochemical processing of industrial waste. 10. Biomass and processes of biochemical decomposition of pollutions. 11. Biochemical oxidation and nitrification processes. 11,1. Processes of biochemical removing of biogenic materials. 12. Fundamentals of technology biodiesel production.
Security Concepts and Their Evaluation	6	A theoretically-oriented unit meant to examine various concepts of security across social sciences and the evolution of these concepts over time.	To expose students to a range of core security concepts and their methods of analysis across various social science disciplines. The examination of threats, risks and vulnerabilities as viewed from psychology, sociology, economics and political science covers core analytical approaches to security. It is a theoretically-oriented unit, which develops students' conceptual and analytical skills.	1. Traditional approaches to security 2. Critical security discourses 3. Securitization 4. Regime security 5. Societal security 6. Environmental and energy security 7. Gender and security 8. Peace studies
Basics of Fluid Mechanics	3	To acquire knowledge about the laws of fluid equilibrium and motion, the conditions of equilibrium of forces acting on liquids, to be able to construct equations describing them. To develop the ability to apply the equations for the solution of fluid mechanics problems.	The students acquire abilities to understand the laws of fluid mechanics and be able to apply them in practice. They are able to describe by analytical equations definite cases of fluid equilibrium and motion, to apply the equations for analysis of fluid mechanics phenomena. Students are able to compute the main forces of fluid pressure, parameters of fluid flow in closed conduits and open channels, to calculate the energy and hydraulic losses of the fluid flow, to select pipes, pumps, dimensions of channels cross-section, to estimate characteristics of the total system.	1. Physical and mechanical properties of fluids 2. Conception of a fluid, types and properties of it, measurement units and gauges 3. The main law of hydrostatics, Pascal's law 4. The main force of liquid pressure 5. Flow continuity equation 6. The main characteristics of fluid flow 7. Bernoulli equation and possibilities of it's application for design of hydraulic systems 8. Chezy formula, application of it for design of pipelines 9. Fluid flow through orifices and nozzles 10. Phenomena of hydraulic hammer and cavitation 11. Open flows, their types and characteristics 12. Application of Chezy formula for design of open channels 13. Interaction of fluid flow and vane of hydraulic machine, hydropower 14. Centrifugal pumps and turbines, their characteristics 15. Ground water flow
Information Modelling of Manufacturing of Construction Products	9	To obtain a systematic understanding management of the manufacturing of construction products, using the deployment strategy of Building Information Model (BIM).	Information modelling of manufacturing of construction products is acquired, which aims to clarify the objectives of the specific implementation methods and processes, using necessary information tools. The knowledge about the infrastructure needed to implement BIM is learned and needs of specialized jobs and how company staff perceives their responsibilities and roles.	1. Strategy of design and manufacturing processes of construction products using BIM. 2. Information exchange of digital construction project participants and their management process. 3. Standard of universal building data exchange and the project participant's communication with manufacturing. 4. Organizing BIM plan and its benefits at the manufacturing plant. 5. Infrastructure needed to implement BIM needs. 6. Roles, responsibilities and sustainable management of risk in manufacturing. 7. Classification of construction products and its coding system at the manufacturing plant. 8. Management of manufacturing technology of construction products using BIM. 9. Integration of people, processes and manufacturing technology in digital plan of work stages. 10. Stages of project model development, correction of clashes. 11. Levels of detail and information of BIM templates. 12. Design and implementation of manufacturing processes of construction products using BIM. 13. Analysis of processes maps of digital construction. 14. Transfer devices of parametric data of construction products.
Technical Evaluation of Buildings	3	To acquire knowledge of essential requirement, the causes of collapses and defects, expertises and investigation of buildings. To learn to apply the methods of reliability evaluation of buildings.	Knowledge about the essential requirements of buildings, the means of evaluation of conformity of buildings to these requirements and investigation of buildings is obtained. Ability to evaluate the defects of buildings and their parts, and durability affecting impacts is gained. Knowledge about the methods of determination of building reliability after collapses and structural defects is obtained. Experience of preparing recommendations for repair and modernisation of buildings, ensuring their conformity to essential requirements, is gained.	1. Essential requirements of buildings 2. Expertise and investigations of buildings 3. Impacts causing collapses and deformations of buildings. 4. Methods for evaluation and reconstruction of strength and stability of buildings after collapses and deformations 5. Methods of evaluation of reliability of load bearing elements 6. Assurance of hygienic, health and environment conditions for people in being buildings and near the buildings 7. Safety in use of buildings 8. Noise management in buildings and building environment 9. Evaluation of energy efficiency and heat conservation in buildings 10. Defects and durability of building elements 11. Strategy of restoration and modernization works of buildings 12. Technical and economical justification of restoration and modernization works in buildings
Technical Evaluation of Buildings	6	To acquire knowledge of essential requirement, the causes of collapses and defects, expertises and investigation of buildings. To learn to apply the methods of reliability evaluation of buildings.	Knowledge about the essential requirements of buildings, the means of evaluation of conformity of buildings to these requirements and investigation of buildings is obtained. Ability to evaluate the defects of buildings and their parts, and durability affecting impacts is gained. Knowledge about the methods of determination of building reliability after collapses and structural defects is obtained. Experience of preparing recommendations for repair and modernisation of buildings, ensuring their conformity to essential requirements, is gained.	1. Essential requirements of buildings 2. Expertise and investigations of buildings 3. Impacts causing collapses and deformations of buildings 4. Structural defects, damage and their causes 5. Investigations of structural condition, investigation of physical and mechanical properties of materials 6. Defect and defect detection 7. Safety in use of buildings 8. Noise management in buildings and building environment 9. Evaluation of energy efficiency and heat conservation in buildings 10. Defects and durability of building elements 11. Strategy of restoration and modernization works of buildings 12. Technical and economical justification of restoration and modernization works in buildings

Heating, Ventilation and Air Conditioning Systems	9	To provide knowledge about the types, equipment, installation, control, operation of heating, cooling, ventilation and air conditioning systems in buildings, and to develop the design competencies of such systems.	Theoretical and practical knowledge are obtained about heating, cooling, ventilation and air conditioning (HVAC) systems in residential, administrative and small industrial buildings, schemes of HVAC systems, its functioning, used facilities, installation, setting, adjustment and service of operating. Knowledge and skills are obtained in design HVAC systems as well as selection of its elements, technology of installation and management.	0. History of heating, ventilation and air conditioning systems 1. Ventilation and air conditioning 1,1. Indoor air quality 1,2. Types and features of ventilation and air conditioning systems 1,3. Equipment of ventilation and air conditioning systems 1,4. Humid air and air handling processes 1,5. Air jets and air distribution in rooms 1,6. Industrial ventilation, air filtration and aspiration based systems 2. Heating and cooling 2.1. Thermal comfort in buildings 2.2. Types and features of heating and cooling systems 2.3. Water heating and cooling systems and auxiliary equipment 2.4. Hydraulics of water heating annd cooling systems 2.5. Local heating and cooling systems 2.6. Radiant heating 2.7. Air heating and cooling systems 2.8. Boiler rooms and central heating systems 2.9. Environment protection and use of renewable energy sources for heating and cooling systems 3. Fundamentals of building heating, ventilation and air conditioning systems design 3,1. Calculation of air change rates in buildings 3.2. Aerodynamic calculations of ventilation systems 3.3. Calculation of heat gains in buildings 3.4. Air handling processes and control 3.5. Calculation of heat losses in buildings 3.6. Evaluation of building heat demand 3.7. Hydraulic calculation of water heating and cooling systems 3.8. Selection and layout of equipment for heating, ventilation and air conditioning systems 3.9. Composition of heating, ventilation and air conditioning projects, drawings and bill of materials 4. Fundamentals of building heating, ventilation and air conditioning systems testing 4,1. Test of multi nozzle diffuser 4.2. Investigation of air flow in ducts 4,3. Investigation of air handling processes in air conditioning systems 4,4. Fundamentals of heating and cooling systems balancing
Heating, Ventilation, and Air Conditioning Systems	6	To provide knowledge about the types, equipment, installation, control, operation of heating, cooling, ventilation and air conditioning systems in buildings, and to develop the design competencies of such systems.	Theoretical and practical knowledge are obtained about heating, cooling, ventilation and air conditioning (HVAC) systems in residential, administrative and small industrial buildings, schemes of HVAC systems, its functioning, used facilities, installation, setting, adjustment and service of operating. Knowledge and skills are obtained in design HVAC systems as well as selection of its elements, technology of installation and management.	1. Ventilation and air conditioning 1,1. Indoor air quality 1.2. Types and features of ventilation and air conditioning systems 1,3. Equipment of ventilation and air conditioning systems 1,4. Humid air and air handling processes. Air heating and cooling. 1,5. Air jets and air distribution in rooms 1,6. Industrial ventilation, air filtration and aspiration based systems 1,7. Test of multi nozzle diffuser 1,8. Air currents and air circulation in rooms 1,9. Investigation of air handling processes in air conditioning systems 2. Heating and cooling 2.1. Thermal comfort in buildings 2.2. Types and features of heating and cooling systems 2.3. Water heating and cooling systems and auxiliary equipment 2.4. Hydraulics of water heating and cooling systems 2.5. Radiant and local heating and cooling systems 2.6. Boiler rooms and central heating systems 2.7. Environment protection and use of renewable energy sources for heating and cooling systems 2.8. Fundamentals of heating and cooling systems balancing
International Textile and Clothing Industry	6	To provide knowledge about global textile and clothing industry, production technological processes and quality management.	Knowledge about international textile and clothing industry, it's peculiarities and tendences of development are provided. Processes and equipments of product development and production are studied. Knowledge about quality management are provided, to evaluate the quality of textile materials and clothing, to prepare and analyze production technological documentation are taugth. Knowlegde about general principles of technical design of clothing technological processes as well as work organization is provided and ability to apply it in engineering practice is built.	1. Global textile and clothing industry. Peculiarities and tendencies of development 2. Global fashion industry 2,1. Production shift 2.2. Production in Far East 2.3. Trasformation of production companies in Europe 3. Planning of production 3,1. Production development proceses 3.2. Project of production proceses 3.3. Ergonomics of workplace and work safety 3.4. Design of enterprise, evaluation of efficiency 3.5. Quality management and sustainable development 4. Design of the production processes 4.1. Determing production capacity needs 4.2. Production costs and price
International Trade Operations	6	To assimilate knowledge of international trade operations management, be able to evaluate impact of export and import operations benefit to a company, to make decisions on export and import policy formation.	Knowledge about the specifics and indicators of international trade in goods and services is acquired. Abilities are gained to evaluate the impact of digitalization on the development of international trade. The students will be able to apply evaluation of the peculiarities and consequences of the use of international trade operations control and regulation forms and methods. Abilities are gained to plan and organize international trade operations while evaluating a company's opportunities, choosing potential export markets and forms of international trade operations. Abilities are gained to prepare an export contract and export pricing strategy according to the needs of a company.	1. Development trends of international trade. 1,1. The impact of digitalisation on the development of international trade. 1,2. Specifics and indicators of international trade in goods and services 1,3. International trade in the context of sustainability 2. Regulation of international trade operations in globalization and economic integration conditions. 2,1. The forms of regulation of international trade operations. 2.2. Restrictions on international trade in services and their liberalization. 2.3. Measures of export and import operations regulation and evaluation of their using. 3. Planning and organization of international trade operations. 3,1. Analysis and evaluation of a company's potential and needs to export and import. 3,2. Criteria and methods of potential market selection. 3.3. Selection of export and import operations form. 3.4. Export contract and pricing strategy. 4. Control of international trade operations. 4,1. Customs activity and functions in modern conditions. 4,2. Procedures and control of export and import.
Technical Creativity and Intellectual Property	3	To provide knowledge of the principles and methods of creating technical innovations and to gaion competences in the development of new technical objects, to develop the skills necessary to apply the legal protection of intellectual property.	Technical creation and its management principles. The importance of simulation, optimisation and design. Rules and principles of invention training. Creation and legal protection of intellectual property. Patenting of technical innovations. Ecodesign methods of new technical decisions. Formulation and analysis of technical problems, the search of analogues, their evaluation and definition of design process sequence. The solution of concrete technical problems.	1. Principles of technical creation management 1,1. Engineering tasks 1.2. Features of skilled engineer 2. Three main spheres of engineer work 2.1. Simulation 2.2. Optimisation 2.3. Design process 3. Is it possible to learn to invent 4. Application of the principles of sustainable development in the product development process. 5. Methodologies for environmental impact assessment of products 5,1. Applying a life cycle approach 5.2. Life cycle assessment methodology and standards 5.3. Application of life cycle assessment software 6. Creation and patenting of technical innovation. Inventions, patenting and legal procedures 7. Author and patent right 7,1. Rules and juridical relations 8. Juridical protection of industrial objects 8,1. Peculiarities of juridical protection 8.2. Industrial design 9. International patent contracts 10. Patent information 10,1. International patent systems 10,2. Patent funds

Textile Technology	9	To provide knowledge of textile technology and structure of textile materials.	Basic knowledge about technological processes of textile manufacturing: spining, weaving, knitting, formation of nonwovens, finishing and structure of textile materials.	1. Basic knowledge of textile technology 2. Spining technology 2,1. Process of yarn spinning: main stages and sistems 2,2. Production of yarns and threats 2,3. Yarns of compex structure 2,4. Sewing threats and electrical conductive threats 2,5. Braided and twisted textile products 3. Knitting technology 3,1. Clasiification of knitting machines 3,2. Knitted loops formation in weft and warp knitting machines. Tuck and float formation in weft knitting machine. 3,3. Knitting systems of the classicnknitting machines 3,4. Main stages of manufacture knitted garments 4. Weaving technology 4,1. Parameters of woven fabrics structure. Plan of weave. Elementary weaves. 4,2. Combined weaves 4,3. Patterns 4,4. Winding process, warping methods 4,5. Warp sizing, drawing - in and tying process 4,6. Shedding. Weft insertion. Cloth take up. 5. Processing technologies of nonwovens 5,1. Nonwoven textile in general and their clasification 5,2. Mechanical processing technology of nonwovens 5,3. Physical-chemical processing technology of nonwovens 5,4. Recycling of textile materials 6. Textile finishing 6,1. Stages of textile pre-treatments, princips of textile materials dying and printing 6,2. Mechanical and chemical finishing of textile materials 6,3. Formation of textiles materials with functional properties during finishing
Network Ethics	6	To acquire knowledge about the basic ethical categories, moral principles, norms, the specifics, the importance of network ethics, the classical ethical theories, the most important authors.	Students acquire the knowledge about the basic ethical theories and their features, the most important philosophers: Plato, Aristotle, I. Kant; are able to understand the transition from morality to ethics and the relationship of this transition to the media (alphabet); get acquaintance to a broad theoretic-empirical context of network ethics; become able to analyze the sources, to operate the terms and to apply the various theoretical models; to understand the problem of ethics challenged by network and globalization, to know information ethics; to deal with information and communiacation issues emerging in the network society..	1. WHAT IS ETHICS? 1,1. Ethics and Ethos 1,2. Morality. Ethics, Ethos and Morality: the Problem of Relativism 1,3. Ethics, Happiness, Virtue, Duty 1,4. Ethics, Religion, Individualism, Revolt 1,5. Why Network Ethics: Theoretical Background of Network Ethics 2. NETWORK ETHICS AND IT 2,1. Panopticism 2,2. The Moral Status of Information and Information Technologies 2,3. Virtual Communities, Ideals of Democracy and DRE Subdivision 2,4. Mobile Phone, Dialogue, and Autonomy 2,5. Digitized Ethics: not Offending the Other 2,6. Privacy and the Property in Global Data Domain 3. TECHNOETHICS 3,1. Media Ecology 3,2. Bionics 3,3. Robotics, AI 3,4. Nano-Ethics 3,5. Sustainable Development
Business Ethics	6	To deliver knowledge about business ethics, interaction between humans, data and advanced technologies as well as peculiarities of such interaction, to learn ethical business decision making for managing humans, data and advanced technologies, to create and develop business ethics for current and future organizations.	In this course students obtain most recent knowledge about business ethics in the world of human, data and advanced technologies. Knowledge about ethics theories, complexity of ethical issues and risks as well as skills of using relevant research literature develop competency to make ethical business decisions, select and implement instruments for ethical management. In real business cases students learn to develop arguments, to evaluate, implement and develop business ethics in digital organizations and to balance employees' values, the need for business data and rules of artificial intelligence ethics.	1. Ethical Discourse of Evolution and Impact of Advanced Technologies on People and Businesses 1,1. Evolution of technologies, production systems and transdisciplinary tech 1,2. Ethics and innovation business models, ethical tech innovations 2. Interaction Ethics: Power and Control using Robotics and Artificial Intelligence 2,1. Truth, ethics, morale, and digital environment 2,2. Ethical theories, the hierarchy of ethical concepts, ethical decision making 2,3. Ethics, robotics and artificial intelligence: complexity and risks 2,4. Codes of ethics for people and AI, safeguards of business 3. Business Ethics and the Business Organizations 3,1. Business ethics of shared, collaborative and GIG economies 3,2. Business ethics in networking and uberization, social innovations 3,3. Ethics in emergence, reverse, and circular engineering, frugal innovations 3,4. Ethics of collective systems, mimicry and ascendancy 4. Ethical Management of Digital-Driven Organization 4,1. External and internal data privacy, responsibility and conviction 4,2. Digital workplace and ethical behaviour, safety of employees and organization 4,3. Whistleblowing, monitoring, security in big data and the web 4,4. Ethical digital culture, corporate governance, and CSR 5. Perspectives and the Future of Business Ethics 5,1. Ethics in worldwide governance, hyper-democracies and hyper-collectivities 5,2. Ethics of considerations, sustainable ethics, exclusive and inclusive societies 5,3. Challenges, limits, and the future of business ethics
Human Resources Management	6	To acquire the basic knowledge of human resource management policies, as well as be able to understand the key human resource management principles, to develop abilities to process and evaluate information and apply it to the adoption of human resource management decisions.	The main human resource organizing and management principles are absorbed, in-depth human resources organizing and management knowledge is mastered and skills to apply for the adoption of human resource management decisions are gained.It is taught to carry out personnel accounting and statistics, to usage main methods of personnel need planning, workplaces and employees evaluation. Students learn general personnel selection, development and career organization principles, abilities are developed to apply personnel compensation and motivation means.	1. The conception of human resources management 1,1. The content of human resources management 1,2. Environment of human resources management 1,3. Human resources management in legal regulation 2. Human resource management indicator 2,1. General indicator 2,2. Specific indicator 2,3. Methods of analyze 3. Human resources formation 3,1. Staff need planning 3,2. Personnel search and recruiting 3,3. Personnel selection 3,4. Personnel adaptation 4. Development of human resources 4,1. Motivation 4,2. Reward systems 4,3. Empoyee evaluation 4,4. Learning and training 4,5. Career Planning 5. Sustainability in Human Resource Management

Study modules for Master's degree programmes

Name	Credits	Purpose	Description	Chapters and topics
Environmental Policy	6	To develop skills of improving and developing environmental policy - critically evaluate existing context (legal basis and practices), create possible solutions and present them in an argumentative manner	Students will acquire knowledge about the main environmental policy documents, institutions, basic principles and instruments, environmental risk management, as well the factors influencing the formation of environmental policy; will be able to carry out environmental policy and environmental risk assessment studies based on reliable statistical data sources and indicators and will be able to initiate and implement social projects in the sphere of environmental policy.	1. Environmental policy: theoretical and practical definitions, introduction of the research scope on the issue 2. Structural causes of environmental degradation 3. Environmental policy: principles, participants, institutional frameworks (EU and Lithuanian context) 4. International Agreements and Agendas 5. Ethics of environmental policy 6. Politics of sustainable development (UN, EU and Lithuanian context) 7. Policies on climate change (UN, EU and Lithuanian context) 8. Energy policies (EU and Lithuanian context) 9. Urban policy (EU and Lithuanian context) 10. Policies of environment, biodiversity and landscape protection (EU and Lithuanian context) 11. Waste management policies (EU and Lithuanian context) 12. Environmental communication 13. Environmental risk management 14. Environmental movement and environmental critique 15. Assessment and monitoring of environmental policies
Renewable Energy Engineering	6	To acquire knowledge of technologies for transforming of renewable energy into thermal and electric energy, to learn methods for selection of equipment and design of thermal engineering systems.	The students are taught to understand impact of thermal and CO2 pollution on environment and global climate change as well as possibilities of use of renewable energy technologies for the heating of the buildings. The students are provided with the knowledge in possibilities of use of solar, wind, water and biomas, biogas energy technologies and efficiency of them.	1. Program of the renewable energy resources recovery in Lithuania until 2020 and 2050. 2. Solar, wind, hydro and biomas energetics 2,1. Solar energetics 2,2. Wind energetics 2,3. Hydro energetics 2,4. Biomas energetics 2,5. Biogas energetics 3. Geothermal stations 3,1. The deep geothermal energy 3,2. The shallow geothermal energy 4. Fuel cells 5. Use of renewable energy in the buildings
Sustainable Development Policy, Law and Economics	6	Provide the specific knowledge and develop the competences how to stimulate technical and technological change, business transformation, societal behavioral changes and address broader issues of sustainable development using of the law, policy and economic instruments.	The module goes beyond the traditional topics and addresses the information-based obligations of industry, enforcement of environmental law, market-based and voluntary alternatives to traditional regulation, risk assessment, environmental economics, and technological innovation and diffusion. During this module the knowledge on the important issues in environmental law, policy, and economics will be introduced. The students will get competences how to stimulate technical change, industrial transformation and address broader issues of sustainable development using of the law and policy.	1. Economic Development, Globalization, and Sustainability 2. Industrial Policy and the Role of the Firm in Pursuing Sustainable Development 3. Sustainability policy and economic research: research methodology, data bases and integration of AI 4. Climate change and its legal regulation 5. Sustainable development: National, Regional and International legal regulation 6. Financing Sustainable Development 7. Strategic Policy Design for Sustainable Transformations
Sustainable Energy	6	To acquire knowledge and competencies in integrating economically sound and environmentally and socially beneficial innovations in sustainable energy development, understand the main trends in the development of energy from the transition from fossil fuel to renewable energy sources, to understand the benefits of solutions in the context of climate change, to acquire practical knowledge in the preparation of problem-based learning.	This module is intended to analyze in detail the trends in the development of the energy sector, the possibilities and peculiarities of the use of renewable energy technologies, the importance of increasing energy efficiency. Students will develop their abilities to analyze the advantages and disadvantages of renewable energy technologies, learn how to adapt technologies to specific environmental conditions, gain knowledge about their environmental impact and economic and social aspects of development.	1. Global trends of energy production and consumption 2. Power systems 3. Role of renewable energy in climate change prevention 4. Policy and law of energy (as well Renewable energy sources) 5. Electric vehicles 6. Solar Energy 7. Biomass, biofuels 8. Geothermal and hydro energy 9. Wind Energy 10. Energy efficiency principles and technologies
Design of Sustainable Value Chains	6	To form the competency to evaluate the value chains, using the holistic approach and methodologies for evaluation the value chain systems from the economic, social and environmental aspects.	This discipline will give the following results: knowledge and understanding of the basic methodologies for the systems' analysis. Ability to evaluate the systems using environmental, economic and social analysis methods. The students will have the understanding about the importance of the information flows and their relationship with the current economic, production, market and other systems, and the possible impact to the sustainability of the mentioned systems. Students will be able to analyze and design models of the value chains, based on the software and introduced best practices. Application of the knowledge to the real context will be based on the challenge based learning.	1. Concept and definition of value chains and interface with other systematic methodologies 2. Sustainability issues and alternative models of collaboration within value chains 3. International value chains within the sustainable development context 4. Analysis of the value chains and methods for the sustainable management (Bloomberg) 5. information flows, data analysis and IT in the value chains 6. Tertiary sector - its innovations for the stimulation of the sustainable value chains 7. Design methods, standartization and practices of the sustainable value chains 8. Value chains in the context of climate crisis and circualr economy 9. Life cycle costs analysis
Sustainable Buildings and Cities	6	To provide knowledge about sustainable buildings and cities and to develop skills to critically discuss and evaluate the relevant context.	The concept of sustainable, circular and regenerative construction are learned. Knowledge about the main methods and indicators for evaluating sustainable buildings and cities is acquired in order to implement them in design, expertise and research work. The students will be able to perform building life cycle analyses.	1. Principles of sustainable construction, green buildings certification systems. 2. Principles of circular and regenerative construction. 3. Trends in ecological building design and architectural expression. 4. History and concept of life cycle assessment. 5. Objectives, scope, environmental impact assessment and benefits of the application of life cycle assessment. 6. Digitizing life cycle assessment at the construction stage. 7. Concepts for sustainable and smart cities, trends in the development of urban areas. 8. Applying biophilic design principles in architecture and urban planning. 9. Globalisation and environmental sustainability.
Negotiation and Conflict Management	6	To master essential knowledge of negotiation and conflictology and be able to put them into practice by using various strategies and tactics of negotiation, techniques of argumentation and questioning, by choosing optimal methods of diagnostics and resolution of conflicts.	Essential knowledge of negotiation and conflict management and the abilities to apply them in the process of negotiations and in the resolution of conflicts will be acquired. The main stages of preparation for negotiation will be analysed. The main techniques of successful finish of negotiation will be acquired. The reasons, types and dynamics of inner-, inter-personal and organizational conflicts will be analysed. The abilities to generate alternative solutions, choose tactics in stranged negotiation, evaluate the situation and to apply suitable methods of diagnostics and resolution strategy of conflicts will be acquired.	1. Conception of negotiation 1,1. Definition and types of negotiation 1,2. Positions and interests of negotiation 1,3. Intercultural differences in negotiations 2. The process of negotiation 2,1. The preparation for negotiations 2,2. Psychological readiness for negotation: methods of management of emotions and stress defeating 2,3. The peculiarities of the beginning of negotiations and the process of negotiations 2,4. Creation of psychological climate 2,5. Consideration of purposes, conditions and procedures of negotiations 2,6. Strategies of negotiations 2,7. The end of negotiations 3. Typology and management of conflicts 3,1. Conception and typology of conflict 3,2. Structure, functions and dynamics of conflicts 3,3. Interpersonal conflicts and strategies of their resolution 3,4. Inner conflicts of personality 3,5. Conflicts in an organization 4. Research and prevention of conflicts 4,1. Methodological basics of conflict research 4,2. Methods of conflict diagnostics in an organization 4,3. Conflict prognostication and prevention 5. Applied aspects of conflict psychology 5,1. The impact of temperament and character on conflicts 5,2. The influence of mistakes of communication on conflictual situation 5,3. The principles of saying of pretensions and criticism 5,4. Management of emotions in conflictual situations
Energy Systems	6	To acquire knowledge about the energy recourses in power systems, power systems structure, operational framework and strategic concepts.	The students are taught to understood the objectives of the energy system and the composition, to calculate energy flows and node voltages using computer calculation methods, to solve the quality and the reliability of compatibility challenges. Tasks of energy flow, quality and reliability assessment and assurance there are analyzed.	1. Energy resources 1,1. The types of energy recources 1,2. Renewable energy resources 1,3. Energy resources exploitation areas 1,4. Energy resources utility 2. The structure of the energy system 2,1. The energy system and its components 2,2. Generating sources 2,3. Power transmission and distribution 2,4. Characteristics of the consumers 3. Energy system operation concepts 3,1. Requirements for energy system 3,2. Operating parameters and their management 3,3. Energy storage systems 3,4. Energy system reliability and safety 4. Strategy of energetics 4,1. The European Union and the Lithuanian priorities of energetics 4,2. The energetic and the economic links 4,3. Energy demand forecasts 4,4. Energy consumption efficiency 5. Energy systems and environmental interactions 5,1. Pollution sources in the energy system 5,2. The influence of energy systems for climate change and legal regulation 5,3. The pollution prevention in energy system objects 5,4. Renewable energy and the environment
Markets of Energy Resources	6	To master knowledge and patterns of the modern energy markets.	To get knowledge on the energy market regularities, economic of joint work of various types power plants, economical load distribution of power plants and their units. To get knowledge on methodology of determination of power generation, transmission, distribution and supply costs, and energy tariffs. To analyze the reasons of the latest generation and reorganization of electricity market, the legal regulation of energy sector, the organization of electricity market, the electricity market organizations in the European countries, the USA, Lithuania and the Baltic countries.	1. Energy policy and participants of electricity market 1,1. Reorganization of energy sector enterprises and development of markets 1,2. Development of electricity markets in various countries 2. Structure of electricity market and effective competition 2,1. Advantages and disadvantages of various market models 2,2. Competition impact on power system development 3. Electricity pricing 3,1. Structure of electricity cost and methodology of tariff determination in regional market 3,2. Electricity price forecasting methods 4. Energy and environment 4,1. Sources of air pollution, mitigation measures. The environmental impact assessment 4,2. Climate change and mitigation measures. 5. Reorganization of power sector 5,1. Peculiarities of energy markets 5,2. Sustainable development of energy sector 6. Electricity market and electricity trade 6,1. Principals of electricity trade 6,2. Electricity exchange 7. Markets of other energy sources 7,1. Global energy market models and trends 7,2. Investment incentives and opportunities in regional markets

