MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
"IGOR SIKORSKY KYIV POLYTECHNIC INSTITUTE"

APPROVED
by the Academic Council of Igor Sikorsky Kyiv Polytechnic Institute
(Minutes № 3 of 15.03.2021)

Chair of the Academic Board

_____ Mykhailo ILCHENKO

ЕНЕРГЕТИЧНИЙ МЕНЕДЖМЕНТ ТА ЕНЕРГОЕФЕКТИВНІ ТЕХНОЛОГІЇ

ENERGY MANAGEMENT AND ENERGY EFFICIENT TECHNOLOGIES

EDUCATIONAL SCIENTIFIC PROGRAMME

(Master's Degree)

in	**141 Power Engineering, Electrical Engineering and Electromechanical Engineering**
field of knowledge	**14 Electrical Engineering**
qualification	**141 Master of Science in Power Engineering, Electrical Engineering and Electromechanical Engineering**

Put into effect by Order of the Rector of Igor Sikorsky KPI of (Decree № NON/89/2021 from 19.04.2021)

Kyiv – 2021

PREAMBLE

DEVELOPED by the Project Group:

Head of the Project Group:

Serhii Denysiuk, director of the Instotute for energy saving and energy management, Professor, Doctor of Technical Sciences

Members of the Project Group:

Volodymyr Nakhodov, Associate Professor at Department of Power Supply, Associate Professor, Doctor of Technical Sciences

Denys Derevianko, Candidate of Engineering Sciences (Ph.D.),

Associate Professor of the Department of Power Supply

The Department of Power Supply is responsible for the training of applicants for higher education under this educational programme

AGREED BY:

Scientific and methodological Committee of Igor Sikorsky KPI, for Speciality 141 Power Engineering, Electrical Engineering and Electromechanical Engineering
Chairman of the SMCU 141

_____ Oleksandr YANDULSKYI

(Minutes № 4 of 18.02.2021)

Methodological Council of Igor Sikorsky KPI
Chair of the Methodological Council _____ Yuriy YAKYMENKO
(Minutes № 6 of 25.02.2021)

Reviews of stakeholders are enclosed.

According to the monitoring results, the educational professional programme " Energy Management and Energy Efficient Technologies" of the second (Master's) level of higher education in the speciality 141 Power Engineering, Electrical Engineering and Electromechanical Engineering, approved by the Academic Council on 02 April 2018 (see Minutes No. 4), taking into account the opinion of relevant participants involved in the implementation of EP, proposals of graduates, employers and other external stakeholders, was updated.

The project team revised the balance, rational allocation of course credits, the ability of students to master certain disciplines (educational components) and the educational programme overall, investing in a certain time, the completeness of documentary, personnel, information and other support of EP and compliance of the educational programme.

To enable individual educational trajectory, including through individual choice of academic disciplines within the scope envisaged by law, it was decided to replace the existing select blocks with separate educational components.

The educational and professional programme " Energy Management and Energy Efficient Technologies" was discussed and approved by the scientific and pedagogical staff of the Department of Power Supply (Minutes № 9 of 19 January 2021).

CONTENTS

1. PROFILE OF THE EDUCATIONAL PROGRAMME

for Speciality 141 Power Engineering, Electrical Engineering and Electromechanical Engineering

1 – Background	
Full name of the University and institute/faculty	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Institute of Energy Saving and Energy Management
Degree and title of qualification in the original language	Degree – Master Qualification – Master of Science in power engineering, electrical engineering and electromechanical engineering
Official name of the educational programme	Energy management and energy efficient technologies
Diploma and scope of educational programme	Master's degree, single, 120 course credits, duration of study: 1 year 9 months
Accreditation	Certificate of accreditation ND-IV № 1158095, issued by the Ministry of Education and Science of Ukraine Accreditation period from 30 May 2013 to 01 July 2023
Cycle/level of higher education	NQF of Ukraine – level 7 QF-EHEA – second cycle EQF-LLL – level 7
Prerequisites	Bachelor's degree
Language(s) of instruction	Ukrainian
Duration of the educational programme	Until the next accreditation
Permanent link of the educational programme	http://ep.kpi.ua/ department website https://osvita.kpi.ua/ section "Educational programmes"
2 - Goal of the educational programme	
Specialist training based on a combination of a high level of professional training with the formation of the student's scientific worldview and providing a broad outlook in the social, humanitarian, fundamental and professional spheres, in particular, training of specialists capable of independently: conducting comprehensive energy audits and energy certification of buildings and engineering structures; to create systems of energy management and control of energy supply of enterprises; carry out design, analysis of efficiency and reliability, optimization of energy systems; apply modern energy supply systems, energy efficient technologies and renewable energy sources, which are based on the principles of strategies for sustainable energy development of the country, decarbonization; implement mechanisms for managing energy demand, including the involvement of active consumer behavior and renewable energy sources; carry out business planning and organizational and managerial functions in the energy market. The educational program is aimed at training a specialist capable of making scientifically sound management decisions in the field of energy and energy efficiency, to solve complex problems and problems in the energy sector: to create modern energy	