Regulation and Management of Energy Resource Markets	6	Gain knowledge about energy market organization, be able to perform an economic analysis of the structure of the energy market, understand the interactions among market structure and market power.	While studying the module the evaluation aspects of energy policy are understood, the analysis needed to distinguish, develop and evaluate policy measures for solutions of energy problems is emphasized.	1. The economic justification for energy policy. 1,1. Imperfect competition: oil, gas and electricity markets. 1,2. Energy shocks and impact on the national (regional) economy. 1,3. Energy supply problems. 2. Evaluation of energy policy. 2,1. The cost-benefit analysis. 2,2. Risk assessment. 2,3. Pollution assessment. 3. Development of energy policy. 3,1. The energy tax policy. 3,2. Price control policy. 3,3. The subsidy. 3,4. Liability and insurance. 3,5. Innovation, research and development in energy markets. 4. Today's energy challenges. 4,1. Energy and climate change. 4,2. Energy and environmental laws. 4,3. Global energy problems.
Climate Change Mitigation Technologies	6	To develop skills in analyzing the causes of climate change and apply technological and organizational measures to reduce, manage and adapt to climate change.	Knowledge is obtained on climate change, its parameters, global and regional climate change projections. Abilities are gained on analyzing climate models, observed changes and responses in natural and managed systems. The knowledge on climate change impact and management in world regions, adaptation practices and key vulnerabilities and the risk from climate change is given. Abilities are gained on getting to know mitigation options of climate change. Knowledge about carbon dioxide capture and storage and utilization technologies is acquired.	1. Historical overview of climate change science 2. Monitoring of climate change parameters 3. Climate Models and their evaluation 4. Global and regional climate projections 5. Climate change impact and management in world regions 6. Assessment of adaptation practices, options, constraints and capacity 7. Assessing key vulnerabilities and the risk from climate change 8. Perspectives on climate change and sustainability 9. Mitigation of climate change 10. Technologies for carbon dioxide capture 11. Technologies for carbon dioxide storage 12. Global and European carbon dioxide utilization potential 13. Technologies for carbon dioxide utilization
Comprehensive Studies of Risk and Security Issues	6	To develop holistic and systematic thinking by critically reviewing and assessing a wide range of complex geopolitical, social, public health, technological, environmental, and economic risks and challenges to security.	The student is able to apply interdisciplinary knowledge and risk assessment methodologies to a critical systemic discussion of geopolitical, environmental, social, public health, technological and economic risks and security threats, e.g. related to climate change, terrorism, natural disasters, migration, ageing societies, energy security, economic crises, etc.	1. Introduction to the study of complex risk and security issues 2. Geopolitical and related risks 2.1. Overview of international security crises 2.2. State actors: violent and non-violent conflicts 2.3. Non-state actors: terrorism 3. Social risks and security threats 3.1. Migration, refugee and humanitarian crises 3.2. Demographic transition and social conflicts 3.3. Public health risks 4. Risks posed by technological developments 4.1. Digitalisation and security 4.2. Cybersecurity 4.3. Nuclear safety 5. Environmental and ecological threats to security 5.1. Energy security 5.2. The challenges of climate change 5.3. Natural disasters and water crises 5.4. Food crises 6. Economic security 6.1. Fiscal crises 6.2. Economic downturns and disintegration
Food Law	6	To provide knowledge about the modern food regulatory framework in the EU and globally and to develop the skills needed to meet the legal obligations of food business operators, starting from ensuring the safety and quality of newly developed or marketed foods to food marketing and labeling or consumer protection and information.	Knowledge about the modern food regulatory framework in the EU and globally, ranging from safety and quality standards and procedures for newly developed or marketed foods, to food marketing and labeling or consumer protection and information is aquired. Ability to explain main principles, procedures and development of food law. Knowledge about Lithuanian, European Union and global institutions responsible for international and national food policy and their activities is acquired. Practical skills to find and use relevant food legislation databases and information sources and to rely on food legislation in non-standard situations are built.	1. Development of domestic, EU and international food law 2. Key elements of food law and procedures of legislation 3. The link between EU food law and international food policy generally 4. EU rugulations on the free movement of food 5. Food safety acts 6. Regulation of chemical and biological safety of food: hormones, pesticides, materials in contact with food, food hygiene 7. Food under regulation: novel food, organic food, food for special medical purposes, infant formula, etc 8. Consumer information: regulation of food labeling and advertising 9. Nutrition, obesity and health: domestic, EU and international policy and recommendations 10. Ethical and environmental aspects of food law: climate change, genetic modification, welfare of food producing animals 11. Future challenges for food law
Low Energy and Modernized Buildings	6	To acquire the knowledge of the core principles of design and construction of low-energy and modernized buildings (LOEB -MB), to develop the ability to analyze the possibilities of using renewable energy in buildings and to perform LOEB -MB energy efficiency assessment and integration of the obtained results with BIM projects.	Acquires knowledge about LOEB -MB concepts, energy efficient building planning and construction solutions, used materials and construction technologies; efficient heating, ventilation, hot water, lighting and household systems of buildings, equipment for energy production from renewable energy sources. It is possible to predict the impact of selected measures on the energy efficiency and indoor microclimate of the building, to create optimal combinations of energy production from renewable energy sources and building energy systems, to comprehensively assess the efficiency of LOEB -MB and their systems and energy production facilities. Ability to model heat loss and payback time of building.	1. Concepts for low-energy and smart buildings 2. Climate impact on low energy buildings 3. Partition constructions for low energy buildings 4. Interior equipment systems for low energy buildings 5. Installations for the production of energy from renewable sources in or around the building 6. Methods for assessing the energy performance of low - energy buildings and their systems 7. Design of building renovation (modernization) and calculation of payback of measures 8. Import a longitudinal thermal bridge model from Autodesk AutoCad into Therm. 9. Integration of a computational analytical model with BIM projects, Open BIM and ISO standards. 10. Energy efficiency simulations and dynamic modeling. 11. Development of energy efficiency nodes from BIM model, selection of alternatives "NRGpro5" program. 12. Build an integrated team and review the capabilities of working with Autodesk Insight 360.
Low Energy Buildings	6	To acquire the knowledge of the core principles of Low energy buildings (LOEB) design and construction, acquire abilities to analyze the potential for renewable energy use in buildings and to carry out LOEB energy efficiency evaluation.	Knowledge of LOEB concepts, energy efficient design and construction solutions, building materials and construction technologies is obtained. Knowledge of effective heating, ventilation, hot water preparation, lighting and home management systems, appliances for energy production from renewable energy sources is gained. Ability to estimate the effect of selected means on the thermal efficiency of the building and the internal micro-climate, select optimal combinations of systems of energy production from renewable energy sources and those using the energy from the buildings, and to evaluate the efficiency of LOEB and their systems and energy production appliances is obtained.	1. The concepts of low energy buildings 2. The effect of climate on low energy buildings 3. Design solutions of low energy buildings 4. The constructions of enclosures of low energy buildings 5. Experimental investigations of low energy buildings 6. Internal equipment systems of low energy buildings 7. The assurance of internal microclimate conditions of low energy buildings 8. Appliances of energy production from renewable energy sources in the building or its surroundings 9. Production of thermal energy in water heating Solar collectors 10. Production of electric energy in Photovoltaic Solar collectors 11. Production of electrical energy in wind power generators 12. Production of energy in biomass power generators 13. The use of energy produced from renewable energy sources in the building or its surroundings 14. The energy efficiency evaluation methods of low energy buildings and their systems
Nanotechnologies in Power Engineering of Alternative Fuel	6	To acquire basics of nanomaterials and nanotechnology used in alternative fuel (hydrogen) energetic, to know how to choose the materials and technologies for hydrogen production, storage and electrochemical conversion research and develpment and engineering works.	To know and understand main areas of hydrogen energy technologies: hydrogen production, employing nanocrytalline hydrogen separation membranes; storage, employing carbon nanomaterials and nanocrystalline metals and their alloys hydrides. To know and understand the basic types of hydrogen fuel cells and used materials.	1. Energy and global warming 1,1. Main energy production technologies existed at this moment 1,2. Future energy technologies 1,3. Climate changes 1,4. Hydrogen energy 2. Nanomaterials and nanotechnologies in hydrogen energy 2,1. Characterization of nanomaterials 2,2. Main technologies used for synthesis of materials 3. Physical basics of hydrogen energy 3,1. Physical properties of hydrogen 3,2. Hydrogen interaction with solid state materials 3,3. Hydrogen transport in solid state materials 3,4. Electrochemical conversion 4. Hydrogen production 4,1. Membranes for hydrogen separation 5. Hydrogen storage 5,1. Comparison of main methods 5,2. Hydrogen storage in carbon nanostructures 5,3. Hydrogen storage in metal and their alloy nanostructures 6. Hydrogen fuel cells 6,1. Working principles 6,2. Types of hydrogen fuel cells 6,3. Consumption analyze of energetic systems 7. Application of machine learning methods in alternative energy
Building Energy Demand Modelling	6	To develop skills to analyse the building energy consumption taking into account various single and complex architectural-construction solutions and determine the optimal combinations based on chosen criteria.	Knowledge about the methods of analysis of the architectural-structural solutions of the building is acquired. The students will be able to analyse the influence of the architectural-structural solutions of the building on the annual energy demand. The students will be able to use software to optimise selected solutions according to selected criteria and to perform building assessment according to the criteria defined by legal acts.	1. Methodologies for determining building energy demand. 2. Indicators of energy efficiency of buildings. 3. The influence of building envelopes on building energy demand. 4. Evaluation of two-dimensional temperature fields in building envelopes in steady state. 5. Internal heat and moisture emissions of the building and their influence on the energy demand of the building. 6. The influence of external conditions on the energy demand of the building. 7. Assessment of the factors influencing the natural light indicators of the premise. 8. Forecasting of micro-climate indicators and ventilation efficiency. 9. Energy efficiency of engineering system components. 10. Optimizing building structural and engineering system solutions.
Indoor Climate	6	Gain knowledge on air quality, thermal, visual and acoustic comfort in buildings, as well as its impact on occupants. Obtain abilities to estimate pollution sources, thermal comfort conditions. Develop skills to perform indoor environmental quality predictions by means of numerical computational methods.	Knowledge in human thermal regulation, thermal sensation and indoor parameters for thermal comfort are obtained. Understanding of air pollution sources in buildings and influence of air pollution on occupant health and productivity is gained. Abilities are obtained to design advanced heating, ventilation and air conditioning systems in buildings to ensure microclimate conditions in a sustainable way. Knowledge about methods of indoor climate and ventilation effectiveness evaluation are acquired.	1. Thermal comfort in buildings. Human sensation and environmental factors 2. Air pollution sources and air pollutants in buildings 3. Indoor climate impact on occupant health and productivity 4. Ventilation efficiency indices and evaluation methods 5. Air distribution in buildings 6. Numerical prediction methods of air distribution and indoor environment in buildings 7. Accoustic and visual comfort in buildings
Indoor Environmental Assessment and Design	6	Providing skills to assess, perform simulations of indoor environment in buildings (thermal comfort, air quality, acoustic and visual comfort), select design solutions to ensure indoor comfort.	Providing knowledge about human thermoregulatory functions, thermal environment sensations, and parameters influencing the thermal environment in buildings. Examining sources of air contaminants in buildings, the impact of harmful air pollutants on human well-being, health, and productivity. Providing skills to select design solutions for indoor climate, forecast their performance using numerical modeling and design tools, and apply methods for evaluating the effectiveness of thermal comfort, air quality, and ventilation systems.	1. Thermal comfort in buildings. Human sensation and environmental factors 2. Air pollution sources and air pollutants in buildings 3. Indoor climate impact on occupant health and productivity 4. Ventilation efficiency indices and evaluation methods 5. Air distribution in buildings 6. Numerical prediction methods of air distribution and indoor environment in buildings 7. Systemic design and management of indoor environment 8. Accoustic and visual comfort in buildings

Studies of Modern Languages (Level A1)	6	To develop communicative competence in learning pronunciation, grammar and acquiring vocabulary. To teach basics of reading, writing, listening and speaking.	Able to understand and use familiar everyday expressions and very basic phrases aimed at meeting the needs of a concrete situation. Able to introduce him/herself and others and can ask and answer questions about personal detailes such as where he/she lives, people he/she knows and things he/she has. Able to interact in a simple way provided the other person talks slowly and clearly and is prepared to help.	1. Vocabulary formation and development of linguistic competencies 1,1. People and places. Famous people 1,2. Communication and friendship 1,3. Home. Meals. Daily routine. 1,4. Family. Leisure time. 1,5. Transport. 1,6. Animals. Climate 1,7. Future 1,8. Reading of adapted literature 2. Use of language 2,1. Nouns. Plural and cases. 2,2. Articles. Prepositions. Adverbs. 2,3. Verb "to be". Simple tenses. There is/there are. 2,4. Present perfect. 2,5. Modal verbs 2,6. Formation of questions. 2,7. Types of sentences. 2,8. Revision of verb tenses
International Institutions and Cooperation	6	To develop a broad theoretical understanding of the role that institutions play for international cooperation on diverse issues of global politics.	International cooperation is critical for realizing beneficial global outcomes on issues that range from from climate change and biodiversity over trade and financial stability up to security, disarmament and beyond. Institutions are the basis of international cooperation, improving the effectiveness and fairness of global governance despite their diverse deficits and shortcomings. A robust theoretical understanding of the role that institutions play in international cooperation is essential for the understanding of world politics as such. This course focuses on how the thinking about institutions and cooperation has evolved in the discipline of International Relations.	1. Anarchy and hegemonic stability 2. Complex interdependence 3. Interests and ideas 4. Institutional change 5. Legalization and soft law 6. Institutional complexity 7. Transnational governance 8. Organizational ecology 9. From theory to practice: international trade 10. From theory to practice: climate change 11. From theory to practice: arms control
Sustainable Production	6	To obtain an understanding of the principles of sustainable production, possibilities and advantages of its implementation in the industry. To acquire knowledge on the application of a wide range of contemporary technologies aiming to increase the efficiency and sustainability of production processes. To build up a practical skills on the integration of knowledge for the assessment and analyses of production processes and technologies as well as for the generation of ideas for their modification.	Knowledge on the basic principles that guide modern science and technology towards a wider implementation of sustainability in the industry is acquired. The ability to perform complex analyses of options for pollution reduction, resource conservation and recovery while considering particularities of various industrial sectors (chemical, food, biotechnology etc.) and manufacturing processes is gained. The ability to carry out systematic feasibility analyses for the modification of industrial processes is build up. The practical skills on integration of knowledge and advanced processes based on the principles of nano- and bio-technology, green chemistry for sustainable production are gained.	1. Principles of Sustainable Production at the Product, Process and System Levels. 2. Environmental Policy and Management Tools for Industrial Sustainability. 3. Overview of Industrial Sectors and Production Processes. Challenges and Opportunities. 4. Evaluation of Production Processes. Aspects of Life Cycle Assessment and Other Methods of Evaluation. 5. Closed-Loop Production Systems. 6. Material Use and Resource Management Technologies in Industry. 7. Materials for Sustainable Manufacturing. 8. Sustainable Water and Wastewater Systems in Industry. 9. Energy Conservation and Recovery in the Industrial Processes. 10. Nanotechnology and Biotechnology for Sustainable Production. 11. Green Chemistry for the Environmental Sustainability. 12. Application of the Principles of Sustainable Production in Different Industries.
Management of Persons and their Groups	6	To provide essential management knowledge and abilities for persons and their groups in an organization that enable the organization to successfully achieve its activity goals.	This module is aimed to provide new competences as well as develop working competences for managing people and their groups in an organization. Participants of the module will acquire management knowledge most important for members of a modern organization and their groups as well as they be able to apply it in their practical professional activity. The module is meant for students of master's programmes in all science fields.	1. Essence, models and methods of management in an organization as well as skills necessary for it 1,1. Essence and importance of management in an organization. 1,2. Models and process of management 1,3. Competences necessary for management 1,4. Self-knowledge and motivation 1,5. Knowledge about others and motivating them 2. Team formation and managing it 2,1. An individual, groups and teams in an organization 2,2. Peculiarities of team formation in the context or organization's activity 2,3. Goals of team activity 2,4. Peculiarities of communicating in a team 2,5. Keeping sustainable team activity and solving problems 2,6. Organization culture and climate 3. Achievement management 3,1. Harmony in organization, team and individuals' goals 3,2. Self-evaluation 3,3. Assessment of teams and individuals' activity 4. Employees' training 4,1. Transformational leadership and its importance for employees' development 4,2. Importance of shared leadership in an organization conditions necessary for it 4,3. Conditions to develop employees in an organization 4,4. Organization culture benevolent for employees' development
Challenges for Social Welfare in XXI Century	6	To provide comprehensive complex knowledge about human development, criteria for its analysis and complex challenges for social welfare in XXI century and to develop competencies to analyse global and local trends of social development, to identify and systematize the data about human development at country level and to conduct comparative analysis.	Student has acquired comprehensive and complex knowledge about human development and the criteria for its analysis. Student is able to identify and analyze global, national and local challenges for social welfare in structural way using human development data. Student is able to provide evidence – based proposals for the solutions of human development problems.	1. Studies of social welfare and development. Concept of social problems 2. Sustainable development and social change. Principles and politics of sustainable development 3. Security challenges for contemporary societies 4. Challenges of science and technologies for social change 5. Social problems in Baltic - Nordic region 6. Urbanization: tendencies, scope, challenged for social welfare 7. Migration challenges for social welfare 8. Demographic transition 9. Inequality, social cohesion and social unrest 10. Subjective social welfare: concept and current situation 11. Theoretical conceptualisaton of vulnerability and resilience 12. Risks of climate change and environmental problems for social welfare 13. Education problems in post-modern societies
Active Electrical Network	6	To develop students' abilities about active power networks to which renewable energy generators are connected and to learn to calculate the tasks of power system active network management.	The students are taught to understand the purpose and structure of active electrical networks, to calculate power floats and bus voltages using computer aid metods, to design projects of consumers suplaing and generator connecting networks, to solve power quality and electromagnetical compatibility problems.	1. Introduction. The kinds of electrical power networks and elements 2. The diagrams and forecasting of loads and generation capacities 3. The propability methods of wind stations power and energy calculation 4. The designs of distributive generation sources 5. The parametrs and equivalence diagrams of power network elements 6. Reactive power compensation with active generators 7. The methods of power networks calculation 8. The calculation of radial networks with active generators 9. The calculation of grid networks with active generators 10. The computer calculation of complicated active power networks 11. The projecting of active electrical power network 12. The selection of active power netwrks schemes 13. The costs oe power energy and its loses 14. The parameters of power quality 15. The metering of power quality parameters 16. The controlling of voltage in the active power distribution networks 17. Tne elctromagnetic compatibility 18. The salculation of asimetrical regimes 19. The calculation of high harmonics 20. The rules of connection of dittruction generation sources to electrical network 21. The calculation of reliability of active electrical networks 22. The impact of active electrical network to electrical power system 23. The regimes of microgrids 24. The future directs of electrical networks evolution
Environmental Policy	6	To develop skills of improving and developing environmental policy - critically evaluate existing context (legal basis and practices), create possible solutions and present them in an argumentative manner	Students will acquire knowledge about the main environmental policy documents, institutions, basic principles and instruments, environmental risk management, as well the factors influencing the formation of environmental policy; will be able to carry out environmental policy and environmental risk assessment studies based on reliable statistical data sources and indicators and will be able to initiate and implement social projects in the sphere of environmental policy.	1. Environmental policy: theoretical and practical definitions, introduction of the research scope on the issue 2. Structural causes of environmental degradation 3. Environmental policy: principles, participants, institutional frameworks (EU and Lithuanian context) 4. International Agreements and Agendas 5. Ethics of environmental policy 6. Politics of sustainable development (UN, EU and Lithuanian context) 7. Policies on climate change (UN, EU and Lithuanian context) 8. Energy policies (EU and Lithuanian context) 9. Urban policy (EU and Lithuanian context) 10. Policies of environment, biodiversity and landscape protection (EU and Lithuanian context) 11. Waste management policies (EU and Lithuanian context) 12. Environmental communication 13. Environmental risk management 14. Environmental movement and environmental critique 15. Assessment and monitoring of environmental policies
Environmental Systems' Theory	6	To provide knowledge how Systems' Theory can be used as environmental decision making process integrating social -economic and physical -biological aspects. Specific goals: to develop skills in applying Systems' Theory for interdisciplinary focus on environmental problem decisions, to understand the importance of process control and optimization in preventive environmental activity; to provide knowledge and skills to develop environmental management systems, decision-making support models in environmental activities.	The concept of systems theory, its main principles and methods are learned. Knowledge of how systems theory is applied to the analysis and synthesis of environmental systems, including physic-ecological and socio-economic systems, and to the development of decision support models is acquired.	1. Environmental management: strategy and practice 2. Industrial systems 3. Process control, optimization through Cleaner Production 4. Environmental intervention and symbiosis: systems approach 5. Environmental decision - making processes 6. Control systems, their stability 7. Environmental systems analysis (Physic - ecological systems; Socio - economic systems) 8. Application of information systems in environmental systems management
Environment Protection in Energy Production	6	Know pollution generation regularities by fuel combustion process and pollution reduction methods. Know emission prevention principles.	Know pollution generation regularities by fuel combustion process. Understand the measurement methods of pollutant concentrations. Can calculate the spread of pollutants in the atmosphere. Know the European Union's policy on pollution reduction field and law requirements. Know the reducing of emissions formation and flue gas treatment techniques. Understand the environmental aspects using waste for energy production. Understand the principles of implementation pollution prevention methods.	1. Generation of pollutants by energy production 1,1. Generation of pollutants by combustion 1,2. Generation of pollutants by burning of biofuel 1,3. Reduction pollutants concentrations 1,4. Measurement of pollutants concentrations 2. Reducing of impact to environment 2,1. Environment protection policy by energy production 2,2. Dispersion of flue gas in the air 2,3. Flue gas cleaning 3. Pollution prevention 3,1. Increasing of energy production efficiency 3,2. Waste utilization for energy production
Environmental Biotechnology	6	To gain knowledge on biotechnological processes and their utilization for pollution prevention, to acquire application possibilities of biotechnologies in diverse fields of environmental protection and sustainable resource management.	Knowledge on environmental biotechnology and it's application in wastewater treatment, solid waste treatment, contaminated soil treatment, air pollution reduction and sustainable resource management is acquired. The students will be able to analyse and evaluate alternative biotechnology application opportunities, to employ methods of technological equipment selection, to perform general engineering calculations.	1. Introduction to Environmental Biotechnology 2. Microbes, metabolism and biodegradation 3. Water Purification and Wastewater Treatment Biotechnology 4. Biotechnology in Solid Waste Treatment and Resources Generation 5. Biotechnology for odor and air pollution control 6. Trends in development of environmental biotechnology

Waste Management and Recycling Technology	6	Gaining knowledge about the sources of waste generation, waste quantities and influencing factors, and the main characteristics of the waste handling and recycling methods, equipment and technology	Knowledge of types and composition of waste, its generation, sources, physical, chemical and biological properties of waste, principles of waste management, legal framework and priorities for waste management, landfilling, mechanical, biological and thermal treatment, hazardous waste and its sources, reuse the use of secondary raw materials.	1. Waste management of legal regulation and management priorities for the EU and Lithuania 2. Waste generation, nature, collection and transportation 3. Main streams of secondary raw materials processing technology 4. Thermal waste treatment. Pyrolysis and gasification 5. Mechanical treatment of waste 6. Extraction of raw materials 7. Metal, rubber, plastic, glass waste, recycling technologies 8. Re-use of waste for the manufacture of construction products 9. Packaging and packaging waste management 10. Biodegradable waste. Sewage sludge management 11. Waste electrical and electronic equipment management 12. Storage and management of radioactive waste
Technologies for Waste Management and Resources Recovering	6	Develop the capacity to assess the technical feasibility and economic and environmental benefits for waste management and recovery of raw materials, energy and space resources from the anthroposphere in the context of the circular economy.	The methods for selection of structure of waste management systems and its individual elements are mastered, the ability to evaluate resources suitable for product and energy production and recovery from waste and other anthroposphere elements is compared, comparing them economically and environmentally with extraction of the same resources in nature.	1. Material flows in the anthroposphere, principles of linear and circular economics 2. Traditional extraction of resources from the lithosphere and biosphere 3. The main engineering, economic and legal aspects for solid waste management 4. Waste generation, characterisation and properties 5. Waste prevention, collection and transportation 6. Mechanical waste treatment and material separation 7. Physico-chemical recovery of materials from waste 8. Chemical stabilization of hazardous substances in waste and soil 9. Aerobic processes and technologies for waste treatment and resource recovery 10. Anaerobic processes and technologies for waste treatment and resources recovering 11. Thermal and thermooxidative treatment of waste and soil, recovery of materials and energy 12. Integrated specific waste management and resource recovery processes 13. Recycling and use of recovered materials 14. Waste landfilling and landfill operation
Energy Converters of Renewable Energy Sources	6	To give knowledge about operation principles, design, and application of power converters used in renewable energy power plants.	Students are taught about energy converters used within wind power stations; electrical rectifiers; inverters, recuperation of power in power circuits; conversion of frequency of AC circuits; electrical filters; converter circuits for electrical machines driving; protection of semiconductor circuits and devices.	1. General knowledge 1,1. Semiconductor devices for energy converters 1,2. AC converters 1,3. DC converters 1,4. Rectifiers and inverters 1,5. Back-to-back converters 2. Analysis of energy converters working in power circuits 2,1. Transient processes in circuits with switches 2,2. Power converters control circuits 2,3. AC rectifiers 2,4. Independent inverters 2,5. Frequency converters 2,6. Electrical filters 2,7. Converters for electrical drive control
Energy Conversion Technologies of Renewable Energy Sources	6	To give knowledge about influence of energy conversion technologies in to process of harmonious development power engineering. To advance abilities to evaluate problems of an ecology both power engineering and technological capabilities of their solution. To run in the basic knowledge of technologies renewables and alternated power sources modern converters of energy and also hybrid systems energy conversion of renewables. The additional purposes: To advance practical capacities of implementation researches processes of technologies for conversion solar, wind and hydraulic power in virtual space at usage of the imitative program MULTISIM-2001 P.	Influence of energy conversion technologies on process of harmonious development of power engineering, basic knowledge of renewables technologies and alternated power sources modern converters of energy and also hybrid systems energy conversion of renewables, advance practical capacities of implementation researches processes of technologies in virtual space and real experimentation.	1. Introduction 1,1. Role and significance of energy convertion technologies in process of heat and power engineering harmonious development 1,2. Conservation (saving and energy efficiency) of energy as equivalent of alternative energy source. 2. Heat and power engineering problems of ecology. Technological ways of their solution 2,1. Global problems of ecology and energetic technologies 2,2. Problems of heat and power engineering and ecology in Lithuania 2,3. Possibilities of employment renewable and alternative energy technologies in Lithuania 2,4. Existing and possible measures for improving of application of modern energy conservation technologies in Lithuania 3. Technologies of renewable energy conversion 3,1. Solar energy for heat and power 3,2. Energy conversion of wind turbines 3,3. Hydro electric energy conversion 3,4. Heat pumps 4. Technologies of energy storage for renewabbles 4,1. Hydro pumped storage systems 4,2. Technologies of hydrogen production 4,3. Production of synthetic fuels (methanol CH3OH, methylcidohexan - CH3OCH) 4,4. Ilon batteries (regenerative Fud cells) 5. Energy converters for the renewables 5,1. PV modules their parameters and characteristics 5,2. Wind rotors and electrical energy generators, their parameters and characteristics 5,3. Hydro turbines and electrical energy generators, their parameters and characteristics 5,4. Thermoelectric generators, their parameters and characteristics 5,5. Fuel cells, their types, parameters and characteristics 5,6. Converters of electrical energy parameters 6. Hybrid energy conversion systems based on the renewables 6,1. Solar-wind power systems 6,2. Hybrid heat production systems based on the renewables and traditional energy sources
Resilient Urban Futures	6	To develop a comprehensive understanding of the city as a complex phenomenon consisting not only of the physical domain but also of economic, social and ecological layers and introduce students to innovative urban theories and empirical models as well as ways of their implication in practice.	"Resilient Urban Futures" will help to obtain the theoretical knowledge and skills necessary while working with urban projects or architectural projects within the urban environment. The module starts with an introduction to the contemporary theories shaping the framework for resilient urban futures. Then several aspects within that framework are scrutinized: sustainability and circular economy, current and future urban mobilities, the ways to a more inclusive society and quality of life, and finishing with the more controversial idea of cyberspaces. The combination of lectures and practicals will provide knowledge and skills on the foundations of the latest urban theories and urban models.	1. Introduction – a Framework for Resilient Urban Futures 2. Sustainability and Circular Economy 2,1. Sustainability Goals 2,2. Introduction to the Circular Economy 2,3. The Circular Economy in the Built Environment. New Paradigms of Urban Regeneration 3. Urban Mobilities 3,1. Histories, Concepts and Theories 3,2. Methods, Tools and Approaches 3,3. Commutes, Modes and Rhythms. Everyday Life, Bodies and Practices 4. Participatory Research and Planning 4,1. Participatory Transport Planning 4,2. Participatory Planning in the Post-socialist Urban Context 4,3. Participatory Urban Green Infrastructure Planning 4,4. Participatory Research on Heritage- and Culture-based Development 5. Well-being and Cities 5,1. Happy Cities 5,2. Healthy Cities 6. Cyberparks 6,1. Potential of the Cyberparks 6,2. Socio-spatial Practices 6,3. Activating Cyberparks, Digital Hybrids.
Technologies of Processing and Utilization of Proteinous Products Destined for Non-food Uses	6	To get knowledge about integrated processing and utilization of destined for non-food uses proteinous products using biotechnological methods.	Knowledge about technologies of processing of destined for non-food uses proteinous materials and about core and aims of technological processes is gained. Students are trained to carry out such technological processes. Also, knowledge is gained about methods and trends of treatment and utilization of exploited products and wastes from non-food uses proteinous materials.	1. Proteinous materials destined for non-food uses. Nature. Composition. Main poperties of proteinous components. 2. Collagen processing technologies. 2,1. Processing of fur and leather. Core and aims of technological processes.Properties and utilization of wastes. 2,2. Hydrolysis of collagen: acidic, alkaline and enzymatic. Production of gelatine, properties and destination. 2,3. Supplements for fertilizer and animal feed, films formers and other technical products from collagenous hidrolizates. 3. Processing of keratin containing materials and management of keratin containing wastes. 3,1. Production of textile materials. Core and aims of technological processes. 3,2. Chemical, microbial and enzymatic hydrolysis of keratin. Properties of keratin hidrolizates. 3,3. Products from keratin hidrolizates. 4. Biofuel production from proteinous materials destined for non-food uses and from their wastes.
Production of Biologically Active Materials	6	To gain knowledge about the sources of bioactive materials, methods of bioproducts obtainment, isolation and purification, and their regulatory requirements.	Introduction of the conception and principles in the modern biotechnology and sustainable development. Giving knowledge about bioactive/biorganic materials: their sources, production and application. Widely discussed about methods of bioactive compounds obtainment, isolation, purification and analysis. Provide principles of good manufacturing practice, validation and production planning.	1. Introduction. Biomass. Resources of biomass. 2. Biomaterials and their transformation to chemicals for industry. 3. Products of industrial biotechnology. 4. Production of biologically active substances. 5. The method of isolation. Destruction of cells. Safety of work with biomass. 6. The isolation of endo products. 7. Chromatographic purification methods: Sorbents. Methods of purifications. 8. Membrane based affinity technology: Tangential filtration. Membrane. Dialysis. 9. Preparation of bioproducts. Storage of bioproducts. 10. Bioproducts analysis: Quantitative methods. Qualitative methods. Product specification. 11. Good Manufacturing Practice. Production facilities. Biosecurity principles. 12. Validation. Description of technological process and modeling. 13. Planning of production.
Biorefinery	6	To provide knowledge about the principles of biorefining technology and the possibilities of using the technology, by creating efficient processing processes that ensure rational and sustainable processing of plant raw materials into high value-added components, applying modern environmentally friendly methods of extraction and fractionation of bioactive compounds.	This module presents the basics and principles of biorefining processes, the latest developed and existing agro- and biorefining technologies. The complex processing of bio-raw materials is introduced using various, environmentally friendly extraction and fractionation processes, extracting natural, high-value components that can be used to supplement the human diet with specific components. The benefits of the extracted bioactive components and their application possibilities are discussed. As a result, the basic principles of technology are mastered and the ability to apply them in production activities is developed, implementing and implementing new waste-free production strategies.	1. Introduction into Biorefinery 2. Fundumentals of Agro-, Biorefinery 3. Stages of Agro-, Biorefinery 4. Type of Refinery Methods 5. Technologies and Equipments of Biorefinery 6. Extraction and Refining of High Added Value Components Using Green Solvents 7. Complex Application of Various Refinery Methods for Natural Compounds Isolation 8. Optimisation of Process Parameters
Chemical Kinetics and Catalysis	6	To acquire advanced theoretical knowledge and practical skills in order to understand, analyze, investigate and develop catalytic systems	Acquisition of advanced knowledge related to kinetic investigation of chemical reactions, theory of homogeneous, heterogeneous and bio- catalysis and its industrial applications for synthesis of organic compounds, energy processing, bio- and environmental technologies, methods of characterization and design of catalysts, trends in development of catalytic processes. Acquisition of practical skills to carry out statistical analysis and interpretation of kinetic data, to develop mathematical models and solve them in order to calculate kinetic parameters of catalytic reactions, to evaluate the efficiency of various catalytic systems	1. Methodology of kinetic investigation of chemical reactions 2. Statistical analysis of kinetic data 3. Theoretical aspects of catalysis 4. Mechanisms and kinetics of homogeneous catalytic reactions 5. Mechanisms and kinetics of heterogeneous catalytic reactions 6. Industrial catalytic processes for organic synthesis, energy processing, bio- and environmental technologies 7. Materials and methods for synthesis of catalysts 8. Structural characterization and activity testing of catalysts 9. Engineering of catalytic reactions: principles, trends and innovations
Chemicals in Environment	6	To understand behaviour of chemicals in the environment and to acquire skills of risk assessment.	The following subjects are beeing studied: management of chemical substances, transformation and degradation of chemicals in the environment; toxicology; main pollutants (soaps and detergents, synthetic fibers, polychlorinated biphenyls, pesticides, polycyclic aromatic hydrocarbons, pharmaceuticals). Knowledge on reactions of pollutants in the atmosphere, natural waters as well as geosphere is beeing acquired. Students obtain skills in assessment methods of human health and ecological risk due to exposure to chemicals.	1. Management of Chemical Substances 2. Environmental Transformation and Degradation Processes 3. Polycyclic Aromatic Hydrocarbons 4. Polychlorinated Biphenyls and Dioxins 5. Pesticides 6. Soaps and Detergents 7. Synthetic Polymers and Fibers 8. Pharmaceuticals 9. Volatile Organic Compounds 10. Endocrine Disruptors 11. Environmental Toxicology, Genotoxicity 12. Environmental Risk Assessment

Sugar and Starch Science and Technology	6	To provide knowledge of the technological processes of sugar and starch production, the possibilities of processing secondary products and to develop skills, necessary for sugar and starch quality and safety assessment.	Knowledge about the physical chemical processes of sugar and starch production, engineering and technological innovations, the use of by-products, as well as the subsidiary sections in sugar and starch plants. The students will be able to apply evaluation of quality and safety of raw materials and technological process, technological calculations of sugar and starch intermediate products .	1. Technology and equipment of primary treatment of sugar beet 2. Theory of saccharose extraction and mass-transfer 3. Diffusion apparatus: construction and working 4. Physical and chemical changes in juice during defecation, saturation and sulfitation 5. Filtration of sugar solutions in sugar industry 6. Theoretical principles of sugars crystalization 7. Thickening of beet juice, periodical and continuous crystalization of fillmass 8. Fillmass centrifugation; processing of runoffs and secondary crystallization sugars 9. Subsidiary sections in sugar plants 10. Technology of starch and starch products 11. Starch modification chemistry and products of modified starch 12. Side products in sugar and starch industry and they use 13. Control of processing and safety in sugar and starch industry 14. Technological calculation of intermediate and final products in sugar and starch syrups production 15. Innovations in sugar and starch production processes, development of sustainable technologies
Internet of Things and Services for Smart Environments	6	To acquire and understand the trends in development, application areas and the basic principles in management processes of Internet of Things (IoT) and Internet of Services (IoS) and be able to apply	Acquiring the conception of Internet of Things and Internet of Services, its trends in development, application areas and challenges, students are able to assess the basic parameters for IoT and IoS operation and management; to understand the impact of different technologies for IoT and IoS operation; to obtain knowledge of M2M environments, systems, security of data and its role for Internet of Things and Internet of Services. Acquiring the abilities to apply these skills for creating Internet of Things and Internet of Services in M2M environments and evaluating the basic parameters of its operation and management.	1. Internet of Things and Internet of Services – what is this? 1,1. The conception of Internet of Things and Internet of Services 1,2. Past, present and trends in development 2. IoT and IoS technologies 2,1. Backbone 2,2. Protocols 2,3. Software and hardware 2,4. Cloud platforms 2,5. Sensors in Internet of Things 2,6. The interoperability and role of M2M in Internet of Services 3. Application areas of Internet of Things and Internet of Services 3,1. Smart home (office) 3,2. Smart cities 3,3. Smart transport, logistics 3,4. Smart marketing 3,5. Telemedicine and Healthcare, sports 3,6. Ecology 3,7. Manufacturing
Sustainable Development Economics	6	To acquire knowledge about and understand the sustainable development economics paradigm, its origins and context of its development, principles, methods, to be able critically to evaluate sustainable development progress.	Essential interdisciplinary knowledge of sustainable development concept is acquired, main sustainability principles in economics, their implementation methods and tools is understood and the organizational practice skills are built in order to implement this understanding in practice, i.e. critically analyse global environmental and social issues and choose social responsible economics methods for solving these issues.	1. Concepts of circular economics and sustainable development 2. Sustainable development policy and SDG's 3. Individual choices leading to sustainable economics 4. Business strategies towards sustainable economics. Circular economy business models 5. Cities and national policies that can help transitions to a sustainable economy 6. Evaluation of sustainable development progress 7. Circular economic development methods, global iniciatives
Sustainable Development	5	To form competences that enable a systematic understanding of the essence, principles and application possibilities of sustainable development, and to be able to integrate these principles into the daily activities of companies, organizations and government institutions..	The students are taught to understand the essence of the concept of sustainable development and the main principles of practical application, to understand its individual dimensions and their role. Knowledge of sustainable development measures is acquired - methods of their creation, evaluation, financing and implementation. The directive documents of sustainable development and the perspective of interdisciplinary scientific research on sustainable development are analyzed. You learn to systematize the engineering, environmental protection, economic, social, financial and legal knowledge acquired during studies and apply them in practice.	1. Introduction (sustainable development concept and dimensions) 2. Organizational Context of Sustainability 3. Sustainability Related Differences Across Industries and Around the World 4. Interest Groups of Sustainable Development 5. Sustainable innovation in a real-world context 6. Sustainable corporate governance 7. Sustainable supply chain management 8. How to develop a corporate sustainability strategy
Sustainable Transport Development	6	To acquire knowledge about evolution of all transport modes, peculiarities of develpment of the transport means, predicting and systemic models .The specific aims are: appraise to present circumstances of their development, dependance on economical and technical progress, to assess peculiarities of creation of transport system based on use of effective resources, common systematic models.	The students are given abilities to evaluate current situation and development perspectives of all transport modes. There is examinated transport technologies based on usage of effective resources, tendencies of transport policies, development of multimodal transport, implementation of intelligent transport systems (ITS), analitic models and their management.	1. Aims of Baltic region and Lithuania when realizing global transport development 2. Progress of technologies of alternative energy sources that are conditioned by sustainable transport development 3. Traffic flow models 4. System analysis of logistics 5. Models of transportation systems 6. Models of enviromental influence of traffic flows 7. Development of multimodal transport 8. Models of facility of transport terminals 9. Sustainable public transport 10. Intelectual transport systems (ITS) and services 11. Prognosis of transport development in the context of White Book for EU transport policy
Sustainable Architecture and Construction	6	To get knowledge about the main principles and goals of sustainable development. To obtain understanding about the interaction between environmental, economical and social sectors. To get knowledge about the principles of sustainable architecture and construction.	The concept, principles and the main goals of sustainable development are learned in order to implement them in design, expertise and research work. The students will be able to identify architectural and construction problems in the context of sustainable development; to analyse structural, material, environmental, legislative, economical, social, aesthetical elements and aspects of sustainable architecture and construction. The students will be able to perform building life cycle analyses.	1. Evolution of concept of sustainable development and its essence. 2. Principles of sustainable construction, certification systems. 3. Perspectives of sustainable development and future tendencies. 4. Life cycle analysis of buildings – a tool of sustainable development. 5. Sustainable territorial development with respect to construction and architecture. 6. Architectural expression of sustainable technologies and design problems. 7. Sustainable architecture in the different contextual environments. 8. Regionalism in sustainable architecture.
Sustainable Energy	6	To teach thorough understanding of tendencies of sustainable energy and aspects of its development, to master its implementation for solving of problems related with energy planing and operation.	To acquire knowledge of implementation of sustainable energy principles, to master methods and means of its use in practical activities. To acquire abilities to perform evaluation of sustainability of thermal and power energy generation systems through social, technical, economical and environmental points of view.	1. Conception of energy sustainability 1,1. Energy resources and demand in Lithuania and the World 1,2. Criterions of sustainability in energy and society; 1,3. Environmental assessment of sustainable energy evolution 1,4. Life cycle conception and anaysis of products and processes; 2. Renevable energy in the context of sustainable one 2,1. Transformation of thermal energy, reverse thermodynamic systems 2,2. Conversion of thermal energy. Heat engines. 2,3. Sustainable bioenergy 2,4. Types of biofuel and their technologies. Vood chips for combined heat and power. 2,5. Thermodynamic and economic analysis of the biofuel cogeneration plant 2,6. Vood fuel. Expenditure of vood chips production 2,7. Calculation of the main parametres of biofuel cogeneration plant 3. Possibilities of the effectiveness increase of the conventional energy technologies 3,1. Potential of the effectiveness increase of the steam technology 3,2. Potential of the effectiveness increase of the gas turbine cycle technology 3,3. The potential of effectiveness increase of the combined gas turbine cycle 3,4. Carbone dioxide capture and storage technologies 3,5. Sustainable energy and integrated gazification combined cycle technology 3,6. Energy storage technologies 3,7. Air compressing like a manner of energy storage and conversion. 3,8. Utilization of excess electricity for production of thermal energy. 3,9. The off-peak (excess) power utilization for electrolytic hydrogen production with oxygen re-utilization for combution 4. Fuel cell at sustainable energy context 4,1. Operation essence of fuel cells 4,2. The main types of fuel cells 4,3. Advantages and disadvantages of various fuel cells 4,4. The technology of design of the fuel cells. The main problems. 4,5. Fuel used in fuel cells. The properties of hydrogen 4,6. Technologies of the hydrogen production and storage
Sustainable Urbanism	6	To provide the knowledge , which will help to use the principals of sustainable urbanism in territorial planning and urban design for students	The module Sustainable urbanism is additional to other basic modules of architecture and urbanism. There will be presented the bases conected with the creating of spatial structure of settlements in this module.They will touch social, economical and ecological aspects of living, work and rest environments. It will be analysed town and country sustainable aspects in various levels, - state and its parts, district municipalities, municipalities and their parts. There will be concerned functional, esthetical and security aspects of territory planning and urban design.	1. The objectives and conceptions of sustainable urbanism 2. The aspects of sustainable urbanism (social, economic, ecological aspects) 3. Concept of quality of life and sustainable development in urban planning 4. Planning of residential areas in sustainable spatial development perspective 5. Smart City Analytics and Technology (People as Sensors, Crowdsourcing, Transport Flows, Internet of Things) 6. Creation of sustainable urban structure 7. Survey, analysis and planning recomendations for sustainable urban environment (job of the course)
Development and Management of Sustainability Projects	6	Development of the behavioural skills, emotional intelligence, ethical stance and project understanding necessary to lead and contribute to sustainable project processes, practices and outcomes. The core unit provides the framework and impetus for a sustainable and intelligent approach to the introduction of innovation, the delivery of change and the strategic management of organisations through portfolios and programs.	In this module the concepts of creativity, project development and management will be introduced in the context of innovative organizations, business and industries. The students will gain knowledge of economic, social and technological innovations, theories of creativity, will learn to understand basic project management principles, concepts and strategies. The gained knowledge will be applied in the development of the real projects.. After successful completion of the module students will be able systematically evaluate project idea, goals, develop tasks and analyze life cycle of its phases, to plan the duration of the project and possible risks.	1. Introduction 2. Sustainability matrix 3. Critical thinking and creativity in project development processes 4. Sustainability projects: leadership and communication 5. Project environment, development of idea and tasks 6. Project team formation, evaluation of risks and planning of the duration 7. Evaluation and dissemination of the project results 8. Sustainability projects: EU and global experience
Sustainability Management and Law	6	To obtain principles of sustainability management, environmental legal system of European Union, management and control of environment protection.	Sustainability management principles are determined. The students will be able to select and apply problem based methods in environment protection. Application of life cycle assessment method is determined. The students get practical skills of environmental impact assessment. Is able to understand European Union legal system of the main environmental components. The students will be able to apply EU laws.	1. Sustainability management principles. 2. Environmental impact assessment. 3. Development stages and basic principles of the International environmental law. 4. Development stages, principles and instruments of the European Union environmental law. 5. Eco-efficiency analysis. 6. Legislation system, basic conventions and directives of air pollution and noise. 7. Legal system of water protection. Water Framework Directive. 8. Legal system of waste management. 9. Legal system of biodiversity and nature conservation. 10. Legal system of chemical substances and genetically modified organisms. REACH system. 11. Application of European Union environmental law and sanctions for non-application.
Sustainable Chemicals Management	6	To know how to develop products and processes and to perform activities in a way that chemical substances do not cause unacceptable risks to human health and the environment. For that, to provide knowledge about hazards of chemicals used in various economic activities, about risks and about chemicals control system. To develop competences to create appropriate elements of chemicals management at companies, to adopt engineering and technological solutions allowing to reduce risks.	Sustainable chemicals management prevents exposure to hazardous substances, limits risk to supply chains and reputation of a company. Knowledge about aims and means of chemicals control, about relevant legal frameworks, about responsibility of authorities and industry is acquired. Students learn information communication in the supply chains – classification, labelling, and safety data sheets. Students will have skills to analyse reasons of risk caused by chemicals to human health (workers, consumers) and the environment, and to provide managerial, engineering, technological solutions for risk reduction. They will be able to develop chemical management systems at enterprises.	1. Principles and instruments for chemicals control 2. Hazardous chemical substances in technological processes and products 3. Chemicals management in enterprises 4. Classification of chemical substances and mixtures 5. Transferring of information on chemicals in the supply chain 6. Chemicals risk assessment and reduction
Sustainable Management of Natural Resources	6	To provide professional knowledge on natural resources, to equip with understanding of impact and of opportunities for technology development due to the limitation and state of natural resources, and due to strategic initiatives of European Union. To acquire indicators and methodologies for analyzing the use of natural resources, to be able to carry out material flow analysis at the enterprise or regional level, and to apply it to identifying and solving the problems.	The course provides knowledge needed to understand the interdependence between natural resources (state and limits in availability) and human activities (economic growth, technologies used, social issues). The basics of anthropogenic metabolism, European Union strategic initiatives development (Roadmap to a Resource Efficient Europe, The Raw Materials Initiative, An EU Action Plan for the Circular Economic, and other), indicators and methodologies to analyse resource use are taught. Competences to assess and plan the use of natural resources are developed: students will be able to perform material flow analysis at enterprise or regional level with a help of software STAN.	1. Introduction. Natural resources and socio-industrial metabolism 2. Analysing resource use 2,1. Indicators of metabolic performance of economies and regions 2,2. Flow analysis 2,3. Ecological footprint 3. Resource use trends and examples 4. Strategies and visions for a sustainable resource use

Sustainable Consumption and Production	6	To take knowledge about the principles and means in the field of responsible consumption and sustainable industry development. To learn how to analyze factors affecting consumption and industry activity. To know how to use engineering, economic and social measures to promote responsible consumption and production.	Students gain knowledge about the key elements and links of sustainable industrial development and responsible consumption, about the role of consumers and industry in achieving sustainable development goals. The perspective of Lithuanian industry in the context of sustainable development is analyzed. Competences are provided to assess the environmental and social consequences of personal consumption. Students gain ability to systematize the engineering, environmental, economic and legal knowledge acquired during the academic year and apply it in practice when assessing the sustainable development opportunities of individual industries and assessing measures for sustainable lifestyles.	1. Sustainable development strategy: sustainable development problems in industrial society 2. Sustainable development goals: from strategy to real implementation of objectives and indicators 3. Industrial ecology – the strategy of sustainable industrial development: main elements of industrial ecology 4. Critical raw materials in EU and Lithuania and the methodology of evaluation of their impact to competitive ability 5. SD indicators and their practical use for the evaluation of development perspective of different sectors of economy 6. Main tools of sustainable industrial development 7. Sustainable innovations in Lithuanian Industry: development and implementation 8. Sustainable consumption: consumer behavior and the environment 9. Relation of sustainable consumption with the production and resources efficiency 10. Sustainable consumption and production indicators: calculation, evaluation and monitoring 11. Principles, objectives and implementation of Circular economy 12. Environmental impact assessment of households and reduction of environmental impact 13. Social business and regenerative economy 14. Structure and organisation of scientific work: selection and description of methodology
Optimization of Combustion Process	6	Know the peculiarities of fuels kinds in the combustion technology. Can to choose appropriate combustion technology and equipment. Know advanced fuel using technologies.	Know kinds and characteristic of fuels. Know the processes are going during fuel combustion. Know fuel combustion technologies and technical means to implement these technologies. Can calculate elements of burners. Know methods of measurement of combustion products. Know the burners control methods. Learn the optimization methods of fuel combustion process. Know advanced fuel using technologies.	1. Introduction 2. Theoretical basis of fuel combustion 2,1. Fuel types, comparison 2,2. Combustion reactions 2,3. Ignition conditions, flame propagation speed 2,4. Types of gas fuel combustion 2,5. Influence of fuel C/H ratio 2,6. Flame tracking techniques 2,7. Pollutants generation during fuel combustion 2,8. Principles of flame stabilization 2,9. Ways of twisting the air flow 3. Optimization of fuel combustion 3,1. Thermal ballance of boiler 3,2. Heat losses and their determination 3,3. Determination of the optimal excess air 3,4. Fuel savings due to precise regulation of air quantity 3,5. Principles of burners power regulation 3,6. Ways to increase boiler efficiency 4. Gas fuel 4,1. Main types of gas fuel 4,2. Types of gas burners 4,3. Management of gas burners capacity 4,4. Burners selection 4,5. Calculation of gas burners 4,6. Specifics of biogas burners 4,7. Gas lines and appliances for gas burners 4,8. Automatic testing devices for gas valves 4,9. Automatic start sequence of gas burners 5. Liquid fuel 5,1. Liquid fuel composition, characteristics and combustion 5,2. Fuel atomization methods 5,3. Examples of burners designs 5,4. Regulation of burners capacity 5,5. Starting sequence of liquid fuel burners 5,6. Liquid fuel components 5,7. Liquid fuel supply systems 6. Solid biofuel 6,1. Characteristics and combustion 6,2. Fuel preparation 6,3. Combustion technologies 6,4. Storage and transportation 6,5. Reducing the impact of biofuel boilers on the environment 6,6. Technological aspects of biofuel ash 6,7. Thermochemical technologies for energy production from biomass 6,8. Peculiarities of burning straw, peat, coal 7. Solid fuels 8. Domestic heating boilers
Big Data Analytic Tools	6	To obtaine the SAS software tools environments, acquire skills to use them for management, storage and analysis of big data sets.	Obtained the major tools used in the management, storage and analysis of big data sets. Acquired the big data sets integration and management of multi-platform environment, analytical, data analysis tasks of programming languages (SAS) knowledge, capacity building program realistic activity data extraction, transformation and loading (ETL), and analysis tasks. Obtained parallel computing techniques and develop skills to work with DS2 (SAS) SQL-type access to unstructured data, the public cloud as a limitless resource intended for the analysis of large data sets. Develop skills to analyze data systems that can analyze large amounts of data.	1. An introduction to big data management tools 1,1. The need to analyse new more complex data sources using popular big data analytic applications 1,2. Data warehousing and BI versus big data, popular patterns for big data technologies 2. Big data analytics 2,1. Types of big data analytical workloads, streaming data analytics at high velocity 2,2. Exploratory, complex, graph analysis of multi-structured data 2,3. Challenges when managing and analysing big data, key components in a big data analytics environment 3. Big data platforms and storage options 3,1. The new multi-platform analytical ecosystem 3,2. NoSQL DBMSs, analytical RDBMSs 3,3. Analytical databases and DW appliances, analytical tools – SAS 3,4. Data cloud and creating a multi-platform analytical ecosystem 4. Big data integration and governance in a multi-platform analytical environment 4,1. Types of big data, connecting to big data sources and supplying consistent data to multiple analytical platforms 4,2. Loading Big Data – what's different about loading HDFS, Hive & NoSQL Vs analytical relational databases 4,3. Change data capture and data warehouse offload 4,4. Tools for ELT processing, dealing with data quality in a big data environment 4,5. Parsing unstructured data 4,6. Joined up analytical processing from ETL to analytical workflows and the impact of data scientist and end use 4,7. Mapping discovered data of value into your DW and business vocabulary, big data audit, protection and security 5. Tools and techniques for analysing big data 5,1. Data science projects, creating sandboxes for data science projects 5,2. Options for analysing unstructured content, using SAS as an analytical language for big data 5,3. Text, clickstream, exploratory graph analysis and visualisation 5,4. Using search to analyse multi-structured data, creating search indexes, the integration of search with traditional BI 5,5. Building dashboards and reports 5,6. Analysing big data using self-service BI tools 5,7. Big data analytics – query performance enablers 5,8. Managing stream computing in a big data environment, tools and techniques for streaming analytics 6. Integrating big data analytics into the enterprise 6,1. Integrating big data platforms with traditional DW/BI environments 6,2. Tying together front end tools, options for implementing multi-platform analytics 6,3. Cross-platform analytical workflows 6,4. The role of data virtualisation in a big data environment, multi-platform optimisation
Transport Traffic Organisation, Control and Modelling	6	To gain knowledge on safe traffic system organisation, management and modelling principles. To develop abilities to assess, model and forecast transport traffic flows by using the most recent transport traffic flow methods and IT capabilities, analyse environmental impact of vehicles and economic assessment. To be capable of developing the study on assessment and control of transport network capacity by simulation modelling.	Students develop the abilities to understand, assess main principles of traffic organisation and control. Generic skills in analysing, modelling and assessing transport network system, traffic flows by applying modern IT solutions and application packages are developed. Methodology in selection of effective research methods and design of transport traffic flow solution tasks is mastered. Abilities in assessment of environmental damages caused by vehicles are gained. Abilities in application of statistical methods, new strategies, development of plans for a part of transport network are developed.	1. Sustainable mobility in transport system 1,1. Public transport system organisation and control 1,2. Vehicle traffic organisation measures and control 1,3. Safe bicycle traffic system development principles 2. Parameters and features characterizing the transport traffic 3. Mathematical methods for flow research and their application 3,1. Transport network balance and traffic variation dynamics 3,2. Model of traffic flow dynamics 3,3. Shock waves in vehicle traffic flows 3,4. Transport traffic flow control and modelling under numerical and analytical methods 3,5. Higher order models in transport flows 4. Environmental impact of vehicles and traffic safety 4,1. Environmental impact of vehicle noise 4,2. Research and assessment of factors of environmental pollution by vehicles 5. Strategies of a safe transport system and methodologies for economic justification 5,1. Transport network black spots and design solutions for greater safety 5,2. Statistical analysis and modelling of traffic accidents, high accident concentration sections 5,3. Economic assessment of transport network capacity
Eco-entrepreneurship Project	6	To provide students necessary knowledge and skills required for entrepreneurial process from the generation of creative ideas to technological and economical feasibility analysis by adopting the challenge-based learning approach.	Students are acquainted with the technological entrepreneurship concept, its complexity, mindset of the entrepreneurial leader. Skills to generate entrepreneurial idea in the environmental sector are gained. Understanding of the role of creativity in the process is gained. Skills to perform feasibility analysis, to select assessment criteria and methods are gained. Ability to evaluate commercialisation potential of the technology, and present it is developed. The course is based on the challenge based learning method.	1. CHALLENGE BASED LEARNING. WHAT WE BENEFIT? 2. ENTRPERENEURSHIP. FASION OR MUST? (INSPIRATION) 2,1. Concept of Entrepreneurship 2,2. The Role of Creativity 2,3. Management of intellectual property 3. IDENTYING THE CHALLENGE (ENGAGEMENT) 3,1. Finding, grouping and selection of essential questions. 3,2. Creation and presentation of challenge. 4. SOLVING THE CHALLENGE (INVESTIGATION) 4,1. Identification of resources and information required 4,2. Analysis of collected information 4,3. Conceptualizing solution of the challenge 5. IMPLEMENTATION OF CHALLENGE SOLUTION (ACTION) 5,1. Implementation plan of challenge solution 5,2. Prototyping the solution of a challenge 6. Final Pitch
Eco-Design	6	Development of skills for using main eco-design principles and strategies in product development phase. Providing knowledge in methods of environmental impacts analysis, which allows to recognize and evaluate negative impact of a product to the environment. Teaching to select and apply main eco-design tools aimed to decreasing or elimination negative environmental impacts in the entire life cycle of a product – from "cradle to grave".	Subject gives extensive knowledge of main eco-design strategies and motivators, "life cycle thinking" concept; development of skills to use different methods of environmental impact evaluation, which allows to evaluate product environmental impact and product performance in terms of social, economical and environmental aspects. Students develop ability to apply different eco-design tools in different industry sectors and for different types of products, to decrease or eliminate negative environmental impact in the whole life cycle of a product.	1. Introduction 2. Product environmental policy 3. Methods and tools for product environmental impact evaluation 4. Eco-design strategies 5. Eco-design tools 6. Model for product eco-design 7. Product-service systems 8. Ecological product marketing and environmental reporting 9. Eco-design management
Ecosystems Engineering	6	To acquire knowledge about the functioning of ecosystems, to understand the benefits of engineering solutions, to acquire practical knowledge in the preparation of problem-based tasks.	This course considers the interactions between organisms and their environment that together form an ecosystem – which can range from a simple microbial community to the biodiverse forests or lakes. Students will develop their understanding of the terrestrial and water environment as a habitat for a vast array of different organisms; the connections between them and their surroundings; and their resilience to anthropogenic changes. Students will also gain practical experience in ecosystem science by making observations, and through the use of models to investigate processes essential to supporting life in various ecosystems on Earth.	1. Introduction. Definition of an ecosystem 2. Ecosystem composition and functioning 3. Biodiversity 4. Industrial ecosystems 5. Percularities of terrestrial ecosystems 6. Forest ecosystems 7. Meadow and agrarian ecosystems 8. Sand and urban ecosystems 9. Welland ecosystems 10. Percularities of water ecosystems 11. Riverine ecosystems 12. Limnic ecosystems 13. Marine ecosystems

Electrochemical Energy Storage Devices	6	To acquire the basic knowledge of construction, operating principles, design features, the materials and technologies of manufacturing of the various electrochemical energy storage devices.	Knowledge about diversity and construction characteristics, production and technologys of different types of electrochemical energy storage devices is acquired. Ability to understand operating principles and electrochemical processes taking place in the different types of electrochemical energy storage devices is gained. Knowledge how to calculate parameters of electrochemical energy storage devices is obtained.	1. Electrochemical power sources 2. Types of electrochemical energy storage devices 3. Operating principle of electrochemical energy storage devices 4. Reversible processes in electrochemical energy storage devices 5. The main characteristics and parameters of electrochemical energy storage devices 6. Materials and technologies for production of electrochemical energy storage devices 7. Peculiarities of the use of electrochemical energy storage devices 8. Electrochemical energy storage devices and environmental protection
Numerical Methods in Electromagnetic Field Theory	6	To form abilities to apply numerical field calculation methods for electrostatic, direct current electric and magnetostatic fields calculation, to create problem solving program implemented in chosen programming language and to evaluate accuracy of the calculations.	Ability to solve two-dimensional problems of stationary electromagnetic fields by use the numerical finite difference, finite element and moment methods. Knowledge of other numerical methods of electromagnetic field theory. Ability of discretization of field equations, determination the boundary conditions for given area of the field and solving the system of discretized equations. The skill to evaluate the accuracy of the results of computation.	1. Preface 2. Finite difference method 2,1. Selection of coordinate system 2,2. Description of boundary conditions for calculating field area 2,3. Used grid patterns 2,4. Finite difference approximation of Laplace's and Poisson's equations 2,5. Methods of solution of the system of difference equations 2,6. Boundary conditions 2,7. Computational errors 2,8. Computing of field strength 3. Finite element method 3,1. Description of the method 3,2. Finite element discretization 3,3. Formation of element governing equations 3,4. Assembling of all elements 3,5. Solving the resulting equations 3,6. Method of iterations 3,7. Band matrix method 4. Moment method 4,1. Integral equations 4,2. Green's functions 4,3. Solving of equations 5. Other numerical methods 5,1. Variational method 5,2. Monte Carlo method 6. Presentation of computational results 6,1. Visualization of equipotential lines 6,2. Visualization of field lines 7. Comparison of numerical methods 8. Advantages and imperfections of analysis and numerical methods
Electromagnetic Field	6	To form abilities to understand and apply the method of separation of variables and the method of complex potential for analysis of two-dimensional fields and the method of Green's functions for three-dimensional fields, to introduce to numerical methods of electromagnetic field theory.	Ability to solve two-dimensional electric and magnetic field problems applying the variable separation method is provided. Knowledge of the mathematical theory of complex variable functions is introduced. The skill of field analysis using the complex potential method is given. Ability to use Schwartz's integral is provided. Ability to use spatial Green's functions is trained. Introduction to numerical methods of electromagnetic field theory is made.	1. Preface 2. Methods of analysis of two-dimensional electromagnetic fields 3. Separation of variables 3,1. Cartesian coordinates 3,2. Circular cylindrical coordinates 3,3. Spherical coordinates 3,4. Conducting sphere in the uniform electrostatic field 3,5. Dielectric sphere in the uniform electrostatic field 3,6. Conducting circular cylinder in the uniform electrostatic field 3,7. Dielectric circular cylinder in the uniform electrostatic field 3,8. Magnetizable sphere in a uniform magnetic field 3,9. Screening 4. Method of complex potential 4,1. Functions of complex variables 4,2. Conformal mapping 4,3. Complex potential 4,4. Complex field strength 4,5. Complex potential of the fields with components of complex potential represented by radial planes and circular cylinders 4,6. Complex potentials of elliptic and hyperbolic cylinders 4,7. Complex potential of the charges placed on the straight line 4,8. Jump of potential 4,9. Schwartz's integral and applications 5. Problems of analysis of three-dimensional fields 5,1. Green's functions in the space 5,2. Integral equations 6. Numerical methods of electromagnetic field theory 6,1. Finite difference method 6,2. Finite element method 6,3. Moment method
Power System Planning	6	To provide students with knowledge of the structure of electricity systems, energy demand forecasting methodologies and power system planning criteria, and electricity regulation and pricing.	The structure of electricity systems. Energy sector regulation. Pricing. Forecasting of energy demand. Energy balance. Process of electricity systems planning. Generation and networks planning. Lithuanian electric power system development and perspective, strategy.	1. Introduction 2. Structure of electricity systems 3. Energy strategy 4. Regulation of energy sector 5. Management of energy sector 7. Energy demand forecasting 8. Energy balance 9. Renewable energy 10. Planning of power system generation 11. Planning of power transmission systems 12. Security of energy supply
Energy Economics	6	This module is to absorb economic principles relating to the energy sector with emphasis on the economic challenges facing the global energy system.	Assimilating the knowledge and skills that allow you to assess the energy structure of the markets, energy production and consumption patterns, analyze energy data. Knowledge and skills are acquiredto to analyze and evaluate energy demand and supply, perform forecasting and economic analysis and investment analysis of energy efficiency.	1. Energy Demand Analysis and Forecasting 1,1. Energy Data and Balance. 1,2. Understanding and Analysing Energy Demand. 1,3. Energy Demand Forecasting. 1,4. Energy Demand Management. 2. Economics of Energy Supply. 2,1. Economic Analysis of Energy Investments. 2,2. Economics of Fosil Fuel Supply. 2,3. Economics of Non-Renewable Resource Supply. 2,4. Economics of Electricity Supply. 2,5. Economics of Renewable Energy Supply. 3. Energy pricing 3,1. Basic pricing models 3,2. Energy pricing as an energy policy tool.
Energy Economics	3	To realise the course of energy economics, to understand the issues of energy security and efficiency, to obtain the skills of evaluation of investments and to understand influence of nuclear energy.	The contant of modulus embrasses a studies of energy economics foundations and its interpretation in Lithuanian energy problems. The core, structure, methodological bacground and instruments of energy economics as science will be obtained. Main energy problems are interpreted on the macroeconomics plane by integrating energy economics categories-security of energy supply, energy conservation, taxing and regulation policy, environment into criteria of energy development.The main knowledges about nucleaer energy economics will be obtained.	1. Fundamentals of energy economics 1,1. The essence and structure of energy economics 1,2. Methodological basics and concepts of energy economics science 2. Economic problems of Lithuanian energy 2,1. The elements of evaluation of interaction between energy and economics 2,2. Evaluation of the consequences of closure Ignalina NPP 3. The directions of energy efficiency improving 3,1. Macroeconomic evaluation of small scale combined heat and power production 3,2. The basics of energy efficiency policy 4. Basics of nuclear economics 4,1. Analysis of special nuclear energy properties 4,2. Principles of nuclear energy economy
Energy Production and Supply	6	To provide knowledge about the basic and advanced technologies of energy generation, accumulation, transmission and efficient consumption and to develop skills necessary to determine and evaluate the possibilities of the use of renewable energy sources in the engineering systems of the buildings and assess the appropriateness of using centralized heat networks for buildings heating and their development prospects.	Knowledge of modern technologies of energy generation, transmission and use for buildings heating and cooling is acquired. The ability to assess the building's physically energetic environment and make valid engineering decisions regarding the use of renewable energy sources. Knowledge is acquired about energy flows, optimal operating regimes of energy systems, the forecast of the energy demand for buildings heating during the period of the year, the integration of renewable energy sources into the engineering systems of buildings, and the connection of buildings to centralized heat networks.	1. Energetics 1,1. Energetical environment - physical, geopolitical. 1,2. Energy policy, energy generation technologies. 2. Fuel-burning, cogeneration power plants. 3. The concept of nuclear energetics. 4. Industry and transport. 5. Utilization of renewable energy sources. 5,1. Wind energetics. 5,2. Solar energy utilization methods and technologies. 5,3. Geothermal energy utilization methods and technologies. 5,4. Heat pumps. 5,5. Hydropower. 6. Energy conversion and storage technologies. 7. Electricity supply. 8. Centralized heat networks. 8,1. Development and generations of centralized heat networks. 8,2. Centralized heat networks. 9. Technogenic accidents. Environmental impact.
Space Syntax	6	The aim of the module is an acknowledgement of the students with the concept of urban / architectural genotype and Space Syntax theory as a tool for its modelling.	Students will obtain knowledge about the concept of two languages of architecture, architectural / urban genotypes and space syntax theory as its model. The abilities to use various space syntax analysis tools for various architectural/urban contexts will be developed during the problem oriented tasks.	1. Introduction. Theorethical context and background of Space Syntax. Possibilities of usage and examples. 2. Axial analysis and it's main calculations 2,1. The fundamental concept of symmetry 2,2. The second fundamental concept of depth 2,3. Relative assymetry, real relative assymetry and integration 2,4. Choice and it's normalization 2,5. Connectivity, intelligibility, controll and predictability 3. Angular segment analysis: the main indicators and examples of usage 3,1. Weak points of axial analysis and the concept of continuity lines 3,2. Essential features of segment analysis 3,3. The main indicators of angular segment analysis with examples 3,4. Weighting of segments 3,5. Node count as a separate indicator 4. Advanced concept of segment analysis and possible application 4,1. Normalization of abgular segment choice and integration 4,2. Generic city concept 4,3. Indicators of local urban structure 1: mean metric depth 4,4. Indicators of local urban structure 2: embeededness 4,5. Indicators of local urban structure 3: meatric reach 5. Space Syntax and sustainable urban development. Concept of pervasive centrality 6. Multi-modal graph in Space Syntax analysis. Additional possibilities after integration with GIS 7. Visual Graph Analysis 7,1. Visibility VGA analysis 7,2. Metric VGA analysis 7,3. Analysis of Isovistas in VGA analysis 7,4. Agent based analysis in VGA 7,5. Cognitive frame model 8. Graph of Convex spaces