management systems, to develop feasibility studies and expertise of innovative energy efficiency projects. stages of project implementation, to provide consulting in the field of energy efficiency and energy supply.	
3 - Description of the educational programme	
Subject area	**Objects of activity:** - scientific and design institutions and companies in the power industry; – enterprises and organizations of industrial, commercial and utility sectors; **Objects of study:** –power, technical and electromechanical equipment of industrial, commercial and utility facilities; –power supply systems for industrial, commercial and utility facilities; –energy management systems for industrial, commercial and utility facilities; –systems for monitoring, metering and management of energy use. **Subject**: – processes of production, transmission and distribution of energy in systems of providing electricity to industrial, commercial and utility facilities; – processes of consumption of electricity by technical and mechanical equipment of companies in industrial, commercial and utility sectors; – energy efficiency of equipment and systems for providing electricity to industrial, commercial and utility facilities; – management of consumption and efficiency of energy resources use. **Purpose of training:** training of specialists capable of conducting energy audits of production, commercial and utility companies, analysing the energy efficiency of technological and energy equipment, production processes and systems, developing and implementing energy efficiency measures and technologies in production, distribution, transformation and use of energy resources, and managing their consumption. **Theoretical content of the subject area:** fundamental knowledge of the principles of construction and operation of power supply systems of industrial, commercial and utility facilities, modes of operation and processes of electricity consumption of their technological and energy equipment, knowledge of principles and approaches to assessing and monitoring the efficiency of electricity use, knowledge of methodology and application of energy

	management systems at relevant facilities, systems for monitoring, accounting and management of energy use, knowledge of the principles and approaches to managing the consumption and efficiency of energy resources. **Methods, methodologies and technologies:** methods of modelling of energy consumption processes, methods and ways of estimation and control of efficiency of use of electricity by equipment and systems of power supply, methods and ways of management of consumption and efficiency of use of energy resources. **Instruments and equipment:** control and instrumentation devices and means of monitoring, metering and management of energy use, computer equipment.
Orientation of the educational programme	Educational -scientific

The main focus of the educational program and specialization	Professional education in speciality 141 - Power Engineering, Electrical Engineering and Electromechanical Engineering. The role of the energy manager is in system analysis, configuration management of energy consumption. Basic training of energy manager includes: energy management of small energy; energy management of energy consumption; energy law. Emphasis is placed on the formation and development of professional competencies in the field of energy management system development in accordance with the requirements of the ISO 50001 series of standards and the provisions of the Smart Grid concept; monitoring of energy use to ensure energy saving / energy efficient regimes, development and implementation of energy efficiency certification of buildings and engineering structures; conducting marketing activities and forming business processes in the field of energy efficiency and energy supply of enterprises and organizations, including the regional and national level; ensuring the company's activities in the energy market. The educational program is aimed at combining engineering thinking with research (scientific) innovation, in particular, an integrated combination of courses in engineering training with modern information and communication technologies in energy, obtaining the necessary research skills. **Key words:** energy saving, energy efficiency, energy management, energy market, energy audit, energy management systems, energy service, energy consulting, energy certificate, demand management, renewable energy sources, business processes, intelligent energy supply systems, energy, energy market, energy information and communication technologies

Features of the programme	A characteristic feature of the educational program is an in-depth study of disciplines aimed at developing the ability to analyze and predict at the system level the efficiency and environmental friendliness of energy technologies, develop comprehensive measures for energy efficiency management, in particular, implementation of energy management systems, energy efficiency technologies. organizations) in the formation of intelligent energy systems and systems in accordance with the provisions of the Smart Grid concept, energy audit and certification and energy service activities, implementation of energy projects and energy service contracts with the widespread use of information and communication technologies. Innovative professional activity under the educational program is carried out by internationalization of the educational process and is realized through harmonious and multidimensional education of future highly qualified specialists, able to comprehensively and systematically analyze energy security problems of energy management, energy market functioning, energy efficiency policy. and renewable energy sources. The uniqueness of the educational and scientific orientation of the program is the ability to master the skills of organizational and managerial activities in the field of energy management and energy efficient technologies, as well as the formation of high adaptability of master scientists through interaction with employers and other stakeholders. Students of this program have the opportunity to participate in international mobility programs and obtain a double diploma from the Warsaw University of Technology.
4 – Suitability of graduates for employment and further study	
Employability	According to the classifier of professions DK003: 2010, graduates can work as the following: 2143.1 Research Engineer in Agricultural Energy 2143.1 Junior researcher (electrical engineering) 2143.1 Researcher (electrical engineering) 2143.1 Researcher-consultant (electrical engineering) 2149.1 Junior researcher

	2149.2 Research Engineer 2149.2 Energy Saving and Energy Efficiency Expert 2149.2 Consultant on energy saving in buildings 2149.2 Energy Saving and Energy Efficiency Consultant 2149.2 Engineer for the introduction of new equipment and technologies 2149.2 Calculation and Modes Engineer 2310.2 Assistant 2310.2 Teacher of a higher educational institution 2320 Instructor at a vocational institution Possible professional certification
Further training	Studying for a PhD programme (third educational and scientific level)
5 - Teaching and Evaluation	
Teaching and learning	Lectures, practical classes and seminars, computer workshops and laboratory works; course projects and works; techniques of blended learning, practice and excursions; Master's thesis. Mixed education is possible
Evaluation	According to the rating system, oral and written exams, testing
6 - Programme-based competencies	
Integral competence	Ability to solve complex problems and problems in professional activities in the field of energy management and energy efficiency in production, commercial and utilities or in the learning process, which involves research and/or innovation and is characterized by uncertainty of conditions and requirements
General Competencies (GC)	
GC 1	Capacity for abstract thinking, analysis and synthesis
GC 2	Ability to search, process and analyse information from various sources
GC 3	Ability to use information and communication technologies
GC 4	Ability to apply knowledge in practical situations
GC 5	Ability to use a foreign language to carry out scientific and technical activities
GC 6	Ability to make informed decisions
GC 7	Ability to learn and master modern knowledge
GC 8	Ability to identify and assess risks
GC 9	Ability to work independently and in a team
GC 10	Ability to identify feedback and adjust actions accordingly
Professional competencies (PC)	
PC 1	Ability to apply the acquired theoretical knowledge, scientific and technical methods to solve scientific and technical problems and problems in the field

	of energy management and energy efficiency
PC 2	Ability to apply existing and develop new methods, techniques, technologies and procedures to solve engineering problems in energy management and energy efficiency
PC 3	Ability to plan, organize and conduct research in the field of energy management and energy efficiency
PC 4	Ability to develop and implement measures to improve energy efficiency and environmental safety in the design and operation of equipment, facilities in industrial, commercial and utilities sector.
PC 5	Ability to analyse technical and economic indicators and examine design decisions in the field of energy management and energy efficiency
PC 6	Ability to demonstrate knowledge and understanding of mathematical principles and methods required for use in energy management and energy efficiency
PC 7	Ability to demonstrate awareness of intellectual property and contracts in the field of energy management and energy efficiency
PC 8	Ability to research and identify problems and identify constraints, including those related to nature protection, sustainable development, health and safety, and risk assessments in the field of energy management and energy efficiency
PC 9	Ability to understand and take into account social, environmental, ethical, economic and commercial considerations that affect the implementation of technical solutions in the field of energy management and energy efficiency
PC 10	Ability to manage projects in the field of energy management and energy efficiency and evaluate their results
PC 11	Ability to assess energy efficiency indicators of production, commercial and utility companies
PC 12	Ability to develop plans and projects to improve the energy efficiency of industrial, commercial and municipal facilities, taking into account all aspects of the problem, including production, operation, maintenance and disposal of their equipment.
PC 13	Ability to demonstrate awareness and ability to use regulations, norms, rules and standards in the field of energy management and energy efficiency
PC 14	Ability to use methods of valuation of intellectual property rights for their further commercialization, including for the sale of licenses and technology transfer
PC 15	Ability to publish the results of their research in scientific journals
PC 16	Ability to apply the basic tools of innovation management, to form a comprehensive understanding of the problems of innovation management of the enterprise
PC 17	Ability to use software for computer simulation, computer-aided design, automated production and automated development or design of elements of electrical, electrical and electromechanical systems