Digital Modelling of Spatial Environment	6	To acquire theoretical knowledge and develop practical skills, which allow using of modern computer methods and tools of object-oriented parametric modeling, forming of topography, infrastructure, built environment, and landscape solutions, and to create prerequisites for the application of the Building Information Modelling (BIM) methodology.	Acquire knowledge of computer-aided spatial design systems based on spatial models, taking into account Building Information Modelling (BIM) methodology. To acquire skills in the application of specialised 3D design software for urbanised territories and the natural environment, parametric objects of the territorial environment (AECC objects - architectural, engineering, construction, civil architecture objects), in the implementation of a project of environmental improvement of a territorial unit, considering the natural conditions of a specific territory, relief, aesthetic qualities of the landscape, environmental protection requirements, social needs.	1. Relevance of the discipline, spatial systems of the built environment, basic terms and concepts. 2. Basics of geoecology. Ecological status of the landscape and measures to maintain ecological balance. 3. The structure of a Digital Terrain Model (DTM) as a basis for a topographic environment. Main modelling concepts. 4. Numerical definitions of base parametric terrain elements (AECC objects) and their description procedures. 5. Methods and tools for managing the sustainable use and conservation of landscape assets. Protected areas system. 6. Procedures for generating longitudinal profiles and cross-sections of a topographic terrain model. 7. Slope forming of a terrain model, its parametric modification functions, and their application. 8. The interests of preserving and developing the built environment. Sustainable development. 9. Functions of shaping and modifying linear environmental objects. Alignment digital description of linear objects. 10. Editing tools of terrain models. Footprints of above- and below-ground objects on the terrain surface. Object conversion 11. Modelling of vegetation and small terrain features. Landscape symbols: forming, modification, and library managing. 12. Geometric positioning of symbols on the surface. Spatial positioning and intersection tasks. 13. Methods and software tools for designing plots as property units. 14. Shaping the overall design of the spatial unit.
European Union Internal Policies in Global Context	6	To provide the understanding of the contemporary challenges and issues of societal development and European Union's response to these challenges through existing internal policies and regulations.	Student has comprehensive knowledge about European Union's internal policies and the specifics of their functioning, understands and is able to critically assess how these policies and actions respond to, regulate and impact global and regional development processes, challenges and issues (e.g. in relation to agricultural policies, international migration processes, social equality and poverty eradication, changes in the education sector, demographic challenges, etc.), is able to provide reasoned positions and proposals for improvement of the EU internal policies and relevant national policies of other countries, in accordance with the sustainable human development principles.	1. Introduction to Advanced Studies of EU Internal Policies 2. Comprehensive Overview of EU Internal Policies in Sustainable Human Development Perspective 3. Global Context, Sustainable Human Development and EU Internal Policies: Integrated Studies 3,1. EU Transport Policy and Programmes 3,2. EU Energy Policy and its Global Context 3,3. The Common Agriculture Policy and the Common Fisheries Policy 3,4. EU Industrial Policy in Global Human Development Perspective 3,5. EU Employment and Social Security Policies 3,6. EU Policies and Actions on Social Inclusion and Social Cohesion 3,7. EU Coordinated Actions in the Field of Public Health 3,8. EU Policies and Programmes in the Field of Education and Training 3,9. EU Research, Technological Development and Innovation Policies and Actions in Global Human Development Perspective
Fermentation Science and Technology	6	To provide knowledge of innovative, sustainable industrial technologies for makink of beer and other beverages, by-product recycling, waste-free technologies, and the ability to apply product quality and safety assessment, control and improvement of production processes to the development of new products, ensuring product competitiveness, turnover and diversity.	The latest innovative, sustainable, waste-free and rare fermentation technologies are mastered. New production methods, the processing of their by-products, optimal operational parameters and physico-chemical and biochemical processes and equipment, and the basics of fermentation biotechnology are mastered. The student will be able to evaluate innovations in beer and fermentation technology, to apply knowledge of the main production processes and the possibilities of processing by-products, and be able to apply quality tests on fermentation raw materials and products.	1. Advances in science, technology and new product development in the fermentation industry 2. Authenticity, geographical origin, quality and safety improvement of fermentation industry products 3. Advanced methods to analyse composition and properties of raw materials and products of fermentation industry 4. Innovations in beer, wine, spirits and other drink production technologies and their implementation possibilities 4,1. Advanced fermentation technologies and their impact on product properties, quality and safety 4,2. Advanced distillation technologies and their impact on product properties, quality and safety 4,3. Specific requirements for raw materials and technological equipment, optimization of technological operation parameters 4,4. Properties, production technologies and applications of specific raw materials (hop extracts) 5. Challenges and solutions to increase the sustainability of production processes of products in the fermentation industry 6. Valorization of by-products of the fermentation industry into the higher added value products 6,1. Brewers' and distillers spent grain 6,2. Spent yeast, symbiotic culture of bacteria and yeast (SCOBY) 6,3. Various fruit and berry pomaces 6,4. Other by-products and/or waste
Manufacturing Strategy	6	To provide knowledge about manufacturing strategy, development of production facilities and processes, planning, planning of production volumes, determination of market needs, forecasting, quality planning and management of companies, and to develop abilities to solve problems related to these areas.	It is grounding to understand the main principles of a manufacturing strategy, its structure, and development process. It is given the deep knowledge of strategy functions, stages of manufacturing effectiveness, and strategic integration linking manufacturing to marketing. It is grounding the methodology of products and processes quality strategy and main aspects of the statistical process control. It is given benchmarking methods and estimation of manufacturing systems.	1. The principles and formulation of manufacturing strategy 1,1. The types, differences and decision principles of manufacturing strategy 1,2. The capacity, strengths, and competing priorities of the company 2. The development of a manufacturing company's structure, infrastructure, and production 2,1. The principles of research methods for market and competitive environment 2,2. The assessment and planning of cost, quality and manufacturing capacity 2,3. The assessment and planning of manufacturing time, flexibility and reliability 2,4. The principles of sustainable and green engineering production design 3. The management of manufacturing, factory layout, and process development projects 3,1. The main principles of manufacturing development projects creation and control 3,2. The main principles of factory equipment layout and process development 4. Forecasting methods for the market demand and manufacturing workload
Extraction of Bioactive Natural Materials	6	To acquire knowledge on properties, sources, conventional and innovative isolation, purification, stabilization and characterization methods and technologies of natural bioactive constituents, leading to the effective, rational and sustainable processing of natural raw materials into high added-value components.	Student acquires knowledge on properties and sources of natural bioactive constituents, as well conventional and innovative isolation, purification, stabilization and characterization methods and technologies thereof. Student is familiar with multistep biorefining applying human and environmentally friendly extraction and fractionation techniques for valuable constituent isolation, also with modelling and optimization of bioactive constituent isolation processes. Regulatory issues and application of natural bioactive constituents in various fields of chemical industry are discussed as well.	1. Natural bioactive constituents: sources, classification and properties 2. Solvent selection and sample preparation for isolation of bioactive constituents from natural sources 3. Conventional methods and technologies to isolate natural bioactive constituents 4. Innovative methods and technologies to isolate natural bioactive constituents 5. Isolation of natural bioactive constituents by multistep biorefining technologies 6. Modelling and optimization of bioactive constituent isolation processes 7. Bioactive constituent purification methods and technologies 8. Characterisation and stabilization of bioactive constituents 9. Regulatory issues and application of natural bioactive constituents in various fields of chemical industry
Cereal and Confectionery Science and Technology	6	To provide knowledge of the cereal products and confectionery production technologies, and to develop sustainable production processes of innovative products with improved quality, nutrition value, and safety, ensuring their competitiveness in the market.	Acquired essential knowledge about cereal products and confectionery production technologies. Built practical skills in order to develop new products with higher quality and nutritional value, and implement the product quality management system. Learned analytical and technological methods for targeted studies of food chemical composition, quality and safety, nutritional value, and functionality. Able to solve multiple non-standard and unspecific problems of sustainable production technologies in the entire food system, making socially responsible decisions. Learned steps involved in new food product development and implementation in the market	1. Cereal chemistry: biologically active materials, their properties and application 2. Safety aspects of cereal raw material and technological tools for their control 3. Additives improving the quality of bakery and confectionery products and their effect on technological processes 4. Peculiairities of the application of enzymes in breadmaking 5. Innovative tools for the prevention of microbiological spoilage of baked goods for the sustainable production 6. Microbial fermentation as sustainable tool for the development of bioproducts to improve bread quality 7. Application of freezing technology: production methods and improvement of baked goods quality 8. Gluten-free bread and flour confectionery production technologies 9. Production technologies of non-traditional baked goods ((hamburger buns, pizzas, croissants, Danish sweets) 10. Particularity of the production of dietary sugar confectionery 11. Production technologies of specific baked goods (tortillas, pizzas, semi-baked goods) and pasta 12. Extrusion technology for the production of snacks and ready-to-eat cereal products 13. Aerated sugar confectionery and their production technologies
Hydraulic Systems and Hydroenergetics	6	To provide knowledge about the purpose and operating principles of hydraulic systems, hydropower equipment and hydroelectric power plants, and the main methods of their design. To develop competence to collect and appreciate necessary data and compute the amount of energy to be potentially generated.	The main laws of hydraulics are assimilated. The ability to apply the theoretical knowledge for the solution of engineering problems for closed conduit and open flows is acquired. Knowledge of hydraulic systems and drives and their practical usage is acquired. The fundamentals of hydro energetics are assimilated. Knowledge of modern hydropower technologies and solutions is acquired.	1. Hydraulics. 1,1. Hydrostatics. Pressure, the main force of liquid pressure acting a surface. 1,2. Hydrodynamics. Flow continuity, flow regimes, Bernoulli equation. 1,3. Application. Closed conduit and open flows. Flow through orifices and nozzles. 2. Hydraulic systems. 2,1. Volumetric and dynamic hydraulic machines. 2,2. Hydraulic power drives, hydraulic accumulators and servo valves. 2,3. Pump stations, liquid supply. 2,4. Typical schemes of hydraulic power drives. 3. Introduction to hydrology. Purpose and types of hydraulic structures. 4. Hydroenergetics. 4,1. Energy resources of the rivers. 4,2. Energy exchange between fluid flow and the vane of machine. Hydraulic turbines. 4,3. Hydropower plants and their operation in the energy system. 4,4. Damless hydropower plants. 4,5. Usage of the wave energy. 4,6. Other technological solutions using hydropower. 5. Environmental impact of hydroenergetics. 6. Accidents and disasters in hydroenergetics.
Business Process Analysis and Digitalization	6	To provide theoretical knowledge in the area of business process analysis and digitalization and to develop corresponding skills required to apply that knowledge in practice using business process management ecosystems.	Essential knowledge in the area of business process analysis and modeling using BPMN modeling language is acquired and practical skills are built in order to apply the acquired knowledge for the specific business domain. Practical knowledge of business process digitalization using business process management system Pega is acquired and Business Architect competence is built, which allows to develop a prototype of the information system functioning on Pega platform. Upon completion, students are provided with an opportunity to acquire Pega Certified Business Architect certificate.	1. Introduction 2. Business Process Analysis and Modeling with BPMN Modeling Language 3. Pega Infinity Overview 4. Gathering and documenting requirements in Pega 5. Business Process Design in Pega 6. Development of Data Model in Pega 7. Development of Graphic User Interface in Pega 8. Business Process Monitoring in Pega
Innovations in Fashion Design	6	To provide related knowledge of fashion product technologies and design on the broad context of the phenomenon of fashion innovation, the impact of technology on design decisions. To develop skills to conceptualize, adapt to the latest trends in fashion innovation, generate fashion product design ideas and create fashion product prototypes taking into account the requirements of the circular and sustainable design.	Knowledge of the broad context of the phenomenon of fashion innovation, changes in the design of fashion products through changes in technological innovation is aquired. Abilities to analyze and apply innovative production-creative processes and technologies for creating fashion products and changing the concept of fashion production and consumption are developed. The students will be able to apply the latest fashion innovations, generate fashion product design ideas, according to the impact of technical aesthetics, product demand and brand concept, virtualize and create fashion product prototypes. Design Thinking, Learning-by-Doing and Learning-for-Fun teaching / learning methods are used.	1. Introduction. The concept of a fashion product in social and cultural aspects. Mass production and individualization. 2. Fashion philosophy and forecasting. 2,1. Analysis of perspective fashion. Trend visualization. 2,2. Concept development. Influence of fashion marketing elements. Design of fashion marketing strategies. 2,3. Aspects of collection creation. Economic factors. 3. Fashion product development trends and perspectives. 3,1. Zero waste production principles and design solutions. 3,2. Creating a sustainable product. Inspirations and technology. 3,3. Ethics in fashion. 4. Innovative technologies, future costume. 4,1. Materials of the future. 3D printing in design. 4,2. Laser technology in design solutions. 4,3. Smart materials and smart apparel. 5. Žiedinis dizainas mados sektoriuje. Tvari mada.
Innovation in Building Products Technology	6	To acquaint with the prospects and challenges related to the construction of advanced production technology development and application.	The knowledge about innovative technologies and construction production methods and methods. Considered innovative solutions considering the construction of new production technologies, production of technological schemes, technological calculations, technology design. The innovation process, innovation classification, creativity methods, ideas generation and evaluation of the work of innovation team.	1. The innovation process, innovation classification 2. Technical development of the creative and technical progress 3. Building materials and products, technological innovation specificity 4. Technological systems design in a modular way 5. Flexible technology design and simulation 6. Innovative concretes and dry building mixtures 7. Light concretes and products manufacturing technology 8. Technology of silicate concrete products 9. Technology of chopping - block products 10. Organization forms of main production processes 11. Technology and recast of row materials, breaking and sieves technology analysis 12. Aggregates recycling technological lines of the design principles
Innovation Management	10	To develop innovation management competence, based on deep understanding of innovation management concepts and ability to manage innovations at the strategic and operational levels of organization, with regard to changing organizational environment.	The master student understands key concepts of innovation management, differencies in management of various types of innovations, and organisation of innovation activities. He (she) is able to assess innovation management level in an organisation, identify obstacles in innovation activity and design its improvement, while aligning organisational roles, responsibilities and organisational competencies with innovation strategy, and implement innovation oriented organisational rutines and discipline.	1. Innovation management perspective: background and contemporary approaches 2. R&D development stages and technology readiness levels: managing technology complexity 3. TRL and R&D development stages: from the fundamental research to market. 4. Technology and innovation market development, adoption mechanisms and the role of lead users 5. Stage gate model for innovation management and its application peculiarities 6. Managing open innovation within an organisation and interorganizational networks. 7. R&D and global innovation management models: reverse, frugal, open innovation 8. Managing resposnible research and innovation at the organisational, and ecosystem level. 9. Innovation management systems. Innovation strategies and risks management in open innovation ecosystems. 10. Assesing and improving innovation management performance
Innovation management	5	To acquire R&D intensive knowledge, that enables to solve organizational innovation management challenges at the strategic level, and to develop the competencies of identifying new business development opportunities, the development of new products, while critically assessing technological trajectories and transformations, and project innovative business models and innovation development processes as based on systemic research approach for investigating external and internal environments.	Interdisciplinary R&D intensive knowledge and competencies are acquired in order to solve innovation management challenges in different contexts. The student is able to identify innovation and business development opportunities, such as new products, services, and value propositions, as based on the critical assessment of technology development, systemic approach for scanning internal and external environment, and implement innovative business models and innovation implementation processes.	1. Innovation management 1,1. innovation management principles and system in an organization. 1,2. Contemporary innovation management models and challenges. 1,3. Strategic design of innovation management and development of organizational culture 2. Innovation development 2,1. Development and implementation of green innovation in an organization 2,2. AI and Big Data driven innovation development and implementation in anorganization 2,3. Design driven innovation development and implementation in an organization 3. Assesment of innovation activities 3,1. Evaluation models for innovation activity asesment 3,2. Innovation activity audit and development in an organization

Innovative Production Technologies	6	To provide knowledge about the concept of innovative production technologies, development, implementation and development perspectives in today's context of the Circular Economy and the Green Course and to develop the skills necessary for the tasks of industrial transformation.	The students are taught to understand the modern manufacturing methods and technologies, and apply them in high tech enterprises. They are taught to understand the newest tendencies in the development of CIM and artificial intelligence and to be able to apply the newest achievements in science and technology in the practical activities.	1. Innovative technologies in the manufacturing industry 2. Hightech in Lithuania industry 3. Technology in modern environment 4. The concept of sustainability in the manufacturing companies 5. Innovation's development and the life cycle of new products 6. Circular economy and challenges for state business regulation and environmental protection 7. Good practices in Lithuanian industry 8. National standardization in the fields of environmental protection and CE
Innovative Food Processing and Packaging Methods	6	To provide knowledge of food production areas where new processing and/or packaging methods can be applied, understand the processes and design of processing/packaging equipment, the specifics of different packaging materials influence on the storage and safety of foods.	Advanced knowledge of electrophysical, pressure, infrared radiation, freeze-drying, ultrasound methods and their application for the food processing, electrophysical properties of foodstuffs and their changes during processing, physical and chemical properties of different packaging materials and their influence on the product changes during storage.	1. Sterilization of foods under high hydrostatic pressure 2. Electrophysical properties of food products and their changes in electrostatic field 3. Thermal processing using electric current 4. Electroseparation, smoking and coating under the influence of electrostatic field 5. Electricity induced plasmolysis, stimulation and defrosting 6. Processing in high frequency field: drying, cooking, sterilization 7. Processing of foods by infra red irradiation 8. Application of ultrasound in food technology 9. Freeze drying of foods 10. Minimal processing of foods, using innovative packaging 11. Types of packaging materials, their functions and choices 12. Physicochemical properties of food packaging materials 13. Packaging material costs, waste reduction and sustainable packaging technologies. 14. Differences in materials used for food packaging, their advantages and disadvantages 15. Transfer of chemicals from packaging to products. 16. Different packaging materials and environmental issues 17. 3D printing of food
Integrated Waste Management	6	Provision of knowledge on waste management strategies and on integrated waste management principles; development of skills to identify and solve waste related management and treatment issues at different levels.	Waste management strategies are presented during the course. Means of integrated waste management, based on preventive and other solutions for different waste streams, which enable making environmentally and economically sound solutions are taught. The knowledge is provided on legal requirements, political – economic measures. Skills are trained to determine in practice and to solve waste management and treatment related problems at different level of decision making; to analyse and select appropriate waste prevention (circular economy) methods and implementation strategies.	1. Legal requirements, principles, life cycle approach in waste management 2. Waste properties, classification, collection and sorting 3. Waste management at regional, country and local levels 4. Waste treatment technologies 5. Waste streams (biodegradable, WEEE, textile, packaging, CDW, etc.) 6. Waste management in enterprises 7. Waste prevention. From waste management towards resource management based on circular economy concept
Engineering Economics	6	Acquire the economy and efficiency of the operational engineering,understand the need for investment, financing sources,perform an economic analysis,introduce to the innovative cycle of products,services.	Graduates acquire knowledge of engineering innovation, ranging from the idea of innovation to its implementation. Competencies to evaluate the efficiency of innovations and apply acquired knowledge in preparing applications for project funding are being developed. Graduates acquire knowledge about the sources of innovation funding and legal protection of engineering solutions. They are able to evaluate and apply in practice expert engineering solutions according to economic efficiency indicators; are able to perform economic evaluation of innovation development and justify the purposefulness of innovation in the context of sustainable development	1. Economic justification of engineering activity 1,1. Enterprise's cost structure and revenue streams 1,2. Sources of financing for investment projects 1,3. The objectives of engineering solutions and the criteria of effectiveness 1,4. Legal protection of engineering solutions 2. The concept of enterprise's costs and cash flows 2,1. Forecasting human resource demand and the effectiveness indicators 2,2. Determination of fixed capital needs and the effectiveness indicators 2,3. Determination of working capital needs and the effectiveness indicators 2,4. Product cost determination and product pricing 2,5. Profit and cash flow analysis 3. Innovation economy 3,1. The concept of innovations and the importance for enterprise's competitiveness 3,2. Economic justification of the design and implementation of innovation 3,3. Innovation life cycle and its characteristics 3,5. Acquisition of the design and production of innovations 3,6. Economic equivalency, cash flows of project 3,7. Analysis of the effectiveness of innovative projects
Smart and Sustainable Cities	6	To develop competences and provide knowledge in engineering, technology and economy, that is essential for evaluation of cities' sustainability and systematic decisions making on the main urban resources and flows: energy, transport, buildings, natural systems and other significant parts of the city in existing, ever-changing environment.	It requires knowledge in various disciplines while developing a sustainable city: urban development, economics, engineering and social sciences. This subject provides competences for evaluating situation and adopting systemic solutions on the main urban resources and flows: energy, transport, buildings and natural systems in existing ever-changing environment. During this module, students will understand the concept of sustainable city, learn how to find creative solutions will solve engineering and economic problems in real cities. Problem based learning will be applied, stimulating creativity, teamwork and entrepreneurship skills, systemic thinking at city level.	1. Introduction 2. Cities and Sustainability 3. Skills For Urban Sustainability 4. Systems for evaluation of city's sustainabili 5. City Systems: Energy 6. City Systems: Housing 7. City Systems: Mobility 8. City Systems: Natural Systems 9. Entrepreneurship in sustainable city ecosystem
Smart Mobile Communication Networks and Applications	6	To obtain knowledge about technologies and their implementations aspects in smart mobile communication (SMC) networks. To analyse the deployment principles and options of Apps.	Students are taught to understand the principles of smart mobile communication (SMC) networks operation. The knowledge about radio interfaces, multiple access, connection roaming and antennas technologies is given. Presentation about SMC network terminals synchronization and cell search is given. The knowledge about used communication protocols, channel coding, services and their rates is given. They are taught to apply models of radio wave propagation for cell coverage and inter cell interference-estimation. The opportunities to present theirs competence for SMC network design and planning is given. They are taught to apply SMC network opportunities for implementation different solutions.	1. Smart Mobile Communication Networks (SMCN) 1,1. SMCN architecture, protocols and standards 1,2. SMCN uses technologies and solutions 1,3. Use of fiber optic technology in SMCN networks 1,4. SMCN modeling tools and propagation models 1,5. SMCN design and radio parameter evaluation 1,6. Internet of Things and Services, NB-IoT technology 1,7. Cloud and edge computing architecture, infrastructure and services 1,8. Synergies between the Internet of Things, artificial intelligence and mobile networks 1,9. Application solutions and ecosystems: Industry 4.0/5.0, autonomous cars, intelligent transport, and smart cities 2. Applications 2,1. Smartphone operating systems 2,2. Criteria for application development 2,3. Android, iOS and other application development programs 2,4. Cloud computing applications, their architecture, services 2,5. Application purpose and solutions, development perspectives
Development of Challenge-Based Innovation	3	Enable students to solve complex real-life challenges in an innovative way by adopting the challenge-based learning approach and working in interdisciplinary and intercultural teams.	Students are introduced to the concept, goals and principles of the challenge-based learning method. Students are trained to solve real-life challenges in a creative and non-traditional way, working in interdisciplinary and intercultural teams. Students are supported to come up with an innovative idea of a challenge solution, to implement it, to test it and present it to a wide audience.	1. INTRODUCTION TO THE CHALLENGE-BASED LEARNING 2. SEARCH OF THE SOLUTION FOR THE CHALLENGE (ENGAGEMENT) 2,1. Effectiveness of a teamwork and work in multicultural teams 2,2. Finding, grouping and selection of essential questions for the challenge 2,3. Creation of challenge 3. DIGITAL INNOVATION FOR FUTURE PROSPERITY (INSPIRATION) 3,1. Sustainable cities of the future 3,2. The impact of Artificial Intelligence on the development of society 3,3. Circular economy: towards a sustainable future 4. SOLVING THE CHALLENGE (INVESTIGATION) 4,1. Identification of resources and information required for the solution 4,2. Analysis of collected data and information 4,3. Constructing solution of the challenge 5. IMPLEMENTATION OF CHALLENGE SOLUTION (ACTION) 5,1. Implementation plan of challenge solution 5,2. Development, testing, and validation of a prototype to address the challenge 5,3. Promoting entrepreneurship and managing intellectual property 5,4. Presentation of a solution to the challenge
Development of Challenge-Based Innovation	6	Enable students to solve complex real-life challenges in an innovative way by adopting the challenge-based learning approach and working in interdisciplinary and intercultural teams.	Students are introduced to the concept, goals and principles of the challenge-based learning method. Students are trained to identify and solve real-life challenges in a creative and non-traditional way, working in interdisciplinary and intercultural teams. Students are supported to come up with an innovative idea of a challenge solution, to implement it, to test it and present it to a wide audience.	1. INTRODUCTION TO THE CHALLENGE-BASED LEARNING 2. SEARCH OF THE SOLUTION FOR THE CHALLENGE (ENGAGEMENT) 2,1. Effectiveness of a Teamwork / work in intercultural teams 2,2. Finding, grouping and selection of essential questions for the challenge 2,3. Creation of challenge 3. DIGITAL INNOVATION FOR FUTURE PROSPERITY (INSPIRATION) 3,1. Sustainable cities of the future 3,2. The impact of Artificial Intelligence on the development of society 3,3. Circular economy: towards a sustainable future 4. SOLVING THE CHALLENGE (INVESTIGATION) 4,1. Identification of resources and information required for the solution 4,2. Analysis of collected data and information 4,3. Constructing solution of the challenge 5. IMPLEMENTATION OF CHALLENGE SOLUTION (ACTION) 5,1. Implementation plan of challenge solution 5,2. Development, testing, and validation of a prototype to address the challenge 5,3. Promoting entrepreneurship and managing intellectual property 5,4. Presentation of a solution to the challenge
Resource Recovery Technologies	6	To gain skills for assessment of technical feasibilities and economical and environmental benefit for recovery of raw-materials, energy and water resource from antroposphere in the context of circular economy.	After completing this module, students are able to evaluate a technical feasibilities for product and energy production resources and water recovery from anthroposphere, comparing them economically and environmentally with the acquisition of the same resources in nature.	1. Traditional resource extraction from the lithosphere, biosphere and hydrosphere. Circular economy principles 2. Recovering of metals and non-metalic raw material from waste 3. Oil products and chemical materials recuperation from waste 4. Fuel and energy recovering from waste 5. Resources recovering from landfills 6. Materials recovering in the process of exhaust gas cleaning 7. Alternative ways for procuring of drinking water 8. Water recovery from industrial and domestic wastewater 9. Materials recovering from industrial and domestic waste water 10. Materials recovering from water and wasterwater treatment residues
Accounting for sustainable engineering	6	To provide with sound knowledge and managerial competences to develop measures of corporate technological, environmental and social performance, assessing their reliability, reporting to external stakeholders, and making strategic and operational decisions that affect environmental costs and risks.	The sustainability managers must understand the financial costs and benefits of sustainability practice. During this course, the students will gain understanding of the economic perspective of sustainability in the traditional and broader socioeconomic sense. With the quantitative analysis methods (i.e. environmental management cost accounting) the students will gain the competences to utilize data samples when analyzing different organizational units allowing them efficiently determine the best way to proceed on a particular project on a company level.	1. Introduction 2. Measuring sustainability on company level 3. Environmental management cost accounting: methodology and practice 4. Incorporating sustainability into decision making 5. Sustainability indicators of a company 6. Sustainable Investing and Economic Growth
Quality and Sustainable Development Management	5	To obtain knowledge on quality management and sustainable development, as well as capabilities to implement systems of quality environmental management, corporate responsibility and occupational safety.	Essential interdisciplinary knowledge of quality management and sustainable development concept is acquired, main sustainability and quality management system principles and outcomes, their implementation methods and tools is understood and the organizational practice skills are built in order to implement this understanding in practice, i.e. to implement systems of corporate social responsibility, quality and environmental management and occupational health and safety.	1. Concepts of sustainable development, corporate social responsibility and quality management 2. Sustainable development policy and SDG's: why it is important for organizations? 3. Evolution and the main theories of quality management (TQM, ISO 9000, EFQM, CAF) 4. Contemporary practice of quality management (6 sigma, LEAN) 5. Realization of sustainable development approaches in organization (CSA, ISO 14000, EMAS, SA8000, OHSAS) 6. Evaluation of quality and sustainable development progress

Comprehensive Studies of Risk and Security Issues 2	6	To provide interdisciplinary knowledge and analytical skills for the exploration of complex risks, related to technological development, geopolitical problems, challenges to health and personal sphere; theoretical models of risk governance proposing solutions for these problems.	Student is able to apply interdisciplinary knowledge and models of risk governance in analysing complex risks, related to technological development (nuclear energy, bio-, nano- technologies, cyber security), geopolitical problems (terrorism, nationalism, religious fundamentalism), health challenges (pandemic and chronic diseases, addictions), and personal life (violence and harassment, personal data protection etc.).	1. Theoretical models of risk governance for the complex risk and security issues 2. Technological risk and security issues 2,1. Nuclear safety 2,2. Bio-, nano- and other new technolgies 2,3. Cyber security 2,4. Weapons of mass destruction 3. Geopolitical and related risks 3,1. Terrorist threats 3,2. Religious fundamentalisms 3,3. Nationalism 3,4. International conflicts 4. Health risks 4,1. Pandemic diseases 4,2. Chronic diseases 4,3. Diet and psysical activity related risks 4,4. Addictions related risks 5. Personal security threats 5,1. Violence and harrasment 5,2. Personal data protection 5,3. Risk in working environments 6. Complexity and interconnectivity of risks
Composite and Wooden Structures	6	To introduce wooden and composite structures, calculation methods and design principles and their use in construction.	In-depth understanding of the chemical composition of composite construction materials, properties and behaviour of timber as a construction material, as well as principles of structural design and analysis is provided within this course. Competences in analyzing and understanding the interaction of composite materials in structures, mechanical behaviour under short-term and long-term effects properties of composite materials and connections are gained. Abilities to estimate the sustainability and durability of composite and timber structures are gained.	1. Typology of composite engineering wood constructions 2. Composite materials of new technologies. 3. Engineered timber as a structural material 4. Main properties of composite materials 5. Analysis of composite structural elements 6. Joints and connections of composite elements 7. Design of flexural composite elements with partial shear connections 8. Scope and Design Codes of Composite and Hybrid Structures 9. Design of Shear Connection in Composite Structures 10. Analysis and Design of Composite CLT Slabs with Structural Concrete 11. Design of Hybrid Timber Beams 12. Analysis and Design of Composite Members in Compression 13. Bending Stiffness Analysis of Flexural Composite Members 14. Connections of Composite and Hybrid Structures 15. Sustainability and Durability of Composite and Timber Structures
Leadership	6	To acquire theoretical knowledge of leadership phenomenon and process, to be able to plan and analyse actions of a manager as a team leader and their results as well as to develop the skills of leadership, communication, information, analysis, critical thinking, problem-solving, research, teamwork, personality cognition and development, learning, openness to variety and innovations, and work in an organisation.	Students will have acquired the key knowledge of leadership in an organisation based on theories of leader traits, leadership, team development, and problem solving. The students learn to identify personal traits of leader and to use their advantages in striving for the effective leadership. The prospectus for individual development of leader traits is designed.	1. Leadership essence and importance 1,1. The concept of leadership. The influence of leadership upon organisational activity. 1,2. Traits, motives, and characteristics of leaders. 1,3. Charismatic and transformational leadership. 1,4. Effective leadership behaviour. 1,5. Developing teamwork 1,6. Creative problem solving and leadership. 1,7. Communication and conflict resolution. 1,8. International and culturally diverse aspects of leadership. 2. Theories of leadership 2,1. Leadership styles. 2,2. Contingency and situational leadership. 2,3. Sustainable Leadership 2,4. Motivating and Coaching. 2,5. Leadership of quality and technology. 2,6. Leadership development and the future.
Catering Science and Technology	6	To provide knowledge about innovative catering technologies by developing the ability to organize sustainable and environmentally friendly food production and service systems.	Concepts of catering technology are acquired, knowledge about catering product production and service systems is acquired, and practice skills are built in order to develop the ability to apply innovative solutions in designing a sustainable, environmentally friendly catering service system	1. Catering service 2. Catering production systems 3. Sustainable catering production systems 4. Service systems 5. Innovative service systems 6. Sustainability in catering systems
Photovoltaic Materials	6	Understand the differences between various solar cell architectures and evaluate their characteristics. Analyze advantages and drawbacks of polymers and low molecular weight compounds used in photovoltaic technologies.	Knowledge about the renewable energy sources, possibilities of their application, principles of operation of solar cells and their key characteristics is provided. Analysis of the polymers and low molecular weight compounds used in solar cells, as well as their characteristics crucial for application in the photovoltaics, is conducted. Review and analysis of the cutting-edge research conducted in this area is performed.	1. Alternative Energy Sources 2. Photovoltaic phenomena in the semiconductor 3. Solar cell architectures, their advantages and disadvantages 4. Design of the dyes for solar cells 5. Design principles of the p-type semiconductors 6. Future outlook of the Solar cell technology, innovations and development directions
Meat Products Science and Technology	6	To Provide Knowledge About Innovative Technologies of Meat Products, Improvement of Product Safety and Quality and Creating of Higher Added Value by Applying Sustainable processes of Manufacturing	Deeper knowledge of meat processing technology, the use of additives and substitutes and their influence on functional and technological properties is acquired. Methods of researching the functional properties of meat, its products, additives and substitutes are learned. The students will be able to create recipes for the desired category of meat products and will understand the causes of meat product failures. Knowledge about the possibilities of processing meat offal and by-products, creating value-added products is acquired	1. Sustainable technology and advanced technologies for meat processing 2. Creating the added value, by processing offal and by-products from meat processing 3. Food additives in meat processing 4. Meat protein replacements, their types and usage characteristics 5. Meat fillers, their types and usage characteristics 6. Spoilage, defects and safety of meat products 7. Creation, classification of meat products and formulation of their recipes
Modular Construction and Regenerative Design	6	To acquire interdisciplinary knowledge about the design, production and construction of modular buildings using regenerative design methodologies.	Knowledge is provided about the differences between building construction on a construction site and in a factory, their advantages and disadvantages. The regenerative and ecological design strategies under consideration are designed to create living and working environments.	1. Regenerative design 2. Modular construction. The advantages and challenges. 3. Team building 4. Problem framing, challenge selection 5. Analysis of the current situation, stakeholders identification 6. Analysis of the problem from a socio-cultural, environmental, economic, political aspect 7. Formulation of initial solutions 8. Prototyping of solution 9. Analysis of solutions in terms of sustainability 10. Presentation of solutions
Methodology of Science and Scientific Research	5	To know the science as a phenomenon, to supply basics understanding the diversity of its functions, the logic of science and the language of science, to assimilate the knowledge of social research.	Essential knowledge about science as a phenomenon is acquired; understanding the philosophy of science for society development and sustainability, as well as understanding the models of scientific classification and organization; adopting the understanding of the importance of science in country development, mastering scientific paradigms design principles via logic of science and scientific language; assimilating knowledge of social research and its role in the development process of society; building up the capacity to construct social research methodology when applying quantitative and qualitative research strategies, scientifically based data gathering and analysis methods.	1. Significance of science to the country development. Goals and objectives of philosophy of science in community developme 1,1. The concept of science. Science classification. Science organization models. 1,2. Scientific schools of philosophy, their methodological significance. 2. Scientific knowledge and dissemination. 2,1. Elements of scientific cognition process and methods. 2,2. Scientific cognition methods. Scientific and non-scientific knowledge. Collection of scientific information. 2,3. Scientific text genres. Critical reading. Academic language 3. Science methodology. Design principles of scientific paradigms. 3,1. Theoretical methods of scientific research. 3,2. Methodological approaches in social sciences: positivism and antipositivism 4. Strategies of scientific research methodologies. 4,1. Methodological approach in analysis of social phenomena. 4,2. Strategies and methods of qualitative research 4,3. Strategies and methods of quantitative research 4,4. Mixed research strategy. Triangulation 5. Research design: structure and strategies 5,1. Structure of research design 5,2. Research strategies and modelling 6. Organization of scientific research and stages of research process. 6,1. Qualitative research. Program of qualitative research. 6,2. Quantitative research. Program of quantitative research. 6,3. Processing qualitative and quantitative research data, their visualization and reliability. 6,4. Report preparation of scientific work. Limitations of the research. 6,5. Dissemination of scientific research results 7. Ethics of scientific research.
Inequality and Justice	6	To provide knowledge about forms of inequality and their causes in society, develop skills to ensure equality and justice at work, solve the problems of inequality and discrimination at national, supranational and international levels.	The student acquires knowledge about normative and legal presumptions for justice and equality in organisations and societies at national, supranational and international levels. She is able to understand the competences of Court of Justice of the EU, European Court of Human Rights and Lithuanian national court system for protecting and enacting human rights. She is able to apply theories of intersectionality, justice, human capability approach to the analysis and evaluation of organisational practices for and national approaches to realising social cohesion and social inclusion. The student is able to develop programmes for UN Sustainable Development Goals.	1. Concepts of justice, legitimacy, inequality and discrimination in court practice and academic discourse 1,1. Justice as fairness (J.Rawls). Organizational justice 1,2. Intersectionality theory and systemic discrimination 1,3. Social contract as an instrument for legitimacy of social norms and respect to the rule of law 2. Fundamental human rights 2,1. Human rights as a normative and legal category 2,2. Private life protection and its limitation with regard to public interest 2,3. Human right to equal working conditions 2,4. Freedom of religion 2,5. Human right to freedom of mobility and its limitation 2,6. Right to the accessibility of public services (education, health) 2,7. Human right to clean and sustainable environment 3. Moral imperatives of the human capability approach (A. Sen, M. Nussbaum) to states and organisations 3,1. The relation of the human capability approach to other ethical theories (human rights, utilitarianism, deontology) 3,2. Implications of the human capability approach to the equality of genders and the disabled at work 4. Equality and justice in UN Sustainable Development Goals 4,1. The role of business organisations and intersectoral partnerships in enacting equality and justice 5. Possibilities of human rights protection at national, supranational and international levels 5,1. Structure, competence of the importance of jurisprudence of international justice court 5,2. The structure, competence and the importance of jurisprudence of the Court of Justice of the European Union 5,3. The structure, competence and the importance of jurisprudence of the European Court of Human Rights 5,4. System, competence and the importance of jurisprudence of the system of national courts 6. Social cohesion, integration and inclusion 6,1. Corporate social responsibility and social innovations 6,2. The role of social enterprises in creating social inclusion 6,3. Citizen science as a case of inclusive science
Organizational development	5	To get knowledge that enables successfully solve the challenges of the organizations and to develop the competence to create an organizational development strategy and its implementation plans, to adopt innovative solutions for human resource management and organizational transformation in conditions of uncertainty, after evaluating alternatives by adapting the most effective organizational structures, motivation systems and developing the culture of the organization.	Interdisciplinary knowledge and competences based on high-level scientific research and experimental development and enabling to solve strategic challenges of organizations in various problematic contexts are acquired. Able to create the organization's development strategy and its implementation plans, to adopt innovative transformation-enabling solutions for the implementation of human resources management systems in conditions of uncertainty, after evaluating alternatives, adapting the most effective organizational structures, motivation systems and developing the organizational culture.	1. Strategic development of an organization 1,1. Integrated management: the synthesis of organizational structure, culture and human resource management policy 1,2. Change management 1,3. Organizatio's reputation management and communication solutions 1,4. Sustainable development of an organization 2. Human resource management systems enabling transformations 2,1. Development of human resource management systems 2,2. Remuneration and motivation 2,3. Analytics of human resources 2,4. Value proposition for the employee 3. Employee relations 3,1. Teamwork 3,2. Authentic leadership

Distributed Energy Sources	6	To provide knowledge for students about the development of distributed generation, the impact on distribution and transmission network operating, management and economic assessment criteria	The students are taught to know the problems and consequences of distributed power generation utilization in power system, thorough knowledge of energy objects operation specifics, technology, legal and economical regulation is provided, and also abilities of solving distributed generation and energy system relations, applying modern technology and research, are provided. is, students are taught to analyze methodology of distributed generation regulation, perform practical research, analyze results and formulate conclusions of the research, use legal and standard documentation.	1. Distributed generation 1,1. Distributed generation sources 1,2. Fuels 1,3. Influence of distributed generation on power systems operation 2. Electric generators 2,1. Principles of electric generators 2,2. Design of synchronous generators 2,3. Design of asynchronous generators 3. Prime movers 3,1. Combustion engine generator sets 3,2. Combustion turbines 3,3. Photovoltaic systems 3,4. Microturbines 3,5. Fuel Cells 3,6. Combined heat and power 4. Principles of control of distributed generation 4,1. Distributed generation in electric power distribution systems 4,2. Installation and interconnection 4,3. Control of synchronous generators 4,4. Control of asynchronous generators 5. Economic aspects of distributed generation 5,1. The regulatory environment 5,2. Financial aspects of distributed generation
Building Data Analytics and Machine Learning	6	Be able to work with modern methodologies for the analysis of buildings and infrastructure data and the development of predictive models, using advanced machine learning techniques and tools.	The study subject is designed to know and be able to work with data of the built environment, prioritizing data relevant to the construction and real estate industry, such as thermal and electric energy, water management, external and internal climate, price or structural characteristics data; solve multifaceted problems relevant to the construction industry by applying modern methodologies and tools for artificial intelligence, based on which forecasting algorithms are created. Important learning stages include managing and preparing the programming environment, data preprocessing, analysis, visualization, interpretation, development and improvement of forecast models.	1. Introduction to Buildings Data Analytics. 1,1. Buildings Data, Sources (open/closed, BIM, GIS, IoT). 1,2. Artificial Intelligence in AEC industry. 1,3. Key Statistical Parameters. 1,4. Data types, Formats, and Quality. 1,5. Real Time and Historical Data. 1,6. Time Series Data and its specifics. 1,7. Internet of Things (IoT). 2. Python Programming Environment. 2,1. Notebook Programming Environment. 2,2. Variables, Operators, Data Types, Libraries. 2,3. Loops, IF statements, Functions. 3. Python Data Analytics and Visualization Modules. 3,1. Numpy - for multi-dimensional arrays and matrixes. 3,2. Pandas - for Data Pre-processing and Analytics. 3,3. Data Visualization with Matplotlib, Seaborn, Calplot. 4. Statistics Fundamentals. 4,1. Histogram and related parameters. 4,2. Correlation and Logarithmic Transformation. 5. Applied Machine Learning. 5,1. Machine Learning Methods. 5,2. Regression and Classification. 5,3. Concrete Compressive Strength Prediction. 5,4. Building Thermal Energy Analysis and Forecast. 5,5. Building Electricity Consumption Analysis and Forecast. 5,6. Price Forecast of Real Estate objects.
Building Energy and Environment	6	To acquire knowledge about environment-building interaction forms, the influence of climatic and other surrounding conditions on the energy demand of the building. To know environmental research methods, to be able to analyze the collected data, to forecast the states of the building and the environment. To obtain the knowledge of modern technologies of energy generation, storage, transmission and efficient usage and be able to assess the energy performance of the buildings and engineering systems.	The students acquire abilities to understand the forms of interaction between the structures and the environment, the assessment methods, inhibition possibilities, normative documents, analytical data collection, analysis and scientific forecasting of the interaction. Obtain the knowledge of efficient energy generation, transmission and usage technologies, as well as energy accumulation, saving and energy usage efficiency increase implementations in residential, administrative and industrial buildings, methods for determining and analyzing the energy performance of the buildings and engineering systems.	1. Environment influence to building, its influence to environment forms. 1,1. Environmental law. 1,2. Meteorological measurements. Climatology. 1,3. Pollution. Monitoring for environmental effects. 2. The concept of energetics. 2,1. Fuel combustion - cogeneration plants. 2,2. Solar, wind, hydro and geo energetics. 2,3. The concept of nuclear energetics. 3. Impact of anthropogenic activities on the environment. 3,1. Industry, energetics, transport. 3,2. Technological accidents. 3,3. Ecological disasters. 4. Usage of renewable energy sources in buildings. 5. Necessity and presumptions of the evaluation of energy performance of the buildings and the efficient energy consumption 6. Efficient technologies, solutions and alternatives in energy generation, transmission and supply. 7. Methods of energy accumulation, saving and efficient use in buildings. 8. Evaluation of building energy consumption, energy audits, analysis and certification.
Reliability Theory and Applications	6	To learn to analyse reliability by applying reliability theory and statistical methods.	The students are mastered the knowlege of reliability models and the methods of statistical analysis of reliability.	1. Reliability Characteristics. 2. Statistical Reliability Data. 3. Parametric Reliability Models. 4. Estimation Using Parametric Models. 5. Nonparametric Reliability Estimation Methods. 6. Reliability Modeling of Renewable Objects. 7. Models of Aging and Accelerated Testing. 8. Regression and Semiparametric Methods. 9. Hypothesis Testing in Reliability. 10. Reliability Control.
Methods and Means of Heritage Management	6	To know the legal bases of heritage management, directions of this activity, methods, means. To be able to apply in practice the organization of sustainable use and protective management of cultural and natural heritage values.	Students are provided with knowledge about the concept and goals of heritage management, methods and directions of heritage management; the importance of authenticity in heritage management; learn to allocate and apply heritage management measures in planning activities: restoration, conservation, repair, levels of value preservation: authenticity, copy, imitation; gets acquainted with the basics of organizing sustainable use and protective management.	1. Conception of the heritage object and aims of heritage protection in XXI a. 1,1. Directions of activity of heritage protection 1,2. Modern law of heritage protection 2. Conception and objectives of cultural heritage management 3. Juridical basis of cultural heritage management 3,1. Methods and tendencies of cultural heritage management 3,2. Means of cultural heritage management 4. Guarantee of cultural heritage protection and effective use 4,1. Authenticity in cultutal heritage management 4,2. Anastylosis 4,3. The fundamentals of conservational use and preservational management organization
Advanced and Specialized Textile Processing	6	To provide knowledge about advanced yarns, woven and kitted fabrics, and nonwovens technological processing, technical and specialized fabrics properties, areas of use, theoretical modelling, specifics of manufacturing.	Knowledge of advanced woven fabrics, knits and nonwovens processing, equipment, specificity of technical and specialized fabrics manufacturing is provided. Ability to use theory of fabrics forming process for woven fabric formation modelling is fostered. Theoretical and practical problems, possibilities and achievements in development of woven fabrics, knits and nonwovens manufacturing technologies.	1. Technological innovations of specialized yams 2. Technological innovations of sustainable yams manufacturing 3. Trends of technical progress of weaving preparation technologies. 4. Tendencies of weaving technological innovations 5. Multi shed rotational formation of woven structures 6. 3D weaving 7. Structure and properties of special and technical fabrics 8. Mathematical model of woven fabric formation 9. Theoretical modelling of knitted structures. 10. Types, structure and properties of dimensional (3D) weft knits 11. Types, structure and properties of dimensional (3D) warp knits 12. Types, structure and properties of sandwich knits 13. Types, structure and properties of directionally oriented knits 14. Tendencies of manufacturing technologies of technical and specialized knits 15. Stich bonded and needled special and technical nonwovens properties and manufacturing technologies 16. Dispersion and thermical bonded special and technical nonwovens properties and manufacturing technologies
Advanced Optimization and Control Methods for Biotechnological Processes	6	To teach understanding about the types of biotechnological processes, mathematical models of typical biotechnological processes, optimization and control methods, and to be able to solve typical modelling and optimization problems of biotechnological processes using Matlab/Simulink environment.	The students are taught to master the types of bioreactors and biotechnological processes, key biotechnological parameters, to develop mathematical models of the processes, to mathematically formulate typical optimization problems, to understand the main optimization methods and to apply them in engineering practice, to model and to optimize biotechnological processes using Matlab/Simulink environment.	1. Process modelling, using Matlab and Simulink program environment 2. Bioreactors and biotechnological processes 2,1. Types of bioreactors and biotechnological processes 2,2. Mass and heat transfer processes 2,3. Typical scenarios of biotechnological process control 3. Mathematical modelling of processes 3,1. Mass and energy balances 3,2. Kinetic models 3,3. Artificial neural networks 3,4. Experts systems, fuzzy logic-based models 3,5. Identification of model structure and parameters 4. Process optimization 4,1. Main definitions, formulation of optimization problems 4,2. Evolutionary computation 4,3. Swarm intelligence 5. Process control 5,1. Control problems of typical biotechnoogical processes 5,2. Control systems and methods of biotechnological parameters
Dairy Science and Technology	6	To provide knowledge of innovative dairy technologies and sustainable production processes, product quality and safety assessment and improvement, ensuring food diversity and competitiveness.	Essential dairy science and technology knowledge is acquired and practice skills are built in order to apply it in innovative and sustainable technological processes and production of dairy products, i.e. on the technological processes influence on the dairy products quality and safety on the specificities of dairy production technologies and applied innovative research methods for dairy analysis.	1. Innovations ans sustainability in dairy technological processes and production 2. Heat treatment processes and their impact on dairy product quality and safety 3. Centrifugation and homogenisation processes in the dairy industry 4. Membrane filtration processes and their use in dairy products production 5. Drying processes in the dairy industry 6. Dairy products enrichment with natural biologically active substances 7. Organic dairy products and their specificity of the production technologies 8. Specificities of the different cheese production technologies and new products development 9. Dried dairy ingredients production technologies and their specificities 10. Innovative research methods applied for dairy analysis
Python for Data Science	6	Develop competences in using Python programming language, standard libraries and packages of the ecosystem, command line, Git version control system, means of distributed computing and other tools for solving problems in data analysis.	General principles of software coding, version control system, tracing of the running application, software documentation, standard Python libraries and additional packages for data acquisition from different sources are studied. Competences are developed in organizing machine learning applications using pipeline abstraction, extending functionality of and creating new Python packages. Competences in using Python packages dedicated for data visualization is developed.	1. Introduction. Data analysis using general purpose software tools. 2. Linux operational system and terminal (command line interface). 3. Git version control system. 4. Fundamentals of Python programming language. 5. Creation of terminal (command line) interfaces with Python. 6. Elements of object oriented programming. 7. Extendig the functionality of and creating new Python packages. 8. Python notebooks 9. Data acquisition from various sources (network API, files of various formats, databases) using Python. 10. Packages of Python ecosystem for scientific applications (numpy, scipy, pandas, sklearn, plotnine etc.). 11. Structuring of software code, tracing and good practices in software coding 12. Software documentation and its automatization. 13. Possibilities in distributed computing with Python.

Polymers for Advanced Technologies	6	To provide the knowledge on production methods of polymers used in advanced technologies and understand their combination of features which is needed for the innovative products.	The ability to dissect the chemical and physical structures of polymers predeterminig their exclusive properties and important role in advanced technologies. The ability to evaluate production, properties and applications of polymers used in electronics and optoelectronics as well as nanostructured polymeric materials. The ability to appraise production methods, unique properties of medical polymers as well as polymers obtained from renewable resources and their prospects in advanced technologies.	1. Survey of the methods of synthesis of polymers 2. Peculiarities of the chemical and physical structure of polymers determining their unique properties 3. Polymer coatings 4. Medical polymers 5. Polymers in electronics and optoelectronics 6. Nanustructured polymeric materials and their applications 7. Prospects of biopolymers and polymers obtained from renewable resources in advanced technologies
Polymer Recycling	6	Provide in-depth knowledge and develop the ability to apply polymer waste recycling methods	The students get deep knowledge on the environmental and economic importance of polymer recycling. Students are trained to following skills: apply polymer waste identification and sorting techniques, evaluate compatibility of plastics, select the appropriate methods of plastics restabilization and physical recycling, as well as suitable methods of chemical recycling for individual polymers and their mixtures (pyrolysis, chemolysis, hydrocracking, gasification and thermal recycling), select the photo- and biodegradable polymers for new products.	1. Ecological and economical importance of polymer recycling 2. Collection, identification and sorting of plastic waste 3. Physical recycling of plastic waste 4. Compatibility and restabilization of plastics 5. Physical recycling of individual polymers 6. Chemical recycling of plastic waste 7. Pyrolysis of plastic waste 8. Chemolysis of plastic waste 9. Hydrocracking of plastic waste 10. Gasification of plastic waste 11. Thermal recycling of plastic waste 12. Photo- and biodegradable polymers
Polymer Matrix Composites	6	To provide knowledge about selection of composite structures materials and production processes, be able to evaluate the properties of composite materials.	Student is taught to understand adhesion phenomena in heterogeneous polymer systems, structure, manufacturing methods, characteristics of the polymer matrix composites. Knowledge about recycling possibilities for polymer composites is acquired.	1. COMPOSITE MATERIALS, THEIR PECULIARITY 1,1. Kinds, peculiarities and application's branches of composite materials 1,2. Composition and properties of heterogenic and homogenic polymer systems 2. ADHESION PHENOMENON IN POLYMER MATERIALS 2,1. Significance of adhesion in heterogeneous polymer systems 2,2. Theoretical basics of adhesion, consistents of adhesive bond formation in polymers 3. POLYMER MATRIX COMPOSITES, THEIR COMPOSITION AND STRUCTURE 3,1. Polymeric components of composites 3,2. Non-polymeric components of composites 3,3. Methods of production and structure of polymer composites 3,4. Polymeric nanocomposites 4. PROPERTIES OF POLYMER MATRIX COMPOSITES 4,1. Static and cyclic strength, durability of polymer composites 4,2. Influence of different factors on the strength of composites 4,3. Thermal, electrical, optical and others properties of composites 5. POSSIBILITIES OF RECYCLING OF COMPOSITES 5,1. Methods and facilities of composites recycling 5,2. Sorts of polymer waste products and their secondary application in composites
Modification and Applications of Polysaccharides	6	To assimilate knowledge about the complex properties of polysaccharides and to understand their modification processes in order to get high-value-added non-food products.	This course will provide an introduction to the most widely used industrial polysaccharides (cellulose and starch). Modification and processing technologies of polysaccharides will be explained in detail. Students will be taught to understand the essence of technological processes, objectives, to choose the production technology according to the raw materials and the desired properties of the product. The opportunity to carry out such processes will be given. Students will be introduced to the trends and techniques of polysaccharides processing and utilization.	1. Classification of polysaccharides and prevalence in nature 2. Chemical modification of most widely used industrial polysaccharides (cellulose and starch) 2,1. Introduction of active groups into macromelecules of polysaccharides 2,2. Cross-linking of polysaccharides 2,3. Destruction of polysaccharides, including enzymatic hydrolysis 3. Physical modification of most widely used industrial polysaccharides (cellulose and starch) 4. Cellulose fibers. Preparation and properties. 5. The use of polysaccharides 5,1. Polysaccharides in paper and textile industries 5,2. Polysaccharides as sorbents and flocculants 5,3. Perspectives of polysaccharides as non-food materials 6. Polysaccharides – green chemistry – biomass
Environmental Impact Assessment	6	To gain an understanding of the complex concept of environmental impact, national and international legal regulation of strategic environmental assessment (SEA) and environmental impact assessment (EIA), methodical/ methodological/ procedural assessment issues; learn how to select and apply the appropriate EIA methods for the assessment of architectural, urban, and landscape development activities in order to reduce their possible negative effects.	In this module, the knowledge of the definition of planned activities and understanding of the environmental impact and its character is obtained; knowledge and understanding of the objectives of environmental impact assessment and strategic environmental assessment, assessment procedures, documentation, legal basis, and methodologies are obtained; the ability to use various methodologies for environmental impact assessment and strategic environmental assessment is developed.	1. Introduction - Relevance, Aims and Work Plan 2. Environmental Impact and its Regulation 3. Sustainable Development and Indicators of Environmental Quality 4. Concept of Pattern Language by Christopher Alexander 5. Informational Optimality of Structures by Nikos A. Salingaros 6,1. Fractal Analysis - Introduction 6,2. Fractal Analysis - Implementation 7. Theory of Videoecology by Vasilj A. Filin 8. USA Bureau of Land Management Methodology 9. Geoqualimetry 10,1. Space Syntax - Introduction 10,2. Space Syntax - Implementation 11,1. Other Methods - Structural Models of the Cityscape 11,2. Other Methods - Mapping 11,3. Other Methods - Visual Character of Landscape 12. Overview
Technology of Industrial Bioprocesses	6	To provide knowledge about the latest industrial bioprocesses and biotechnology related to biofuels, bioenergy and biopolymeric products.	Theoretical and practical knowledge is provided about biofuels and bioenergy and biopolymeric products for the production of biomass and applied biotechnology and bioengineered processes i.e. microbial conversion step, enzymes, and use of detergents / textile manufacture, as well as thermochemical reactions. The knowledge is provided of these processes impact on product quality, an environment and implementation in the market development.	1. Introduction to technologies of biochemicals: green chemistry and industrial biotechnology convergence. 2. Bioethanol production from C6 sugars and starchy biomass technologies. 3. Enzymatic / acid hydrolysis and microbial fermentation of bioethanol production efficiency. 4. Lignocellulosic biomasses chemistry; processing into bio-ethanol and organic acid technology. 5. Technologies of processing of lignocellulosic biomasses into lignin and chemicals . 6. Complex mechanical, thermal, chemical, biological biomass processing methods for the preparation of biomass. 7. Oil feedstock into biodiesel processing technology. 8. Liquefied biofuels production technologies (BHD; BTL; FAEE; ED95). 9. Biofuels, chemicals, heat and energy production applying thermochemical technologies: pyrolysis, hydrothermal liquefacti 10. Biogas (methane) production and purification. Anserobic fermentation. Bioreactors and their types. 11. Bioplatics and biocompositic plastics production technology. 12. Application of enzymes for detergents and textile production. 13. Recycling biotechnology. 14. Bio-manufacturing process control and safety requirements and regulatory principles.
Product Development	6	To provide knowledge of market analysis, product design, engineering, manufacturing and recycling principles that allow to develop marketable and successful product.	A set of methods combining marketing, design and manufacturing aspects of product development are acquired. Students are able to analyse customer needs, establish product function, generate and evaluate concepts, decide on product architecture, form product portfolios and embody final product design based on "design for X" methodologies.	1. Planing of Product Development 1,1. Product Development Processes 1,2. Product Development Organizations 1,3. Understanding Customer Needs 1,4. Establishing Product Function 2. Establishing Engineering Specifications 2,1. Benchmarking 2,2. Product Teardown 3. Concept Design 3,1. Concept Generation 3,2. Concept Selection 4. Embodiment Design 4,1. Product Architecture and Portfolios 4,2. Configuration and Parametric Design 4,3. Detail Design 5. Product Evaluation 5,1. Design for Manufacturing and Assembly 5,2. Design for Environment 5,3. Design for Robustness
Software Maintenance and Evolution	6	To provide fundamental knowledge and abilities in software maintenance and improvement based on software maintenance principles, models, methods and processes, and empiric laws.	Course provides knowledge on the life cycle of software; Software Engineering Body of Knowledge as applied to software maintenance and evolution: basic categories, processes, problems and methods; analysis of characteristics of legacy systems; evaluation of legacy systems; software change and empiric Lehman's laws; requirements for documentation to support maintenance processes; code smells; software reconstruction and configuration management; program understanding; technical debt; as applied to maintenance and evolution; develops abilities to use software maintenance tools based on the principles of software reuse and the evaluation of software quality and maintainability measures.	1. Needs, Objectives, Object , Context, Structure and Methodology of Software Maintenance 2. SWEBOK model of software maintenance: categories, processes, problems and methods 3. Legacy Systems. Characteristics, Evaluation and Maintenance 4. Program Change (S-, P-, E-Programs) and Lehman Laws and Maintenance Planning 5. Program Maintenance Costs and Assessment Methods. 6. Maintainability evaluation and measuring, quality measures. Quality and maintainability metrics. 7. Program understanding and code reviews 8. Program Reconstruction and Inverse Reconstruction. Documentation 9. Software change planning and change impact management 10. Sustainable software and maintenance 11. Software Product Line engineering, evolution and maintenance 12. Code smells and anti-patterns in software maintenance 13. Technical debt management in software management 14. Modern methods and tools of software maintenance
Management of Regional Development	6	To provide knowledge and develop competencies necessary to initiate, plan, organize, implement and monitor sustainable development of the region, to prepare region marketing and communication strategies	Students acquire knowledge of the concept, content and role of a region, also knowledge of regional development management process, actors and tools; students gain practical skills required to analyse, develop, apply and assess regional development management means. Students acquire knowledge and learn about practices necessary for preparation of sustainable development strategy, as well as marketing and communication strategies, learn how to sellect measures of implementation of the strategies and monitoring tools.	1. Concept, typology and structure of regions; the role of regions in the context of multi-level governance 2. Regional development: aims, process, actors and environment factors 3. Management of regional development: aim, actors, process, context 4. Strategic regional development management 5. Master (general) planning of the region 6. Urban vs rural development management differences and similarities 7. Policies and practise of regional development in the EU 8. Policies and practise of regional development in Lithuania 9. Regional marketing and branding and communication strategies 10. Technologies, innovations, AI for regional development
Oil Science and Technology	6	To provide knowledge about traditional and innovative oil processing, modification and stabilization technologies and sustainable production processes, product quality and safety improvement, to develop skills necessary for development and implementation of technologies for production of different composition oil based products	Knowledge about traditional and innovative oil processing, modification and stabilization technologies and sustainable production processes, as well as physical, chemical and metathesis processes, reactions of oils during processing and their influence on product quality and safety is acquired. Knowledge about technologies of oil based products: margarine and spreads, shortenings, cooking oils, cocoa butter replacements is acquire. The skills necessary for development and implementation of technologies for production of different composition oil based products are built	1. Sustainable technologies and innovative methods of oil processing. 2. Integrated conversion process of oils and their importance in the development of new products. 3. Oil modification technologies (hydrogenation, interesterification, fractionation, winterisation). 4. Specificity of the production of special fats and fat substitutes, their properties and applications. 5. Processing technologies of mayonnaise, margarine, shortenings. 6. Creating the added value by processing of by-products from oil production 7. Oxidation and stability of fats and oils. 8. Quality control, authenticity and geographical origin of oils and oil based products.
Selected Chapters of Organic Chemistry	6	Students with basic undergraduate level organic chemistry knowledge, give skills identify in, analyze and solve complex problems in various synthetic organic chemistry, and meet the knowledge to choose the methods of synthesis of specific research works.	Getting knowledge about the main modern organic synthesis concepts that enables to identify, analyze and solve complex problems in various areas of synthetic organic chemistry. Acquire knowledge about the basic methods of functional groups transformation, principles of metallo organic chemistry, the short-lived intermediates, the facilities and methods of modern organic synthesis laboratories. It provides an ability to develop more effective and environmentally friendlier methods of the preparation of organic compounds.	1. The main concepts of modern sythetic organic chemistry 2. Principles of sustainable chemistry. 3. Modern laboratory organic synthesis technologies. 4. Peptide synthesis 5. Modern heteroaromatic chemistry 6. Modern homogeneous and heterogeneous catalysis methods 7. Modern methods of organometallic chemistry. 8. Metal-catalyzed cross-coupling reactions

Risk and Security Governance	6	To provide knowledge about risk notion in social theory, interdiciplinary approaches in social analysis of risk, threats and possibilities of technological development; inadequaces of risk distribution in various social groups, to develop skills to analyse the problems of risk regulation and governance assuring sustainable development and solving human security problems.	Students will aquire knowledge about risk notion in social theory, will understand interdiciplinary approaches in social analysis of risk, will understand the threats and possibilities of technological development; will get aquainted with inadequaces of risk distribution in various social groups, will be able to characterize the problems of risk regulation and governance assuring sustainable development and solving human security problems.	1. RISK AND SECURITY: PROBLEMS AND INSTITUTIONAL FRAMEWORK 1,1. The notion of risk. Global risk and security problems. 1,2. Conceptual – analytical framework of risk and security governance 1,3. Stakeholder engagement: institutions and actors 2. RISK GOVERNANCE 2,1. Risk assessment and analysis 2,2. Risk perception research 2,3. Risk characterisation 2,4. Risk and security analysis methods 3. RISK COMMUNICATION 3,1. Audience segmentation for risk communication 3,2. Practical principles of risk communication, infogpraphics 3,3. Social media for risk and crisis communication 4. RISK GOVERNANCE 4,1. Risk management: decision making 4,2. Risk management: organisational perspective 4,3. Complexity of current risks and threats. Social and political contexts.
Relationship Marketing	10	To provide knowledge of relationship marketing and to develop the skills to make adequate decisions on customer relationship development.	The knowledge of relationship marketing is mastered and the skills to make adequate decisions on customer relationship development in various business spheres are gained. Students are able to identify the stages of customer relationship life cycle. The methods of customer value assesment are mastered. Students are able to identify the antecendents of long-term customer relationship, justify decisions on customer value creation and value maximization in different stages of customer relationship development. Skills in assessing and use of relationship marketing techniques, foresee organisation transformations when implementing relationship marketing are gained.	1. The concept of relationship marketing 1,1. The origin of relationship marketing 1,2. Differences between transaction and relationship marketing 1,3. Relationship categories 2. Fundamentals of profitable long-term customer relationship formation 2,1. Enterprise-customer relationship life cycle 2,2. Customer differentiation in relationship marketing 2,3. Estimation of customer value to an enterprise 2,4. Relation of customer value and relationship sustainability 3. Solutions of customer relationship development 3,1. Identification of long-term customer relationship antecedents 3,2. Customer value creation 3,3. Value maximization in different stages of customer relationship development 3,4. Technologies and their role for relationship marketing decisions 3,5. Organizational changes when implementing relationship marketing
Digital Wireless Technologies	6	To provide knowledge of digital wireless short-range communication systems. To learn to design their function block diagrams, models, design LPWAN and choose best wireless system for it, to explore and investigate wireless systems characteristics.	The knowledge of functional architecture of modern digital wireless short-range communication systems is acquired. The ability to analyze study cases of diverse digital subsystems is gained; The skills to design, to model and to simulate diverse digital subsystems by means of GNU-Radio and SDR technology are gained. The skills to design LPWAN network with digital wireless systems are gained. The skills to measure the characteristics and parameters of wireless systems are acquired.	1. General Knowledge of Modern Wireless Communication Systems 1,1. SDR technology. 1,2. LPWAN networks and their use for wireless sensor data transmission 1,3. Comparison of wireless technologies (NB-IoT, LoRa, Sigfox) used at LPWAN networks 1,4. Design of LPWAN network 2. Digital transceivers 2,1. Wireless Short-Range Communication Systems signal processing subsystems 2,2. Binary Digital Modulations. Multilevel digital modulations 2,3. Spread Spectrum and Multicarrier Systems 2,4. Performance of Communication Systems Corrupted by Noise 2,5. Error Control Coding 2,6. Case Studies of Digital Subsystems of Wireless Short-Range Systems using SDR technology 3. Mobile networks 3,1. Main features of mobile networks (2G, 3G, 4G, 5G, 6G). 3,2. Mobile network architecture: RAN, backhaul and core network. 3,3. 5G concept, standardization and ecosystem. 3,4. eMBB, URLLC, mMTC service categories. 3,5. Network slicing. MU-MIMO, AAS antenna concept. 3,6. Peculiarities of mobile communication network design. 3,7. Use of mobile technologies for the Internet of Things (IoT).
Digital Sustainable Design Methods	6	Achieve knowledge about the methodology of parametric building information modelling (BIM), hardware, analysis methods, software, and learn to use sustainable design principles with modern software.	In general digital design methods became the dominant way in architectural design practice. Particularly parametrical 3D modelling and analysis / simulation problem of buildings and their architectural and structural elements is an essential part of building information modelling methodology. The module is designed as reflecting the topic of sustainable architectural design of various newly built and reconstructed buildings (public, dwellings, industrial, polyfunctional and the others).	1. Building information methodology (BIM) and sustainability concepts in architecture. Parametric AEC objects. 2. Methods and tools of sustainable architectural design. Intro to energy analysis methods. 3. Structure of project and main settings. Gridlines of buildings and their graphical control. 4. Modelling functions of wall objects. Multi-layer wall types, integration of material energy parameters. 5. Modelling of room and space objects. Tags, schedules, legends, areas. 6. Parametric information modelling as a design tool. Modelling of building envelopes. 7. Modelling of roof objects. Footprint method and profile extrusion method. 8. Development of architectural project of larger multistory building or the complex of building 9. Methods of modelling of window and door objects. Legends and annotations of windows and doors. 10. Modelling of curtain wall objects. Parametric schemes of curtain walls and curtain systems. 11. Energy analysis of 3D integrated parametric model of building with various parameter values. 12. Modelling of terrain object. Site object modelling. Positioning of objects on the model. 13. Forming and editing of sections and callouts. Import, managing, and editing of vector geometry details . 14. Conceptual modelling technics of architecture object. Conceptual model conversion to architectural models. 15. Modelling of sloped structures. 16. Modelling and editing of stair objects. System stair types. Stair calculator. 17. Evaluation of natural lighting of building rooms in regard to their orientation and geometric parameters. 18. Dimensioning of projections. Dimension types. Altitudes. Texts. Annotations. 19. Data exchange of buildings and territories between different software environments. 20. Detailing. Architectural and structural elements scheduling and annotations. Sheet layouts. 21. Modelling and spatial location of prefabricated structural elements. 22. Introduction to the technics of customized parametric architectural objects. 23. Visualization and animation. Camera, perpective view, modelling of movement.
Social Responsibility	5	Obtain detailed social responsibility theory and practical knowledge, understand forming of the economic, political, legal, and moral relationships between the organization and society, be able to analyze corporate social responsibility practices.	Assimilating the knowledge and skills that allow you to analyze and understand the unique characteristics of social responsibility, business, society and state interaction. Taught practical skills to analyze, evaluate and make decisions individually and in groups, with social responsibility, sustainable development principles, the different balance of interests.	1. THE CONCEPT OF SOCIAL RESPONSIBILITY 1,1. The context of social responsibility. 1,2. The shape of social responsibility. 1,3. Integration of social responsibility. 2. ORGANIZATION SOCIAL RESPONSIBILITY. 2,1. Measures to stimulate organization social responsibility. 2,2. The relationship between OSR concepts and the public sector. 2,3. The role of CSR stakeholders, civil society. 2,4. Social responsibility practices in an organizations. 2,5. Environmental protection as a component of social responsibility. 3. SOCIAL RESPONSIBILITY DEVELOPMENT FACTORS. 3,1. Organization social responsibility and its communication. 3,2. Business ethics and its role in the development of organization social responsibility. 3,3. Social responsibility standards. 3,4. Social responsibility and society.
Social Responsibility	6	Obtain detailed social responsibility theory and practical knowledge, understanding forming the economic, political, legal, and moral relationships between the organization and society.	Assimilating the knowledge and skills that allow you to analyze and understand the unique characteristics of social responsibility, business, society and state interaction. Taught practical skills to analyze, evaluate and make decisions individually and in groups, with social responsibility, sustainable development principles, the different balance of interests.	1. Theories of social responsibility 1,1. The concept of social responsibility and evolution of theories 1,2. The instruments of social responsibility, their functionality and efficiency factors. 1,3. Standards of social responsibility and social responsibility audit. 2. Corporate social responsibility 2,1. Possibilities for implementation of business ethics standards 2,2. Implementation of socially responsible initiatives 2,3. Implementation of environmental initiatives 2,4. Implementation of economic iniciatives 2,5. Communication of corporate social responsibility 2,6. Assessment of indicators of corporate social responsibility and competitiveness 2,7. Examples of corporate social responsibility 3. State social responsibility 3,1. Assessment of social responsible iniciatives of State 3,2. Corporate social responsibility in EU 3,3. Experience of foreign national institutions in the field of social responsibility
Special Catering Technologies	6	To gain knowledge on innovative food product technologies, to use them for improving quality and safety of products, and to develop higher value-added products through sustainable production processes.	An innovative food technologies knowledge is acquired and practice skills are built in order to develop a new food properties: desired texture, color and aroma; extending the shelf-life of the product and ensuring the safety of the food.	1. Technologies of development of properties of food products 2. Application of thermal treatment on texture of food product 3. Effect of emulsions on product properties 4. Application of enzymes to product properties formation 5. Polysaccharides in the formulation of food properties
Construction Logistics and Management	6	To provide knowledge about construction business models of various construction areas, peculiarities of construction enterprise activities and their logistics systems, and to develop skills in preparing strategic plans to increase the competitiveness of the construction business.	Acquired knowledge about construction business models, peculiarities of activities of different construction companies and legal regulation; methods for evaluating the company's operational effectiveness, the formation of company's development strategies, construction innovation development, information distribution and IT communication systems. Able to critically assess the performance of a construction company, develop strategic plans for increasing the competitiveness of different types of construction companies; choose the right methods of decision making and implementation. Acquired theoretical construction logistics knowledge and skills to be applied in the real construction business	1. Theoretical construction logistics knowledge and skills are acquired and applied in real construction business condition 2. Construction industry importance: sustainable development and smart city context. 3. Construction markets and export development in construction industry. 4. Innovations in construction and real estate sector. 5. Evaluation of construction enterprise performance efficiency. 6. Strategic planning for competitive advantage in construction industry. 7. Information flows and decision making system in construction organization. Modern IT communication systems. 8. Construction project portfolio formation and risk management in the construction company. 9. Theoretical foundations of logistics. Features of logistics in the construction sector. 10. Logistics systems and chains, their forms in the construction sector. 11. Design and modeling of construction logistics systems and chains. 12. Construction logistics process management and its improvement.
Construction Project and Risk Management	6	To provide knowledge about construction project and risk management stages, BIM project integration, implementation models, to develop abilities to plan, organize, evaluate and execute construction projects using effective risk management models and advanced IT technologies, to manage data throughout the project life cycle.	Acquired knowledge about the stages of construction projects and risk management and their implementation models, integration of BIM projects, legal regulation of cooperation between construction project participants, the work of the construction project management group and the project manager. Ability to prepare a construction and BIM project implementation and control plan, apply special computer programs to solve BIM project and risk management issues in separate stages of the construction project and evaluate the efficiency of construction project management.	1. BIM project terms, maturity levels, stages, ISO standards, BIM integration with construction projects. 2. Ways to use BIM for information and data management in the construction process. 3. BIM project implementation plan. Customer requirements for information. Cases of application of building information mod 4. Construction project management object, content and value. 5. Construction project management participants and their functions. 6. Construction project management stages. Application of BIM and LEAN in construction project management. 7. Determination and forecasting of construction project costs. 8. Multi-criteria evaluation of construction projects. 9. Application of FIDIC contract terms to construction projects 10. Organizational structure of construction project management. 11. Rights and responsibilities of the construction project manager. 12. Principles of sustainable development and efficiency of construction project management. 13. Risk of construction projects and its assessment. 14. Construction project management solutions are based on cloud technology.
Construction Project Management	6	To provide knowledge about construction project management stages, delivery methods and to develop skills to plan, organize and deliver projects by applying effective management models, methods and advanced IT tools.	Acquired knowledge about the object of construction project management, construction project management stages and delivery methods, forms and legal regulation of construction project participants cooperation; functions of project manager and project management team. Students acquire skills to prepare a plan for construction project procurement and control, to apply special computer programs for separate project management stage solutions as well as construction project management effectiveness evaluation.	1. Object, essence and significance of construction project management. Principles of sustainable development 2. Construction project participants and their functions 3. Construction project delivery methods 4. Stages of construction project management. BIM and LEAN applications for construction project management 4,1. Stage of project concept development 4,2. Stage of pre-design works 4,3. Stage of technical design 4,4. Stage of construction works 4,5. Stage of project operation and maintenance 5. Estimating and forecast of construction project expenses 6. Application of FIDIC contractual conditions for construction projects 7. Organizational structure of construction project management 8. Rights and responsibilities of construction project manager 9. Effectiveness of construction project management

Construction Management	3	To provide knowledge about construction management and contemporary trends at EU and national level, business models of various construction areas and peculiarities of construction enterprise activities and to develop skills in creating and preparing strategic plans to increase the competitiveness of the construction business.	Acquired knowledge about construction business models, peculiarities of activities of different construction companies and legal regulation; methods for evaluating the company's operational effectiveness, the formation of company's development strategies, construction innovation development, information distribution and IT communication systems. Able to critically assess the performance of a construction company, to develop strategic plans for increasing the competitiveness of different types of construction companies; choose the right methods of decision making and implementation.	1. Construction management peculiarities at EU and national level. 2. Construction industry importance: sustainable development and smart city context. 3. Construction markets and export development in construction industry. 4. Innovations in construction and real estate sector. 5. Evaluation of construction enterprise performance efficiency. 6. Strategic planning for competitive advantage in construction industry. 6,1. Business peculiarities and development strategies of construction design companies. 6,2. Business models for real estate development, general and specialized construction contractors companies. 6,3. Operational peculiarities and development strategies of civil engineering construction corporations. 6,4. Operating features and development strategies of facility management companies. 7. Information flows and decision making system in construction organization. Modern IT communication systems. 8. Construction project portfolio formation and risk management in the construction company.
Durability and Life Cycle of the Structure	6	Subject task is to analyse the structure life and unity with the environment, to understand the work of a team of professionals who cover the entire structure life cycle from concept formulation to the construction, maintenance and operation of the demolition.	The structures life cycle stage is acquired and involves the ability to use relevant information gathered BIM model building management and ensure its functionality. The knowledge about the operational environment, the potential elements defects, expertise and tests methods of structures. Leads to sustainable management and the proper use of the structure in all its life cycles before demolition.	1. A structure life stages 2. Structure management using BIM 3. BIM tasks for the whole structure life cycle 4. Environment maintaining structures 5. The processes taking place in the operation of structures 6. Material properties that determine the durability of structures 7. Life cycle assessment of the structure 8. Building service life planning 9. Frost resistance and water permeability of constructions 10. Evaluation and investigation of structures 11. Maintenance defects and durability of structures elements 12. Buildings and structures deterioration types and methods of their assessment 13. Factors determining destruction of building structures and its defects formation 14. Strategies of repair and modernisation of structures 15. BIM information management at the asset creation stage 16. Management of common data environment for all phases of the building life cycle assessment
Strategic Human Resource Management	10	To acquire the theoretical knowledge of strategic human resource management, enabling to understand the importance of the human factor in the value creation process, to be able to conceptualize the principles of strategic human resource management and to develop a human resource strategy taking into account the overall strategy of the organization.	Theoretical knowledge and practical skills of strategic human resource management necessary to define the principles of strategic human resource management and to form and implement a human resources strategy are acquired. Students learn to holistically assess the context of human resources strategy formation and are able to develop an integrated human resources strategy covering various areas of human resources strategic management and are able to select and substantiate human resources management practices from a strategic perspective.	1. Basics of strategic human resource management 1,1. The divide of strategic personnel and human resource management 1,2. The principles of strategic HRM 1,3. Features of strategic HRM in SMB 2. Contemporary concepts and approaches of strategic HRM 2,1. Artificial Inteligence in HRM 2,2. Diversity management and social exchange theory 2,3. Sustainable SHRM 2,4. Work-life balance 3. HR politics 3,1. Factors influencing HR politics 3,2. Stakeholders and expectations 3,3. Formation principles of HR politics 3,4. Code of ethics of the organization 4. Organizational culture 4,1. Concept and levels of organizational culture 4,2. Typology of organizational culture 4,3. Methods and tools for determining organizational culture 4,4. Development of organizational culture 5. Methodological aspects of HRM strategy formation and realization 5,1. Influence of human resources on organizational results 5,2. Links between HRM and organizational strategy 5,3. Analysis of strategic human resources potential 5,4. Monitoring of HR strategy implementation 6. HR strategies 6,1. Human resource capital management strategy 6,2. Achievement management strategy 6,3. Social responsibily strategy 6,4. Talent management strategy 6,5. Reward strategy 6,6. Employee relations strategy 6,7. Employee engagement strategy 7. Balanced indicators for human resource management 7,1. Possibilities of modeling balanced indicators of HRM 7,2. Finance perspective: investment and its return 7,3. The perspective of the employee as a customer 7,4. HRM process perspective 7,5. Learning and development perspective
Health Policy Management	6	To provide complex knowledge about European health policy management, problems, challengess and the influence of the sustainability of health care sector to the social processes.	Student will have obtained complex knowledge about European health policy management, main problems and the influence of the sustainability of health care sector to the social processes. The obtained complex knolegdge will let critically evaluate the health care policies in different countries.	1. HEALTH CARE AS THE OBJECT OF GOVERNANCE 1,1. Principles of Health Policy. Health care system and the concept of institutional framework. 1,2. Public health and health promotion role in health policy 1,3. Health and illness concepts. Biomedical and biopsychosocial models of health 1,4. Health care policy and legislation: national and european levels 1,5. Individual in health care processes.The Doctor–Patient Relationship 1,6. Health care quality and effectiveness problems 1,7. Health reform: global and Lithuanian practice 2. CHALLENGES FOR HEALTH CARE SYSTEM IN MODERN EUROPEAN SOCIETY 2,1. Health care human resourses planning problems 2,2. Health inequalities. Social justice and equal opportunities issues in European countries health care systems. 2,3. Problems of accessibility in health care policy 2,4. Mental health services optimization 2,5. Management of Ehealth System in Modern Healt Care System: Challenges and Opportunities
Processes of Heat Transformation	6	The understanding of heat transformation processes and systems are acquired, calculation and design of equipment are learned, analysis of transformation systems are taken in.	The principles of transformation processes, calculation of particular equipment of heat pumps, systems of gas liquefaction and refrigeration are acquired, design and analyzing of efficiency of such the systems and evaluating them from both economical and environmental point of view are learned and acquired.	1. Thermodynamics of heat transformation 1,1. Principles and methods of heat transformation 1,2. Reverse thermodynamic cycle and processes compounding it 1,3. Coefficient of heat transformation and cycle efficiency analysis 1,4. Exergy losses, exergy analysis 1,5. Software for reverse thermodynamic cycle analysis 1,6. Air cycles of heat transformation 1,7. Analysis of Stirling reverse cycle 1,8. Gas liquefaction technologies 2. Calculation of heat transformation equipment, design of the systems 2,1. Energy losses of real cycles 2,2. Calculation of efficiency of transformation apparatus 2,3. Influence of condensation and boiling temperatures on efficiency of the system 2,4. Influence of detander coefficient of efficiency on efficiency of the whole system 2,5. Heat pump for space heating and hot water 2,6. Source of low potential and efficiency of the heat pump 2,7. Heat transfer and payback time of the heat pump 2,8. Refrigerants of heat transformers 2,9. Lookout of development of heat pumps. Other systems and apparatus of heat transformation
Modern Environmental and Technology Management	3	To teach thorough understanding of modern approach and tackling of environmental problems, improvement of environmental performance.	The students are taught to understand the principles of nowadays environmental management, their evolution, legal regulation of environment protection, possibilities to reduce negative environmental impact to the environment, implementation of cleaner production/pollution prevention. The students are taught to understand requirements and create environmental management systems.	1. Introduction, modern approach to environmental protection 2. Environmental conditions in Lithuania and the Baltic Region 3. Principles of sustainable development 3,1. Strategies of sustainable industrial development 3,2. Consumption of nonrenewable material and energy resources 3,3. Types of alternative energy 4. Legal and economical regulation of environmental protection 4,1. Legal environmental requirements in the European Union 4,2. Legal and environmental regulation of environmental protection in Lithuania 5. Environmental analysis of the organization 6. Cleaner production and prevention of pollution 6,1. Principles of cleaner production 6,2. Implementation of cleaner production projects 7. Best available technologies 8. Environmental management systems 8,1. Environmental management system according standard ISO 14001 8,2. Cleaner production - basis of the environmental management system 8,3. Audit of environmental management system and certification
Modern Environmental and Technology Management	3	To provide knowledge about modern approach and tackling of environmental problems, improvement of environmental performance.	The students are taught to understand the principles of nowadays environmental management, their evolution, legal regulation of environment protection, possibilities to reduce negative environmental impact to the environment, implementation of cleaner production/pollution prevention. The students are taught to understand requirements and create environmental management systems.	1. Introduction, modern approach to environmental protection 1,1. Environmental conditions in Lithuania and the Baltic Region 2. Principles of sustainable development 2,1. Strategies of sustainable industrial development 2,2. Consumption of nonrenewable material and energy resources 2,3. Types of alternative energy 3. Legal and economical regulation of environmental protection 3,1. Legal environmental requirements in the European Union 3,2. Legal and environmental regulation of environmental protection in Lithuania 4. Environmental analysis of the organization 5. Cleaner production and prevention of pollution 5,1. Principles of cleaner production 5,2. Implementation of cleaner production projects 6. Best available technologies 7. Environmental management systems 7,1. Environmental management system according standard ISO 14001 7,2. Cleaner production - basis of the environmental management system 7,3. Audit of environmental management system and certification

Contemporary Human Resource Management Theories and Concepts	10	To gain a comprehensive, global, and reflective understanding of contemporary human resource theories and concepts that enables decision-making on the management of existing and potential employees in an organization to achieve employee well-being and organizational sustainability.	Theoretical knowledge about HRM development, classical functions and practices is acquired. Students are able to evaluate the application of specific HRM theories and concepts in the development of HRM system and in the selection, evaluation and implementation of specific functions and practices based on employee-employer social dialogue and the promotion of human-technology interaction. Ability to make HRM decisions related to workforce planning, recruitment, selection, adaptation, performance management and career planning, staff development and safe working conditions, taking into account the principles of law, ethics, social responsibility, equal opportunities and diversity management.	1. HRM overview 1,1. Development of HRM concept. HRM definition. 1,2. HRM role and contribution for variuos groups of stakeholders. 2. Traditional HRM functions and practices 3. Challenges for organizations and HRM 4. The core theories of HRM 4,1. Motivation theories and their implication in HRM 4,2. Organisational behaviuor theories and their implication for HRM 4,3. Institutional theory and its implication for HRM 4,4. Social exchange theory and its implication for HRM 4,5. Social identity theory and its implication for HRM 4,6. Other theories and their implication for HRM 5. Employee and labor relations 6. Managing a diverse workforce. Current issues in global HRM 7. Sustainable HRM 8. Work - life balance 9. Employee well-being,Workplace health, safety, and security 10. Digital transformations in HRM 11. AI implication for HRM 12. Neuro aspects in HRM 13. Employee development. Gamification. 14. Sustainable career 15. Employee performance management. Remote working.
Cleaner Production	6	To acquire knowledges about the concept of Cleaner Production (CP), development tendencies; to learn applying international RECP methodic for evaluation of Cleaner Production possibilities and to develop Cleaner Production Innovations. Specific objectives: to learn how to carry out environmental audits in the company, to create materials and energy, fuel and energy balances on process and company level, to develop Cleaner Production projects, to evaluate environmental performance.	The students are thought to understand the basics of main environmental strategies, their advantages and disadvantages; provided with knowledge of Cleaner Production (CP) concept, the competence in CP methodology application within the company with purpose to increase environmental performance. Methodology of preparation and implementation of CP innovation is assimilated. Provided with sound knowledge of the role of governmental and financial institutions in development of Resource Efficient and Cleaner Production (RECP) - one of the main tools of Sustainable Industrial Development.	1. Introduction. History of development of environmental strategies 2. Cleaner Production (CP) conception. CP planning and primary evaluation 3. Material and energy flow analysis. Processes' Material and Energy or Fuel and Energy Balances formation 4. Application of CP prevention methods for environmental problems decision 5. CP feasibility analysis: technical, environmental and economic evaluation of suggested innovations 6. Selection of CP innovation for implementation . Evaluation of main financial indicatprs 7. Methods of evaluation of environmental performance 8. Resource Efficient and Cleaner Production (RECP). CP – one of the main tools of Sustainable Industrial Development 9. Cleaner Production practice worldwide 10. The role of governmental and financing institutions in CP development
Applied Microbiology	6	Structure, clasificaton, physiology, genetic of microorganisms, biochemical processes and control. Detection and identification of microorganisms, microbiological methods.	Microorganisms, the main groups and principles of systematic bacteria, fungus, virus, taksonomy categories. Morphology, chemical composition, metabolism, genetic. Relation between the microorganism and the environment.. The main methods of microbiological contol. Cultivation, fermentation, industrial microbiology.	1. Development of practical application of microorganisms and microbiological processes. 2. Classification of microorganisms (bacteria, viruses and fungi), their identification and isolation; 3. Morphology and physiology of microorganisms, metabolism, excretion products, efficiency of bioprocesses 4. Microbial growth and reproduction patterns, growing conditions ensuring the clearance of outsider microorganisms 5. Influence of environmental factors on microorganisms and practical application of these factors 6. Biological treatment , recycling into useful bio-chemicals and decontamination, environmental microbiology 7. Fermentation processes and their management; process criteria, influence of physical, chemical and biochemical factors 8. Organization of technological process of microbiological control 9. Microbiology of biofuels and petroleum: microorganisms for alternative biofuel development 10. Microbiology of soil in Agriculture and forestry: enriching the soil with microorganisms and increasing safety .
International Industry and Business	6	To provide knowledge about the economics of international business, production, trade and the impact of economic integration on international business operations.	Know and be able to understand main features of the factories of the future, which will dominate in the international business, know deep knowledge of international industry development and integration, logistics functions application, know globalization principles, their advantages and disadvantages, know theoretical and practice knowledge of international trade and investments and impact of economic integration to the international business operations, analyze and evaluate international market and international business operations and organization problems, educate and be able to apply strategy development of international enterprises, personal management and control principles.	1. Development of international business and strategic management 1,1. Role of cultural differences in the international business 1,2. Survey and compare markets by means of primary and secondary information sources 1,3. Critical issues in organization of global operations, export and import 1,4. Types of international logistics operations and indication their advantages and disadvantages 1,5. Application principles of international strategic planning and their use to concrete enterprise 1,6. Principles of multinational enterprise control strategy 1,7. Impact of economic integration to the enterprise benefit and competitiveness 1,8. Human resources' management issues in multinational enterprise 2. Concept of sustainability 2,1. Concept of sustainable manufacturing 2,2. Environmental management system 2,3. Reuse and recycling 2,4. Legislation and regulations defining sustainability 3. Globalization of international industry 3,1. The main factors of globalization and their advantages and disadvantages 3,2. The pressure of global manufacturing system to the national producer and its reaction to this pressure 3,3. The strengthens and weakness features of a manufacturing enterprise in the international business environment 3,4. The singularities of development the new products and processes seeking innovations and less manufacturing costs in the
Engineering Electrodynamics	6	To give a knowledge about the use of Green's functions method for analysis of electric and magnetic fields, to provide a skill of conformal mapping method for analysis of two dimensional fields, to introduce a method of integral equations of first order for solving of static and quasistatic field problems, to introduce a theory of propagation of electromagnetic waves.	Abilities are formed to analyse electric and magnetic fields by using the method of Green's functions is provided. The skill of using the method of conformal mapping for analysis of plane fields is given. The method of first order integral equations for solving problems of static and quasistatic field problems is introduced. Knowledge of propagation of electromagnetic waves is given.	1. The use of Green's functions method for analysis of electric and magnetic fields 1,1. Green's functions and its integrals 1,2. Properties of harmonic functions 1,3. Solution of electrostatic problem with Dirichlet boundary conditions in hemiplane. 1,4. Solution of electrostatic problem with Dirichlet boundary conditions in sphere. 1,5. Application of the Green's functions method for analysis of plain fields. 2. The method of conformal mapping 2,1. Conformal mapping and conjugate functions. 2,2. Solution of Laplace's equation and complex field strength. 2,3. Logarithmic, fractal linear and Zhukowsky's functions. 2,4. Solution for areas inside contours consisting of circular curves and straight lines. 2,5. Elliptic integrals. 3. The method of first order integral equation for solution os static and quasistatic field problems. 3,1. The essence of the method. 3,2. Analytical solution. 3,3. Numerical solution. 4. Propagation of electromagnetic waves 4,1. Propagation of uniform plane wave in lossless material. 4,2. Propagation of the uniform plane wave in lossy material. 4,3. Propagation of the uniform plane wave in good dielectric and in good conductor. 4,4. Reflection of uniform plane wave propagating normal to boundary between media and at oblic incidence to it.
Technology trends and transformations	5	To acquire knowledge based on research, development and industrial approach enable sot solve strategic challenges and develop competences for identifying new business opportunities through assessing technologies trends and transformations, designing and implementing products, process and technologies and innovation implementation models for organization growth and transformation.	Acquiring knowledge of technology development, production efficiency, sustainable market and manufacturing sector's development based on interdisciplinary research and development. Enabling identification of new business opportunities assessing technology trends and transformations by systematic approach and scanning internal and external environment innovative designing business and process management models and adapting newest technologies and organization transformation	1. Company production development strategy 1,1. Production development strategies and types, differences and choces 1,2. Company capabilities, strength and competitiveness strategies 1,3. Technology and materials, when is worth to develop technology transformation 2. Structure of production company, infrastructure and production development 2,1. Principals of market and competitiveness research methods 2,2. Pricing, quality and manufacturing capabilities setting and planning 2,3. Planning and assessment of production time, flexibility and reliability 2,4. Sustainable and eco-design principles of product design 2,5. Assessment of technology trends and protolyping of technology processes for comparative analysis 3. Preparation of technology development and transformation project 3,1. Main principles of development projects preparation and management 3,2. Designing technology transformation project in to the manufacturing processes and instrumentation project development 4. Market demand and manufacturing scale influence on technology development and transformation implementation
Technology Venturing	5	Provide business and venturing competences for transferring technology concept into the business model, venture capital attraction and shape entrepreneurial behavior as a professional feature.	This course aims at learning and practicing the fundamental skills required to assess a technology concept or product in the framework of a business opportunity, define a critical innovative advantage that will provide sustainable differentiation, while building a business model around a realistic technology development, based on the stage gate model, including team building, idea generation, feasibility and capability building, R&D planning, financial modelling, commercialization strategy, venture capital deals, and exercising entrepreneurial management skills.	1. Technology venture inception 1,1. Technology venturing: grunding theories 1,2. Technology venturing opportunity search and technology foresight: STEAM approach 1,3. Technology Venturing in High Growth High Technology Intensity markets (HGIE) 2. Technology venture in action 2,1. Industrial and technology venturing strategy 2,2. Business model design for technology venturing and complex solutions 2,3. Technology Venturing in Global Networks of Innovators 2,4. Circularity driven Technology Venturing peculiarities 2,5. Digitization driven technology venturing 3. Ecosystem for high growth technology venturing: navigating the high way
Technology Venturing	10	Provide business and venturing competences for transferring technology concept into the business model, venturing and shape entrepreneurial behavior as a professional feature.	This course aims at learning and practicing the fundamental skills required to assess a technology concept or product in the framework of a business opportunity, define a critical innovative advantage that will provide sustainable differentiation, while building a business model around a realistic technology development, based on the stage gate model, including team building, idea generation, feasibility and capability building, R&D planning, commercialization strategy, and exercising entrepreneurial management skills.	1. The Principles of Technology Venturing 1,1. Dominating theories in technology venturing studies 1,2. Technology venturing opportunity search and technology foresight: STEAM approach 1,3. Technology Venturing in High Growth High Technology Intensity markets (HGIE) 2. Technology venturing: development 2,1. Industrial and technology venturing strategy 2,2. Complexities of Technology Venturing Business Model 2,3. Technology Venturing in Global Networks of Innovators 2,4. Green Tech driven Technology Venturing peculiarities 2,5. Digitization driven technology venturing 3. Ecosystem for high growth technology venturing: navigating the high way
Territorial systems	6	To acquire knowledge of territorial systems and their concepts, terms, activities, object, objectives and practical tasks.	Students acquire theoretical and practical knowledge of spatial systems and are able to apply landscape management paradigm and methods and tools of practical activities in the practice of nature use, cultural landscape formation/creation and environmental management.	1. Actuality of subjects, the concept of territorial systems, key terms and concepts 2. Basics of Geo-ecology 3. Characteristics of natural environmental of Lithuanian and their influence on the planning activities 4. Territorial frames 5. Landscape ecological state and measures of ecological balancing 6. Security and development interests of landscape management. Sustainable development 7. Landscape classification 8. System of protected areas 9. Lithuanian landscape values of sustainable use and protection management methods and tools 10. Land Management and Planning Interface
Research Project	6	To acquire knowledge, abilities and research skills by analyzing the problem task in the field of sustainable and energy efficient buildings (performing analysis of scientific literature, compiling a research plan, choosing research methods, describing research methodology and performing and presenting the results of primary research).	Research skills are mastered, enabling to define and practically solve the tasks of designing sustainable and energy efficient buildings, applying modern methods of engineering calculations and scientific analysis. Acquires the skills and abilities to formulate a research concept by interpreting, summarizing and using various research methods that will be used to complete the master's thesis. Acquires the ability to present research results and discuss topics related to sustainable and energy efficient buildings.	1. Review of the scientific literature 2. Research planning, experimental and/or analytical research, data collection 3. Systematization and analysis of research material 4. Summarizing the results of the research project and formulating conclusions 5. Preparation of the report of the research project and/or a scientific paper

Vehicle Dynamics, Interaction and Energy Efficiency	6	To gain extensive knowledge in methods of dynamic and aerodynamic modelling of vehicles and vehicle behaviour forecasting, energy efficiency assessment; know the principles behind body motion in gaseous environment. Specific goals: to be able to assess the possibilities of vehicle motion under various conditions, develop vehicle and motion models, process and interpret the results.	Students learn to develop dynamic vehicle models for various motion situations and apply them to solution of tasks in vehicle behaviour, performance forecasting, energy efficiency, analysis of vehicle motion possibilities under various conditions. Students learn to assess vehicle-vehicle and vehicle-environment interaction in solving dynamic tasks related to motion. Students master key principles of aerodynamics. Students develop skills in developing an algorithm of dynamic experiments and process experiment findings.	1. Interaction between elements of the vehicle-environment system 1,1. Vehicle-road interaction: road description, wheel rolling theory, road-wheel adherence assessment 1,2. Inter-vehicular communication system and their influence on motion 1,3. Environment monitoring systems and their influence on motion parameters 2. Influence of aerodynamics on efficiency of vehicle motion 2,1. Theory of aerodynamics: viscous, inviscid and incompressible flow and its properties; flow similarity criteria; boundary 2,2. Aerodynamic forces, moments and coefficients, their identification and assessment for influence 2,3. Experimental aerodynamics: wind tunnels, their types and structures, losses, measurement characteristics 2,4. Determination of flow parameters and forces acting on a body by experiment, flow visualisation 2,5. Numerical aerodynamic research methods 3. Vehicle motion dynamics 3,1. Systems of coordinates in dynamic models, their selection and application 3,2. Transmission models, influence of moments of inertia of components on motion 3,3. Kinematic and dynamic models of suspensions 3,4. Rectilinear and curvilinear motion 4. Vehicle motion modelling 4,1. Vehicle models and their design principles 4,2. Driver-vehicle model 4,3. Typical vehicle motion cases and their modelling 5. Vehicle energy efficiency assessment and modelling 5,1. Factors of energy consumption 5,2. Efficiency of energy consumption by vehicles: criteria and assessment 5,3. Dynamic modelling of energy efficiency assessment
Sustainable business models	5	To acquire knowledge about and understand the sustainable development economics paradigm, its origins and context of its development, principles, methods, to be able critically to evaluate sustainable development progress.	Essential interdisciplinary knowledge of sustainable development concept is acquired, main sustainability principles in economics, their implementation methods and tools is understood and the organizational practice skills are built in order to implement this understanding in practice, i.e. critically analyse global environmental and social issues and choose social responsible economics methods for solving these issues.	1. Concepts of circular economics and sustainable development 2. Sustainable development policy and SDG's 3. Individual choises leading to sustainable economics 4. Business strategies towards sustainable economics. Circular economy business models 5. Cities and national policies that can help transitions to a sustainable economy 6. Evaluation of sustainable development progress 7. Circular economic development methods, global iniciatives
Sustainable Water Management	6	To acquire knowledge of how to optimise water supply and wastewater disposal systems by applying the principles of sustainable construction, and to be able to carry out modelling of water supply and wastewater disposal systems, and of potential flood and sinkhole situations.	It provides knowledge on sustainable water management techniques, taking into account the water consumption habits of the subjects, the potential overexploitation of water and wastewater resources and the quality needs of the water supply. The student is able to assess the technical condition of existing water supply and wastewater networks (WSS) and perform hydraulic modelling calculations to determine the optimum system performance parameters. Task solutions are related to the determination of the technical condition of existing systems, the impact of the designed WSS disposal systems on existing WSS systems and the possible impact on the future development of WSS networks. The module also	1. Sustainable Water Management 2. Sustainable water use in buildings 3. Modern drinking water treatment technologies 4. Assessment of the technical condition of outdoor water supply systems 5. Analysis and research on water losses in outdoor water supply systems 6. Hydraulic modelling and optimisation of water supply systems 7. Comparative analysis of wastewater treatment technologies 8. Assessment of the technical condition of outdoor sewage systems 9. Hydraulic modelling and optimisation of wastewater systems 10. Rainwater management, advanced technical solutions 11. Rainwater balancing using buffer tanks 12. Infiltration systems 13. Flood and flood risk assessment 14. Potvynių ir patvankos situacijų modeliavimas
Sustainable Fashion Technology	6	To provide knowledge about of eco-clothing creation, environmental laws, to teach to understand conception of eco-design and sustainable development, possibilities of article recycling, to develop environmental thinking.	Knowledge provided about the principles of development of ecological clothing and other fashion products, the concept of ring design, environmental laws, product life cycle and footprint assessment, recycled products, their use. Acquires the ability to define the environmental development trends of the textile and clothing industry, sustainable textile and clothing production processes, product operation, waste management aspects, recycling opportunities and to integrate and apply knowledge from different fields in developing sustainable fashion products and their sustainable production technologies.	1. Creating a sustainable fashion product: conception, strategy, stimulating forces 2. Main principles of textile and clothing eco-product creation 3. Life-cycle assessment of clothing product. Concept of circular design 4. Environmental laws relevant to textile and apparel industry. Sustainable development. Factors of sustainable consumption 5. Apparel articles eco-labeling 6. Development of environmental trends in textile and apparel industry 7. Ecological aspects of apparel manufacturing processes, articles exploitation, utilization and waste management 8. Recycling of fashion affected products. Recycling of articles influenced of fashion. Overwiev of recycled products.
Urban Theory	6	The aim of the module is to develop a complex understanding of a city as multilayered cultural phenomenon and introduce students to its contemporary theories, empirical models and practical theories.	The module of Urban Theory will assist students in obtaining both theoretical knowledge and skills needed for preparation of urban projects. The module will start with introduction to the contemporary theories of urban-cultural phenomenon and development of abilities to recognize the reflections of the above mentioned theories in real life situations. Combination of lectures and practice will acquit the students with knowledge of the fundamentals of urban theories, empirically based urban models, visions of development of urban forms and tendencies for the 21st century.	1. Introduction 2. Fundamentals of urban theories: 2.1. Max Weber: city in a historical perspective 2.2. Georg Simmel: culture of metropolis 2.3. Walter Benjamin: city as an experience 2.4. Henry Lefebvre: creation of space 3. Empirically based models of a city: 3.1. Chicago school of sociology 3.2. Sociotop concept 3.3. Urban patterns form the perspective of Geography: from the concentric to the edge city 3.4. Gordon Cullen: serial vision, line of life and other concepts. 4. Visions of urban form: 4.1. Le Corbusier: functional city and its transformations in the 21st century 4.2. New Urbanism and its modifications 4.3. City as fractal; city as a complex network. Spatial capital concept. 4.4. K.Lynch: mental image of a city 4.5. Christopher Alexander and organic urban form 4.6. Jan Gehl and city for people 7. Perspectives of urbanism: 7.1. Sustainable city 7.2. Digital city, Smart city and urban lab
Urban Planning 2	12	To develop skills to prepare comprehensive and special plans and to design public spaces.	Skills to prepare comprehensive and special plans are developed. Students preparing comprehensive or special plan of city part (town) and project of public space, understand the relationship between local spaces and the broader contextual environment; analyze the territorial systems and their impact on the environment formation. Students also master methodology of c. and sp. planning; knowledge about possibilities of anthropogenisation regulation by landscape architecture and urban planning measures. Preparing the plans students use GIS analytical and modeling tools.	1. Regulation of anthropogenization by means of landscape architecture and urban planning 1,1. Landscape anthropogenic objects and regulation of anthropogenization 1,2. Landscape architectural research 1,3. Landscape ecologic planning: world-wide experience 1,4. Townscape architectural formation 1,5. Town greenery planning and architectural formation 1,6. Architectural formation of landscape of recreational territorial systems and institutions 1,7. Evaluation of urban potential 2. Comprehensive and special planning 2,1. Common principles and legal acts of territorial planning 2,2. Comprehensive territorial planning 2,3. Special territorial planning 2,4. Norms of spatial planning and planning of communication systems in urban areas 2,5. Content and structure of comprehensive and special plans 2,6. Process of territorial plans preparation 2,7. Analysis of examples of comprehensive and special plans 2,8. Monitoring of the implementation of solutions of comprehensive plans and publicity of territorial planning
Urban Environment Renewal and Territorial Development Management	3	To provide knowledge in the field of territorial development, while solving specific problems of urbanized territory renewal planning and to develop the ability to evaluate technical documentation in various stages of completeness, urban environment renewal processes, the quality of project proposal variants, digitization in this field.	Knowledge about urban environment assessment methods, normative documents, analytical data processing and methods and possibilities of digitization of archival data is acquired. The problems of unused space or overcrowded territory, which often arise in an urban environment, are introduced. Interrelationships of the components of sustainable development, systems and methods of territorial sustainability assessment are understood.	1. The concept of urban environment, development and planning legislation. 2. State territorial planning policy, participants in the process. Provisions of the European Landscape Convention. 3. Development of urban areas according to the directions of territorial development (according to the development regimes) 4. Trends in the use of the general plan and detailed plans, analysis of the possibilities of urban development. 5. Special plans of urban integration axes supporting the development of metropolitan centers. 6. Lithuanian spatial data systems. 7. Criteria for sustainable renewal of urban environment, their significance. 8. Protection of natural landscape elements in urban areas. 9. Urban environment development projects and their management. 10. Integration of urban environment with BIM projects.
Management Systems and Sustainability	5	To obtain knowledge on quality management evolution, classics and total quality management, apply quality assurance methods, be able to evaluate quality, need for mandatory product certification and choose methodology	Knowledge and methods are acquired by students in order to create process systems with high reliability and low quality costs. They are able to evaluate quality, choose quality control method and procedure of certification of goods and services. They gain understanding of quality assurance methods and criteria of excellence models. They are able to apply methodologies for quality problem solving and conduct self-assessment according criteria of excellence models.	1. Quality Management Field 1,1. Field of knowledge on quality management 1,2. Law of quality ant it boundaries 1,3. Social construction of quality concept 2. Total Quality Management (TQM) 2,1. TQM as Explanation: Assumptions and Principles 2,2. TQM as Practice: Methods and Techniques 2,3. Main Images of TQM 2,4. Conlingency Factors of TQM 2,5. TQM realization 3. Evaluation and Control of Quality 3,1. Quality evaluation and control in service organziations 3,2. Quality evaluation and control in service organziations 3,3. Quality costs 4. Mandatory certification of products 4,1. Product Safety General Provisions 4,2. New Approach Directives and Conformance to Directives 4,3. Procedures and Schemes of Evaluation of Conformance 4,4. CE Certification 5. Excellence Models 5,1. Types of Excellence Models 5,2. Self-Assessment Procedures According Different Excellence Models 5,3. National Quality Awards
Fruit and Vegetable Science and Technology	6	To obtain knowledge of innovative technologies for fruit and vegetable products, to improve quality and safety, and developing higher value-added products through sustainable production processes.	Knowledge about the mechanisms of biochemical and chemical changes and the kinetics of storing and processing fruits and vegetables, product manufacturing technologies, and principles of new product development .Apply sustainable technologies to the recycling of bio-waste products.	1. Introduction. Aims and objectives of storage and processing of fruits and vegetables. 2. Quality and chemical composition of fruits and vegetables, their physical and technological properties. 3. Methods of fruit and vegetable storage. Chemical, biochemical and physiological processes and changes during storage. 4. Fruit and vegetables processing, biochemical changes during technological processing 5. Biologically active compounds, their importance and changes during processing. 6. Biotechnology of fruits and vegetables 7. Technologies and perspectives of minimally processed fruit and vegetable production. 8. Sustainable technology of waste during fruit and vegetables processing
Water Resources Engineering	6	To provide knowledge about the processes of water purification, wastewater treatment and water resources recovery, to develop skills in selection of appropriate technological solution according principles of sustainable development.	Knowledge of water purification, water conservation and sustainable use principles, wastewater characteristics and requirements for wastewater treatment, processes and equipment used for water purification and wastewater treatment is acquired. The students will be able to analyze innovative technologies, to select the effective technological system for water purification, wastewater and sludge treatment, process of biochemical wastewater treatment and principles of process control.	1. Traditional and alternative sources of drinking water. Principles of sustainable water resources management. 2. Main technologies and equipment for drinking water purification. 3. Processes and equipment for preliminary and primary wastewater treatment. 4. Waste water microbiology, basics of biochemical treatment processes and technological control. 5. Conventional biological wastewater treatment technology processes, equipment and design. 6. Tertiary wastewater treatment and removal of specific pollutants. 7. Wastewater sludge management. 8. Analysis of sustainable wastewater treatment equipment, selection and application of technologies. 9. Water recovery from industrial and domestic wastewater. 10. Materials recovery from industrial and domestic wastewater. 11. Energy recovery from industrial and domestic wastewater.

Wind Energetic	6	To give the fundamental information abour wind energy using and wind power station building. To learn the projecting of wind station parks with assessing reliabilitys and quality securing halves. The specific aim: to learn the solving the disconnectad as island electrical power networks with wind stations problems.	The students are taught to understand the purpose and structure of wind stations using. to calculate wind stations characteristics, to select wind stations types to calcute the amounts of electricity, power floats and bus voltages, to design projects of wind stations connecting networks, to solve power quality and electromagnetical compatibility problems.	1. The situation of wind energetics 2. The metering, calculation and forecasting of wind energy 3. The constructions of wind stations. Protection from lightning., 4. The properties of mechanical strenght stochastic calculation 5. The influence of electrical generators to power distribution network 6. The wind stations and parks connection networks 7. Other renewable energy sources and its influence to electricity network 8. The accumulators af electricity energy 9. The separate electricity systems in remote locations 10. The voltage regimes in network with local electricity sources 11. The parametrers of elctricity quality and its calculation 12. The profitability of wind stations 13. The standards of wind stations and its operating rules 14. The gaidelines of wind energetics succeeding developments
Corporate Social Responsibility	6	To gain knowledge of evolution of corporate social responsibility (CSR), main concepts, social responsibility standards and measures to improve performance. The specific aims are: to introduce main aspects of social responsibility management system implementation and functioning.	The students are taught to understand the principles of corporate social responsibility, its evolution, modern concept and main terms. Learn how to identify social partners and interested parties of specific business activities and develop the social partnership policy and strategy for the organization. The course will provide knowledge of corporate social responsibility management system standards and legal acts. The students are taught to understand and implement requirements of CSR management system and its relation with other management systems. The student will gain the general knowledge of other, closely related occupational health and safety, quality and integrated management systems.	1. General introduction to concept corporate social responsibility 2. Theories of social responsibility 3. State social responsibility 4. Business ethics. Social business 5. Social responsibility standards and auditing 6. Model of social responsibility management system implementation 7. Evaluating the effectiveness of social responsibility. Reporting 8. Analyses, improvement actions and preparation of reports 9. Business Sustainability and Responsibility Index
Public Sector and Business Ethics	6	To provide knolwdge and skills to solve ethical problems, assess social, economic and environmental impacts of individual and institutional decisions and actions and develop ethics management systems in public and private sectors, giving consideration to sociocultural context of organizational activities and contributing to the UN Sustainable Development Goals.	During the course a student develops the skills to assess activities of public and business organizations based on social, environmental and economic criteria, public sector values and develop effective programmes of responsible institutional ethics.	1. Typology of ethics. Development of the concept of organizational social responsibility. 1.1. Ethical theories 1.2. Public values, social responsibility and accountability of public sector organizations. 1.3. Ethics and values in cultural contexts. 2. Ethics management systems and factors for their effectiveness. 2.1. Development of moral competence development. Ethical decisions. 2.2. Anticorruption programmes. 2.3. Moral reasoning of whistleblowing. 3. Ethical problems and stadards for functional areas of management. 3.1. Ethical problems of human resource management. Standards and principles for ethical workplace. 3.2. Ethical problems and standards in marketing. 4. Stakeholder management models. 5. Environmental responsibility of organizations. 6. Measuring corporate social impact. 7. Social entrepreneurship as a hybrid form of integrating public and private interests. 8. Public interest, social inclusiveness, equity and application of innovative technologies (artificial intelligence).
Management of Public Finance and Budget	6	To provide knowledge of public financial resources management and budgeting, to develop the ability to apply them analyzing situations in various political-cultural and socioeconomic contexts at various levels of management.	Student has mastered the basics of fiscal policy, methods of public budgeting and financial management, will know the limits of its application at various levels of public governance, comprehends revenue raising and resource allocation systems and has the competence to analyze and evaluate critically various situations in public financial management applying artificial intelligence technologies.	1. The Nature of Public Finance and Theoretical Issues 1.1. Macroeconomic Framework and Fiscal Policy 1.2. Impact of Concepts of Public Administartion on Public Financial Management 1.3. Budget Process in Public Administration System 1.4. Intergovernmental Financial Relations 2. Budgeting in Public Administration System 2.1. Coverage and Composition of the Budget 2.2. Budgets Methodologies (Line-Item, Performance, Program Budgeting) 2.3. Budget Formulation and Fiscal Sustainability 2.4. Budget Execution and Fiscal Consolidation 2.5. Budgetary management and its evaluation 3. Distribution of Public Goods and Public Choice 3.1. Public Expenditure and Costing Systems (Activity Based and Price-Based Costing) 3.2. Medium-Term Expenditure Framework and Program Budgeting 3.3. Capital Budgeting 4. Tax Burden and Its Distribution 4.1. Tax System and Taxing Policy 4.2. Public Debt and Its Impact 5. Accountability, Audit and Efficiency of Public Spending 5.1. Systems of Financial Accounting (Cash and Accruals Accounting) 5.2. Program performance monitoring and evaluation 5.3. Finanacial Control and Audit System
Local Fuel Power Engineering	6	To provide abillity to define and analyze the types of local fuels, constructions of fuel combustion technological equipment, the principles of their design and optimization.	The students are learning to understand the importance of local fuel utilization, are gettintg knowledge about the resources and characteristics of local fuel are provided. Getting knowledge about production, preparation, combustion process of local fuel. Are learned to utilize the suitable for energy waste resources, the basic knowledge about waste combustion possibilities and technology are provided. Are learned to solve environment pollution problems of local fuel utilization by choosing technical and combustion control means.	1. Characteristics of local fuel 1.1. Production of biogas 1.2. Production and preparation of solid fuel 1.3. Combustable wastes 2. Combustion theory of local fuel 2.1. Combustion of gaseous fuel 2.2. Combustion of solid fuel 2.3. Particularity of waste combustion 3. Ecological problems of local fuel combustion 3.1. Gaseous pollutants 3.2. Solid wastes
Green Chemistry and Renewable Resources	6	To provide knowledge about main principles or green chemistry, environment friendly chemical processes and utilization of renewable resources in production of chemical industry.	Students will get knowledge about green chemistry principles, renewable energy and natural resources. They will learn to evaluate current chemical technologies and to design new green chemical technologies.	1. Principles of green chemistry and factor calculation 2. Environmental assessment of the product 3. Catalysis: types and importance in the manufacture of chemical substances 4. Alternative energy resourses application for chemical processes 5. Alternatives to organic solvents and guidelines for their selection 6. Guidelines for the optimization of the chemical synthesis pathway 7. Biomass classification 8. Biomass application for energy 9. Biomass as source of high value products 10. Biomass treatment stages 11. Analysis of bioproducts
Circular Economy	5	To master the characteristics of the circular economy, to be able to identify problems in the circular economy at the company, industry and national levels, to assess the impact of the circular economy on the economic system and to analyze, evaluate and formulate strategies and measures to promote the circular economy.	Students will acquire economic and management knowledge about the circular economy implementation in a company, industry and whole country. Perceive principles of circular business models and operating conditions, circular business performance measurement and reporting. Students will be able to assess the impact of the circular economy on the economic system and to analyze, evaluate and formulate strategies and measures to promote the circular economy.Module didactics: practical tasks, real case studies of national and international companies, practical experience presented by business representatives.	1. Sustainable development policy and SDG's. Circular economy concept and principles 2. Circular economy methods and decisions at individual, organizational, city and state levels that lead to sustainable dev 3. Circular economy strategies and business models 4. Circular business performance measurement and value-added chain 5. Tax, financial and non-financial reporting for circular economy 6. Methodology of socio-economic-financial-technological-energy impact assessment of circular economy 7. The country's tax system and the circular economy 8. National, regional and market funding opportunities and financial and non-financial instruments 9. Circular economy communication
Circular Economy and Sustainable Use of Resources in Construction	6	To inform about the basic principles of sustainable development, the legal requirements for sustainable architecture and construction in environmental management, to develop the ability to apply the principles of circular economy in construction and BIM projects, to develop competencies needed to assess the environmental impact of construction processes, products or services throughout their life cycle.	Learn to understand the economic mechanism of environmental protection, to perform economic calculation and evaluation of possible environmental protection solutions. The basic principles of the circular economy in environmental management are mastered. Acquire the ability to search for and analyze the main environmental protection laws of the European Union and the Republic of Lithuania, to analyze structural, material, environmental, legal, economic, social, aesthetic elements and aspects of sustainable architecture and construction, and to identify construction problems in the context of sustainable development, integrating them into BIM projects. Able to perform life cycle analysis.	1. Development and basic principles of environmental economy. 2. Environmental resource management models. 3. Principles of the circular economy. 4. Ecoromic and administrative environmental measures. 5. Alternative environmental policy options. 6. Ecoromic assessment in environmental protection (data integration with the ‚Samata program). 7. The main environmental legal requirements of the European Union and the Republic of Lithuania. 8. Integration of the circular economy with BIM projects (Autodesk Navisworks program). 9. Development and essence of the concept of sustainable development. 10. Principles of sustainable construction, certification systems. BREEAM, LEED sustainable building assessment systems. 11. Perspectives on sustainable development and future trends. 12. Building life cycle analysis as a tool for sustainable development.
Assessment of Circular Economy Impact	6	Acquire knowledge of the value added of the circular economy at company, industry, city and country level, the need to promote it and the economic and social consequences of its development, methods for assessing the impact of the circular economy at company, industry, city and country level, to develop systemic economic thinking and assessment skills.	This module deals with circular economy at the company, industry and national level. The impact of the circular economy on economic development through profitability, job creation, behavioral change, industrial symbiosis and partnerships is analyzed. The circularity of the whole country and industry is assessed. The country's tax system, artificial intelligence, startups, and small and medium business opportunities to promote the circular economy are analyzed. Familiarity with EU and national, regional financial and non-financial instruments.	1. Circular Economics and the interrelation of Smart, Sharing, Digital, Blue, Green, Bio-Economy 2. The circular economy in cities: industrial symbiosis, partnerships, clusters 3. Country and Industry Circularity Assessment and Indicators 4. Methodology of socio-economic-financial-technological-energy impact assessment of circular economy 5. Assessment of the impact of the circular economy on the country, the economy and society 6. Artificial Intelligence and the Circular Economy 7. National tax system and circular economy 8. National, regional and market funding opportunities and financial and non-financial instruments 9. Circular economy communication
Circular Economy Business Models	6	To get knowledge about circular economy business models, strategies and functioning principles, be able to analyze reverse and closed-loop supply chains, be able to apply product life cycle assessment and circular business performance measurement.	The module will help to work in a team of a circular economy at company level. Students will get knowledge about the circular economy strategies and business models, principles and operating conditions, will acquire skills and abilities to analize reverse and closed-loop supply chains, apply product life cycle assessment, circular business performance measurement.	1. Corporate sustainability and a circular economy 2. Circular economy strategies and business models 3. Reverse and closed-loop supply chains 4. Circular design and product life cycle assessment 5. Circular business performance measurement and added value chain 6. Tax, financial and non-financial reporting in circular economy
Circular Design Project	6	Provide knowledge about circular design, its methods and tools; Develop circular design skills and mindset, which enables the development of products/services based on the circular economy model.	Students acquire comprehensive understanding on circular design, its methods and tools. Develop circular design skills, circular mindset and systems thinking. Develop the ability to design products, services and systems, based on the circular economy model and the integration of three dimensions: People, Planet, and Profit. The course addresses a design challenge. The design process is underpinned by design thinking methodology.	0. Introductory session 1. UNDERSTAND 1.1. Understand circular flows 1.2. Regenerative thinking 1.3. Insides out 2. DEFINE 2.1. Define the circular design challenge 2.2. Find circular design opportunities 2.3. Create brand promise 3. MAKE 3.1. Understand the needs of end-users and related groups 3.2. Circular brainstorming and concept selection 3.3. Smart material choices 3.4. Experiment & rapid prototyping 4. DEEPER UNDERSTANING 4.1. Service Flip 4.2. Biomimicry 5. RELEASE 5.1. Product journey mapping 5.2. Launch to learn 5.3. Define your partnership network 5.4. Create your narrative 5.5. Collect feedback and define further development steps

Human Resource Analytics	5	To acquire the knowledge of Human resource analytics, to acquire practical skills needed to perform human resource and human resource management analytics and to make data-driven decisions stiriving for human and organization sustainabilily	Students understand the concept and importance of human resource analytics. They acquire knowledge about the main metrics of human resources and their management as well as their calculation methods. Students learn to collect data, calculate metrics of individual human resources and their management functions as well as interpret them and make data-driven decisions. Power BI, SPSS and Microsoft Excel Power Pivot tools are used.	1. The concept of human resource analytics 1,1. The genesis of human resource analytics 1,2. The definition of human resource analytics. Ethics of human resource analytics. Data protection. 1,3. The importance of human resource analytics for the organization and for employees 2. The metrics of human resource and thei management 2,1. Metrics of human resources (workforce) 2,2. Metrics of human resource management 2,3. The link between human resources (staff) and human resource management metrics 2,4. Data collection, calculations and interpretation of metrics 3. Information systems and analysis strategies 3,1. Microsoft Excel Power Pivot tool 3,2. Power BI tool 4. Calculation and interpretation of metrics according to individual human resources and their management functions (ind 4,1. Diversity analytics 4,2. Employee attitude survey (employee engagamnet and it's outcomes) 4,3. Employee turnover analytics 4,4. Recruitment and selection analytics 4,5. Employee performance analytics 4,6. Employee development analytics 5. The challenges of human resource analytics 5,1. Teh role of CEO 5,2. The role of line managers
Fisheries Science and Technology	6	To provide knowledge of innovative technologies for processing fishery raw materials and by-products, and to develop the ability to create new, competitive products, ensuring product safety, quality and sustainability in all technological processes.	The knowledge about properties and processing specificity of invertebrate marine animals and marine plants, introduction to processing methods able to ensure high quality and safety of fishery products as well as food additives used in production of fishery products, their functional and technological properties is acquired. The innovative processing technologies of fishery products and the fishery by-products processing technologies are introduced. The students will be able to select technologies for the processing of new fishery products taking into account the quality and safety performance. General knowledge about fisheries failure, nature and cause of defects is acquired.	1. Properties of invertebrate marine animals and marine plants 2. Processing technology of marine invertebrates 3. Processing technology of marine plants 4. Food additives in processing of fish products 5. Innovative processes in technologies of fishery products 6. Fisheries products failure, nature and cause of defects 7. Processing technologies of fishery by-products 7,1. Proteins from marine by-products for food uses 7,2. Lipids from marine by-products for food uses

Study modules for PHD degree programmes

Name	Credits	Purpose	Description	Chapters and topics
Sustainable Energy	6	Provide sound knowledge on sustainable energy development, energy efficiency, significance to the electrical energy system as well as ecological, economic and social aspects of their development.	Study module is devoted to familiarize with and analyze in detail the possibilities and peculiarities of the application of renewable energy technologies, giving most attention to wind and solar power technologies, which are the most promising and most rapidly developed energy sectors in the world. Students will develop skills in analyzing advantages and disadvantages of sun and wind power technologies, select and apply these technologies according to specific local conditions. Also they will gain knowledge about the environmental impact as well as economic and social aspects of technologies' development, learn to understand the principles of energy efficiency.	1. Global trends of energy production and consumption 2. Energy needs change and their forecasting methods 3. Role of renewable energy in climate change prevention 4. RES systems 5. Biomass. Biofuels 6. Energy economy 7. Effective use of energy in buildings 8. Effective use of energy in industry 9. Energy accumulation
Environmental Management	9	Development of knowledge on the logic of environmental management principles, systems and methods, development of understanding how to construct life-cycle management and integrate environmental and quality management. Specific goals: development of skills how to organize environmental audit and implement preventive environmental management.	The students are thought to understand the principles of sustainable environmental management, upbringing the abilities to apply different measures and methods, which improve company environmental performance. Also the methodologies of environmental audit, development of environmental management systems ISO 14001 and EMAS are assimilated. The basic knowledge of environmental impact and Life cycle assessment is provided, the abilities to evaluate environmental risk and develop environmental management systems in company are formed.	1. The principles of sustainable development management 2. The problem of natural resources management 3. The advantages of preventive environmental management 4. Life-cycle management 5. Environmental risk assessment and management 6. Environmental management systems. ISO 14001 and EMAS 7. Certification of Environmental management systems 8. Environmental management audit 9. Environmental performance assessment and reporting 10. Integrated management systems
Environmental Sociology	6	To critically assess frontier theoretical approaches and empirical evidence concerning the ecological degradation of contemporary societies, social implications of global environmental change, to be able to scientifically rigorously discuss the possible decisions to solve environmental problems.	The student is able to analyze, critically discuss and practically apply the latest theoretical approaches on the causes and possible scenarios of ecological crisis, ecological movements, the paradigm of sustainable development, the Anthropocene concept, environmental attitudes and behavior.	1. Key perspectives and Developments in Environmental Sociology 2. Social Construction of Environmental Issues and Problems 3. Environmental Discourses. Media and Environmental Communication 4. Risk Construction 5. Sustainable Development Paradigm and Social Transformations 6. Environmental Behaviour and Explanatory Models
Advanced Inorganic Chemistry and Technology	9	To acquire the advanced knowledge about technological achievements and theory in the field of chemistry and technology of inorganic materials.	Acquire in-depth knowledge about the application of inorganic materials for energy storage and conversion, development trends of hydrogen economy and carbon dioxide conversion. Ability to evaluate the technological features of complex fertilizer production, phase changes in multicomponent systems and the latest development trends. Ability to use phase equilibrium diagrams of complex fertilizer components. Learn how to calculate greenhouse gas emissions, the amount of energy required for processes, and how to design sustainable binding materials process lines.	1. Inorganic materials for energy storage and conversion. 2. Hydrogen economy: development trends and technology assessment. 3. Carbon dioxide conversion by electrochemical and catalytic methods. 4. Technological processes of production of complex fertilizers. 5. Multicomponent phase equilibrium diagrams. 6. The latest trends in the development of the fertilizer industry. 7. Cementitious additives: impact on reducing carbon dioxide emissions and energy consumption. 8. Design of equipments and sustainable production processes of binding materials.
Chemicals Risk Management	6	To provide a systemic understanding about risk to natural or anthropogenic environment and to human health, caused by chemical substances, and about risk assessment and management.	The knowledge is acquired on hazardous properties of chemicals, on risk caused to various environmental components (water, terrestrial ecosystem), risk at work-places, and risk to consumers due to chemicals in products. Various groups of chemical substances are covered, which are of interest when developing technologies and products. Different risk assessment methodologies are tested. Risk management possibilities - legal, managerial, technological - are analysed.	1. Hazardous properties of chemical substances 2. Risk assessment principles and methodologies 3. Problematic chemical substances 4. Risk management measures 4.1. Chemicals control. International and EU legislation 4.2. Managerial and technological measures; risk communication 4.3. Substitution of hazardous chemical substances
Fundamentals of Sustainable Design	6	To acquaint with possibilities and peculiarities of application of conception of sustainable development in architectural design and spatial formation of environment and aspects of visual expression of sustainable architecture.	Students acquire thorough knowledge about application of principles of sustainable development in architectural design and formation of environment: key principles of sustainable development, notions of sustainable architecture and sustainable spatial formation of environment, principles of sustainable design and planning, visual expression of sustainable architecture, its trends and relations with contextual environment, possibilities of creation of sustainable objects of landscape architecture, evaluation methods of expression quality and contextuality of results of sustainable design and construction. Acquired theoretical knowledge is applied evaluating projects and implemented objects.	1. Conception of sustainable development and fields of its application 2. Evolution of expression of ecologic ideas in architecture and environmental formation 3. Conception of sustainable development in the context of trends of ethics of environmental formation 4. Aspects of notion of sustainable architecture 5. Sustainable design and sustainable construction 6. Principles of sustainable design of landscape 7. Planning possibilities of sustainable landscape 8. Types of sustainable projects of landscape architecture 9. Visual expression of sustainable architecture and its trends 10. Evaluation possibilities and methods of objects of sustainable architecture 11. Relation of objects of sustainable architecture with contextual environment, its design and evaluation
Sustainable Energy and Environment	9	Know environmental pollution in energy production problems and methods of it's lowering in thermal, nuclear, power technologies. Understand principles and methods of pollution prevention in energy.	Know basics of environmental protection in thermal, nuclear and power energetics. Are acquired knowledge on globality of environmental protection and major technological means for lowering of environmental pollution. Know principles of pollution prevention and are able to select perspective environmental pollution reduction measures in energetics.	1. Sustainable energy 1,1. Principles of energy sustainability. Harmonious development of energy policy 1.2. Perspective of alternative energy sources application 2. Nuclear energy as sustainable energy source and related environmental problems 2.1. Nuclear energy and environmental impact 2.2. Accidents in nuclear power plants 2.3. Principles of safe operation of nuclear installations 3. Influence of power energetics on environment 3.1. . Environmental problems in the electrical power engineering 3.2. Electromagnetic fields, their shielding and biological effects 3.3. Impact of solar and wind power plants on the environment 4. Reduction of environmental pollution in the thermal energetics 4.1. Pollutants generation in the fuel combustion proceses 4.2. Dispersion of pollutants in the atmosphere 4.3. Primary abatement methods 4.4. Flue gas cleaning technology
Sustainable Development of Cities	6	Provide sound knowledge on problems in cities and on implementing of principles of sustainable development, and using holistic approach to find effective and sustainable solutions	Study module is devoted to form holistic approach to processes occurring in cities broaden abilities to analyze them, to evaluate and to propose sustainable solutions. The students are thought to understand social, environmental, economical problems of cities, their development, modern conception, challenges and opportunities. The students learn to understand principles of energy efficiency, renewable resources using, socially responsible business, sustainable consumption, sustainable life style.	1. Cities development history, principles of cities/settlements establishments 2. Environmental, social and economical problems of cities, concepts of sustainable cities and settlements 3. Human factor/social ecology – keystone for the sustainable decisions 4. Materials' and energy flows of region, possible ways to cycle them 5. Buildings – concentrated spots of cities problems and possibilities to solve them 6. Sustainability of transport system 7. Sustainable community – important condition of sustainable city 8. The Circular City: Towards a Sustainable Urban Ecosystem
Sustainable Industrial Development	9	To gain knowledge in area of sustainable development as a fundamental modern development strategy covering economic, environmental and social aspects and the application of this strategy for sustainable industrial development	The students are taught to understand the concept of sustainable development and concept of sustainable usage. The knowledge on industrial sustainable development tools and skills how to implement them are provided. Ability how to generate, assess and implement preventive innovations is developed. The scientific approach of interdisciplinary for the sustainable development research comprising social, economic, environmental and political aspects is provided	1. Sustainable development and Sustainable consumption strategies 2. Relation of sustainable consumption with the production and resources efficiency 3. Industrial ecology – the strategy of sustainable industrial development 4. Critical raw materials in EU and Lithuania and their impact to country's competitive ability 5. SD indicators and their practical use for the evaluation of perspective of different sectors of economy 6. Main tools of sustainable industrial development 7. Sustainable development research 8. Sustainable innovations in Industry: development and implementation
Management of Sustainability Accounting	6	Enhance creative problem solving capabilities that utilise the sustainable economics methods to define problems, generate ideas, developing new approaches and skills for creating sustainable business models and improvement of business ethics and corporate responsibility.	During the module capabilities in adapting knowledge, skills and new approaches to reach collaborative solutions based on technological, economical and socio-cultural sustainability will be developed. The studies will be based on systems approach integrating analytic and systemic thinking to problem-solve and create new holistic understandings of complex situations and the critical infrastructures of society. The emphasis is on global awareness within the context of local communities and simultaneous modifications based on sustainability economics.	1. Enterprise and Innovation 2. Thinking in Systems in company costs assessment 3. Materials, Resources, Energy and their Impact on the Competitiveness 4. Circular Economy Core Principles and Concepts 5. Corporate sustainability accounting 6. Sustainable Business Models
Color Chemistry	9	To provide knowledge about modern concepts of colour of organic compounds, nomenclature and classification, correlations between the chemical structures of dyes and their color brightness and resistance; to provide knowledge about photo-, thermochromism, chemiluminescence and electroluminescence, synthesis methods and environmental assessment of colorants.	This course gives a fundamental understanding of quantum chemical methods for the basic concepts of color and provides knowledge about nomenclature and classification of colorants, correlations between the chemical structures of dyes and their color brightness and resistance. Topics covered include: polymethine, nitro and nitroso dyes, arylmethine, arylamine, azomethine, azodyes, carbonyl dyes, macroheterocyclic dyes. Additionally, this course provides knowledge about photo-, thermo- ,electrochemical reactions of colorants, and environmental assesment of colorants.	1. Colorants. Classification of colorants 1.1. Light and colour 1.2. Chemical classification of dyes 1.3. Technical classification of dyes 1.4. Nomenclature of dyes 2. Modern concept of colour 2.1. Evolution of colour theory 2.2. Empirical correlations between the chemical structures and their colour 2.3. Quantum chemical methods for the description of light absorption by organic compounds 2.4. The main postulates of colour theory 2.5. Correlations between the chemical structures of dyes and their colour brightness and resistance 3. Specific properties of colors 3.1. Photochromism 3.2. Thermochromism 3.3. Chemiluminescence 3.4. Electroluminescence 4. Methods of preparation of dyes 4.1. Polymethine dyes 4.2. Nitro and nitroso dyes 4.3. Arylmethine dyes 4.4. Arylamine dyes 4.5. Azomethine and azo dyes 4.6. Carbonyl dyes 4.7. Macroheterocyclic dyes 5. Ecology
Product Ecodesign	6	Delivery of knowledge on life-cycle assessment/management and eco-design, develop skills on concepts mentioned above and principles of implementation in industry; analyse real cases of implementation	Lille-cycle management and Design for Environment broaden the way an industry or any Subject gives the understanding that changes in consumer behaviour, increase of product diversification, a decrease in the life span of products are the main reasons creating a shortage of raw materials and energy, i.e. physical limits to growth. Students develop ability to deal with life cycle design, that encompasses the entire life-cycle of the product: from raw material extraction and processing to the production, distribution, use and return of the materials to the industrial cycle or their disposal	1. Environmental concepts based on product life-cycle assessment 2. Product Life-cycle management - quantitative and qualitative environmental impackt assesment 3. Development of products and eco-design 4. Eco-design methodology 5. Cases of eco-design in Lithuanian industry and world-wide 6. Product-service systems. Advanteges and Principles of Sustainable Consumption
Inovations and Global Knowledge Economy	6	To develop innovation management competencies while systemically assessing global knowledge economy context, and modelling national, industrial and organizational impact mechanisms.	Contemporary innovation environment, the concepts and types of innovation, modern principles of managing the R& driven innovative enterprises, innovation management in high technology sectors, organization culture and organizational learning, knowledge management inside the organizations, innovative networks and clusters, dynamics of technologies and industries, creativity and innovations, value innovation, cross-national diversity of innovation management practices, organization and management of science and research, EU innovation policy , preconditions for innovation development.	1. Global R&D and innovation management methodology 2. R&D globalization and technology upgrading 3. Global R&D network and management of partnerships 4. Open innovation management in global knowledge economy network 5. Innovation management challenges and strategies in R&D intensive business 6. Global innovation tendencies: opening, greening and digitization of innovations 7. Innovation development with the focus on responsible innovation management in partnership with society and stakeholders 8. Innovation systems and ecosystems: complex approach
Theory and Applications of Catalytic Processes	6	To acquire in-depth theoretical knowledge and analytical skills in order to evaluate and develop catalytic processes.	Acquisition of in-depth knowledge about the theory, development and application of catalytic processes in various fields (synthesis of organic compounds, energy, bio- and environmental technologies), catalyst production and characterization methods. Practical skills to analyze and assess catalytic processes from a techno-economic point of view.	1. Trends in the development of catalytic processes and techno-economic evaluation. 2. Industrial catalytic processes in organic synthesis, energy, bio- and environmental technologies. 3. Kinetic analysis of catalytic processes. 4. Materials and methods used for the production of catalysts. 5. Theoretical and experimental methods of catalyst characterization. 6. Trends in the development of catalytic reactors.

Cultural Ecology	6	To gain knowledge on the aims, trends, problems, and systems of value of cultural ecology, on the human interaction with the environment and other humans.	Students are taught to understand the aims of Cultural Ecology, historical, social, geographical and other foundations of cultural values, contradictions of modern culture and ethics, the essence of human relation with environment, the issues and tendencies of contemporary avant-garde culture.	1. The concept of cultural ecology. Development of the discipline of cultural ecology 2. Trends of cultural ecology. Cultural ecology in interdisciplinary research. Culture as ecological system 3. Relations of human being as cultural subject with the environment. Environmental ethics 4. Contemporary avant-garde culture in the context of Cultural Ecology. Ecological art
Research Ethics	1	Having completed the module, students will be able to critically assess the principles and procedures of research ethics, apply them in the analysis of research conduct and argue their decisions from the perspective of ethical theories and sustainable development.	In this module, the students will learn to analyse and critically assess research (mis)conduct from an ethical perspective and write an application with their own research proposal for an ethics approval.	1. Science and society: their duties and responsibilities to each other. Key concepts. 2. Basic ethical theories and their application to responsible research and innovation. GDPR provisions. 3. Research ethics management tools in organizations. Filling in research proposal for a research ethics committee 4. Typical forms of research misconduct. Factors and cosequences. Conflicts of interest. 5. Issues of authorship. 6. Intellectual property and science progress. A dilemma between open access data and publishing and competitiveness. 7. Rise of citizen science and ethical issues related to it.
Energy Efficiency of Buildings	6	To understand energy processes taking place in the buildings, to learn how to design the energy efficiency of buildings, to analyse and optimize the combinations of building envelopes and energy systems, to know principles of renewable energy usage in buildings	Obtained knowledge about energy processes taking place in the buildings, their envelopes and energy systems involves the ability to evaluate the impact of energy sources on building energy efficiency, to analyse the efficiency and consistency of building energy consuming and producing systems and applying modern design, evaluation and research methods for energy efficiency of buildings.	1. Concept of energy efficiency of buildings and indicators describing energy performance 2. The concept of primary renewable and not-renewable energy and principles of determination of their factors 3. Methods of calculation of specific heat losses through building envelope 4. Evaluation of thermal bridges and methods of calculation of their thermal transmission coefficients 5. Impact of windows and others transparent elements on energy efficiency of building 6. The methods of design, installation and measurement of air tightness of buildings 7. The influence of design, planning and architectural solutions on increasement on the energy performance of building 8. Building ventilation systems, their design and evaluation of energy performance 9. Protection of buildings from overheating. Design methods of passive protection against the sun's heat measures 10. Design and evaluation of energy efficiency of domestic hot water preparation, accumulation and distribution systems 11. Principles of design, installation and evaluation of building electricity using systems 12. Production of energy from renewable sources in the building or its surroundings 13. Determination of cost-optimal energy performance of the building 14. The reasons of differences of calculated and real energy performance of buildings 15. Provisions of building energy performance certification
Sustainability Assessment of Buildings and Construction	3	To develop a deep understanding of state-of-the-art methodologies for sustainability assessment in construction, competencies necessary to perform building project environmental evaluation based on well-established techniques and methods.	Nowadays, buildings and constructions are evaluated not only based on technical and economic criteria but also by the use of criteria that relate to the sustainability performance of constructions. Methodologies and a standardization framework are learned, which are now widely used. The students will be able to apply methods and practices for conducting the sustainability assessment of buildings and constructions, including the environmental footprint analysis and the life cycle assessment.	1. Introduction in sustainability assessment – towards a resource-efficient Europe 2. Methods and practices for sustainability assessment, compare and contrast different approaches 3. The environmental footprint the concept, case studies and worked examples 4. The basic concept of building life cycle assessment 5. Tools for life cycle assessment. Inventories and calculation tools. The Level(s) scheme 6. Environmental product declaration 7. Life cycle assessment in different building project stages 8. Interpreting life cycle assessment towards decision making. Combining multi-criteria for decision making 9. Digitizing life cycle assessment at the construction stage. Extracting sustainability conclusions through BIM
Advanced Water Treatment Technologies	6	To provide consistent knowledge about the fundamentals of development of water treatment technologies. To understand the principles of technological equipment application and technical design	To acquire knowledge about water contaminant removal technologies and these technologies' development tendencies, with the aim to assure cumulative criteria of efficiency, reliability and economy. Also, they attain systematical knowledge about analysis of technological equipment operation intensification methods, They are able to understand the fundamental principles of biofiltration and biotechnological techniques application, to apply different technological solutions for biogenic elements removal, to use various calculation principles for technological wastewater treatment facilities, to apply the sanitary and ecological evaluation of wastewater disinfection.	1. Perspectives of water treatment technologies in the face of current and future challenges. 2. Limitations of traditional water treatment methods. 3. Advanced physico-chemical water treatment methods. 4. Advanced biological water treatment methods. 5. Advanced technologies for the removal of emerging contaminant from drinking water and wastewater. 6. Approaches for selection of an appropriate water treatment technology. 7. Sustainability aspects in water and wastewater treatment technologies.
Technologies of Utilization of Plastics	6	To give the knowledge on the methods of plastics utilization; to give the information on the technologies and devices of plastics utilization.	The students get knowledge on the environmental and economic importance of plastics utilization, identification and sorting methods, physical chemical, and thermal utilization, compatibility and restabilization of plastics. The composting of biodegradable plastics is introduced. The students get knowledge on the structure and basic principles of devices used in plastics utilization technologies.	1. Ecological and economical importance of plastics utilization 2. Identification and sorting methods of plastics 3. Compatibility and restabilization of plastics 4. Physical utilization of plastics 5. Chemical utilization of plastics 6. Thermal utilization of plastics 7. Composting of biodegradable plastics 8. Application of the products of plastics utilization
Adhesion of Polymers	6	To choose the mechanisms of polymer adhesion bond formation in order to develop adhesive systems resistant to various aggressive agents and to extend their application fields.	The science and technology of polymer adhesion is discussed. Depending on the nature of the components and environmental factors, mechanisms of adhesion bond formation are evaluated. Practical aspects of polymer adhesion are justified.	0. POLYMER CHEMISTRY (short course) 1. ADHESION PHENOMENON 1.1. Advantages and disadvantages of adhesion bonding 1.2. Uses of adhesive bonding in modern industry 2. INTERFACIAL CONTACT 2.1. Surface tension 2.2. Kinetics of wetting 2.3. Modern methods of surface analysis 3. RELATIONSHIP OF SURFACE SCIENCE AND ADHESION SCIENCE 3.1. Mechanical interlocking 3.2. Diffusion theory of adhesion 3.3. Electrostatic theory of adhesion 3.4. Adsorption theory of adhesion 3.5. Covalent bonding at interface 3.6. Weak boundary layers 4. SURFACE PREPARATION OF ADHERENDS 4.1. Low-energy surface pretreatment methods 4.2. High-energy surface pretreatment methods 4.3. Primers 5. HARDENING OF THE ADHESIVE SYSTEMS 5.1. Types of adhesives 5.2. Hardening by solvent or dispersing medium removing 5.3. Hardening by cooling 5.4. Hardening by chemical reaction 6. MECHANICAL BEHAVIOUR OF ADHESIVE JOINTS 6.1. Types of adhesive joints 6.2. Stresses in adhesive joints 6.3. Fracture mechanics of adhesive joints 6.4. Non-destructive adhesion joints testing 7. ADHESION PHENOMENON IN POLYMER COMPOSITES AND NANOCOMPOSITES
Modern Environmental Protection Technologies	6	Enhance systemic understanding of technical solutions of environmental problems. Gain knowledge on the development trends of environmental technologies.	Engineering systems of environment protection. Engineering systems of atmosphere protection. Pollution of lytosphere and it's protection. Hydrosphere protection against pollution. Waste water quantity and composition. Methods of waste water and sludge treatment. Natural resources and energy saving. Global environmental protection problems.	1. Waste water qualitative characteristics 2. Primary wastewater treatment 3. Secondary wastewater treatment 4. Qualitative characteristics of air pollutants 5. Treatment methods of solid particles 6. Treatment methods of gaseous pollutants 7. Qualitative composition of waste 8. Waste collection and mechanical treatment 9. Chemical and biological waste treatment 10. Thermal waste treatment 11. Modern waste landfilling 12. Mining of anthroposphere
Contemporary Architectural Theory	6	To provide doctoral students with theoretical knowledge of contemporary architectural theories; to develop the ability to conceptualize the processes of contemporary architecture and urban environment while using diverse theories and methodologies of architectural analysis; to interpret the phenomena of contemporary architecture as a part of cultural and social context; to assess the evolution of architecture and urban environment as a complex of processes and ideas.	The course aims to conceptualise the processes of the contemporary urban enviroment and architecture; to analyse, interpret and independently construct an architectural text on a scientific level; develops the capacity to apply theoretical knowledge in the evaluation and analysis of social diversitu in the context of urban environment.	1. The role of architectural discourse in contemporary society 2. Architecture as a form of visual communication: semantics, representation, visual identity. 3. Architecture as form of social communication: theory of social complexity 4. Architecture as instrument of power: in-between totalitarian and democratic space 5. Architecture as manifesto: from utopia to urban activism. 6. Spatial effects of globalization and policies of architectural identity. 7. Contemporary interpretations of cultural heritage 8. Cultural and social meaning of space: an integral (sustainable) approach.
Contemporary Management Theories and Concepts	9	To create a system of fundamental knowledge in the field of management that would enable the doctoral students to understand the methodologies of management and to rely on them in constructing their doctoral research.	Doctoral students will analyse classical, neoclassical and contemporary theories, concepts and approaches in management. The main emphasis is on studies of fundamental and original works of the most advanced researches. Efforts of relating together different approaches and their evaluation from the perspective of knowledge society will be emphasised.	1. Introduction to contemporary management theories and concepts 1.1. Introduction to the course assignement 1.2. Introduction to the research design and case study method 2. Contemporary management theories & comparative management research 2.1. Main management theories and their evolution 2.2. Economics-based view of strategy; Industrial organizational theory; Transaction cost theory 2.3. Resource-based view; Criticism and on-going debates 2.4. Cognition and attention-based views 3. Strategic management research 3.1. Corporate strategy research 3.2. Competitive strategy research 3.3. Strategy process research 4. Digitalization and management 4.1. Ecosystems and global value chains 4.2. Platforms and digital ecosystems; 4.3. Big data, disruptive technologies, competing in digital age 5. Dynamic capabilities 5.1. Dynamic capabilities and innovations 5.2. Dynamic capabilities and business models 5.3. Dynamic capabilities at individual level

Thermodynamics	9	To make synthesis of energetics and work machines cycles, to make algorithms and optimize the conditions of work of such thermodynamics models. To create the models for the gas systems and model them	Learning on the basis of of knowledge from the course before to make synthesis of energetics and work machines cycles, to make algorithms and on this basic optimize the conditions of work of such thermodynamics models, on the basis of solutions physic-chemical balance theory to make synthesis of new equilibrium thermodynamic systems behaviour models for use in technology, to optimize them and use for the creation of new technologies, to describe them experimentally, to optimize models and the received results to use for ecology environments creation.	1. Common laws of thermodynamic 1,1. Energy (forms), work (forms), heat (modes). Analytical expressions 1.2. First law of thermodynamic, an application for investigation of thermodynamic processes 1.3. Entropy, characteristics. II law of thermodynamic, capabilities for analysis of energy degradation processes 2. Work bodies - the subjects of thermodynamic systems. Thermal, energetics and kinetic characteristics 2,1. Ideal gas, half ideal gas, mixtures form them, processes 2.2. Real gas, real gases mixtures. Real multiphase work body (in gas, liquid, solid and plazma condition). 2.3. Wet gas: characteristics, conditions, processes. 2.4. Solutions and reactive gas mixtures. Thermal, enerbetic and kinetic characteristics. 3. An experimental basics of thermodynamic. 3,1. Methods for thermal characteristics of work bodies estimation 3.2. Methods for energy and calorific characteristics estimation 3.3. Methods for work bodies kinetic characteristics (thermal and diffusive conduction, viscosity) estimation 4. Thermodynamic mathematical model and an efficiancy methods ofr energy transformation 4,1. Thermodynamic cycles and characteristics function method, chemical potencial and main differential equations 4.2. The efficiency of energy transformation:energetic and eksergic 5. Combustion processes thermodynamic 5,1. The balances of the fuel combustion materials 5,2. Thermochemistry and regularities 5,3. II thermodynamic law application for analysis of combustion processes 6. Equilibrium of phases and chemical complexes of thermodynamic systems 6,1. Phases equilibrium. Transformations of pure substance phases. 6.2. Transformations of solution phases. 6.3. Description of equilibrium of chemical gas mixtures. Experimental and analytical estimation of the constant part of equi 6.4. Thermal disocciation. Mathematical model and fume composition. 7. Stationary and transient flow processes 7,1. Elastic liquid flooding regularities 7,2. Gas and steam choke. 7,3. Processes of flow mixtures. 7.4. Irreversible processes of compressor and turbine work. Losses of irreversibility. 8. Analysis and synthesis of thermodynamic cycles 8,1. Cycles with gas work body 8,2. Cycles of thermal power plants, taking to account steam-gas, MHDG and fuel cells cycles 8,3. Energy transformation cycles.The questions of materials cooling and gas liquefication. Problem of thermal pums. 9. Thermodynamic cycles processes modelling, algorithms and optimisation 9,1. Physical cycle machine model creation, algorithms and programming 9,2. Cycle machine model optimisation and new cycles synthesis 10. Basics of irreversible processes of thermodynamic 10,1. Non compensate work, entropy growing, entropy flow 10,2. Laws of Onzageri 10,3. Thermaldiffusion phenomenon

Study modules for Professional studies

Name	Credits	Purpose	Description	Chapters and topics
General and Special Pedagogy	6	To provide knowledge of modern educational science that will help define the relationship between traditional pedagogy and educology. Develop the ability to choose traditional and innovative methods of general and inclusive education	The student acquires knowledge about the relationship between traditional pedagogy and modern pedagogy, theories and concepts necessary for lifelong learning. Able to define, analyze and evaluate relevant terms and concepts of educational science, reflect the acquired knowledge and experience, compare it with their own value system and develop it. Able to apply traditional and innovative educational methods and methods, self-evaluate their pedagogical activities.	1. The challenges of general pedagogy 1,1. The concept of education for sustainable development (ESD). Educational goals and competences 1,2. Changes in learning in the context of lifelong learning. 1,3. Emotional maturity of the teacher 1,4. The school - a learning organization 1,5. Ethics of the educator 1,6. The process of socialization. Personality development in the process of socialization 1,7. Delinquent pedagogy at school. Solving behavior problems 1,8. School-Family Relationships for Child Welfare 2. The challenges of special pedagogy 2,1. The concept of special educational needs and inclusive education 2,2. Positive attitude of the school community towards the education of pupils with special educational needs 2,3. Groups of pupils with special educational needs, their characteristics, recognition and assessment of special educationa 2,4. Adapting educational programs for children with special needs. Special training aids and assistance 2,5. Peculiarities of special needs pupils' relationships with peers and adults 2,6. Impact of special educational needs on the personality and social development of children and adolescents 2,7. Teamwork at school (student, parents, teachers, student support specialists). Interinstitutional cooperation 2,8. A safe environment in the classroom: preventing violence and bullying
Course teaching Methodics 1	3	To master the knowledge of the methodics of subject teaching at school. To be able to define the terms and concepts of subject science, to find relevant information and knowledge relevant to the practice of subject teaching, to be able to plan activities, to choose and apply traditional and active teaching methods, be able to carry out his / her performance improvement research by teaching the subject according to general education programs, applying the acquired knowledge in the study of pedagogical improvement.	Knowledge of the methodology of subject teaching is acquired. Ability to plan, organize and analyze the subject education process; be able to differentiate and personalize activities, taking into account the updated curriculum; acquiring knowledge and ability to apply pedagogical improvement research methodology; is able to evaluate and evaluate his / her activity, to reflect on the experience gained.	1. Subject curriculum for education at school, standards, teaching content, structure, tasks 2. Subject curriculum, subject lessons thematic planning 3. Traditional and active teaching methods of teaching the subject, their application 4. Integration of subject knowledge and skills 5. The concept of pedagogical research in teaching subject 6. Assessment and self-assessment system in subject lessons 7. Acquired competences and their coherence with education for sustainable development
Course teaching Methodics 2	3	Knowledge of teaching methodology taught; is able to apply the peculiarities of methodology in practice, research, solving tasks; master the methodology for performance improvement research; is able to apply differentiated and individual activities in lessons, is able to apply the principles of sustainable development education in the subject lessons.	Knowledge of teaching methodology taught; is able to apply the peculiarities of methodology in practice, research, solving tasks; master the methodology for performance improvement research; is able to apply differentiated and individual activities in lessons, is able to apply the principles of sustainable development education in the subject lessons.	1. Methodology of research on pedagogical improvement 2. Principles of Sustainable Development Education in Lessons. 3. Differentiating and individualizing work in a lesson. 4. Methods of teaching social subject 5. Language teaching / learning methods 6. Foreign language learning directions and strategies. 7. Repertoire of Foreign Language Teacher Methods 8. Self-assessment of pedagogical activities in teaching the subject.
Practice of Curriculum Planning and Its Realization	3	To acquire the knowledge on the construction of curricula; to udnerstand the importance of curricula in the conetxt of traditional pedagogy and contemporary educational science; to udnerstand the concept of curriculum; to be able to analyse and assess, create and reflect curricula of different levels considering modern requirements and the change of education paradigms.	Students get acquainted with the experience and theories of curricula construction; programmes' structure, principles; content and implementation peculiarities. Internal compatibility of curricula between their parts, competences being developed and expected results. Students learn to construct, analyse and assess different type programmes.	1. Principles of curriculum development, essence of curriculum. 2. Curriculum structure and coherence of parts. 3. Students' skills, literacy and competences. 4. Differentiation, personalisation and personalized teaching and learning. 5. Evaluation of curricula 6. Coherence of educational programs with the goals of sustainable development.