PC 18	Ability to implement educational programs and curricula in accordance with state standards of higher education, as well as to develop and conduct all types of classes and tests in higher education
PC 19	Ability to use methods of control of technical condition of power equipment and control systems of technological processes on objects of industrial, commercial and utility and household spheres; developing, compiling and maintaining technical documentation, to use the basic provisions of the international regulations of energy management.
PC 20	Ability to apply experience in relation to the basic principles of development and implementation of energy efficient technologies in the production, distribution, conversion and use of fuel and energy resources.
PC 21	Ability to conduct energy audits of industrial, commercial and municipal facilities, to analyse the energy efficiency of technology projects, to implement energy efficiency measures and technologies.
PC 22	Ability to create and apply automated systems of commercial and technical accounting of energy consumption, control and management of energy use.
PC 23	Ability to develop long-term plans and measures for the implementation of energy saving policy, implementation of energy management systems, development of electricity supply systems, implementation of schedules of planned and preventive works and maintenance of electrical equipment in terms of energy efficiency.
PC 24	Capacity for business communications in the professional sphere, knowledge of the basics of business communication, teamwork skills, ensuring an optimal socio-psychological climate in the team.
PC 25	Ability to perform and evaluate the technical and economic efficiency of design, research, implementation of energy management systems, develop new measures to improve energy efficiency of energy supply systems, assess the competitiveness of the proposed technical and technological solutions.
7 - Programme learning outcomes	
KNOWLEDGE	
KN 1	Knowledge of the main types of intellectual property rights and methods of their protection, methodological and legislative bases of creation of intellectual property objects
KN 2	Knowledge of the main provisions of regulatory documents governing innovations in Ukraine
KN 3	Knowledge of the list of the main open international banks of electronic resources for providing support of educational, scientific and innovative activity
KN 4	Knowledge of the basic principles of sustainable development of society, taking into account the social, technological, economic and environmental aspects of human activity
KN 5	Mastery of a foreign language at a level that allows unrestricted discussions with foreign scientists on current scientific and technical issues of power engineering, electrical engineering and electromechanics, and ability to speak

	at scientific conferences and symposia
KN 6	Knowledge of current standards, regulations and rules according to which Ukraine conducts activities in the field of energy management and energy efficiency
KN 7	Knowledge of the rules of safe operation of electrical, electrical and electromechanical equipment.
KN 8	Knowledge of the provisions of the Energy Strategy of Ukraine and the principles of energy security
KN 9	Knowledge of effective methods and approaches aimed at improving the energy efficiency of industrial, commercial and utility facilities
KN 10	Knowledge of the latest approaches and modern methods of research in the field of energy management and energy efficiency
KN 11	Knowledge of modern methods of mathematical modelling of energy consumption processes at industrial, commercial and utility companies
KN 12	Knowledge of modern software for computer modelling and in-depth study of energy consumption processes at the industrial, commercial and utility facilities
KN 13	Knowledge of theory of complex systems, systems analysis and mathematical methods used to solve optimization problems in the field of energy management and energy efficiency
KN 14	Knowledge of approaches to optimal planning and conducting of experiments, methods of processing and evaluation of results of experimental researches with application of modern information technologies, current regulations and requirements to research reports
KN 15	Knowledge of the composition and sequence of development of innovative projects
KN 16	Knowledge of analytical methods for determining and numerical methods for calculating energy consumption processes at the objects of industrial, commercial and communal services
KN 17	Knowledge of the principles of effective management of production and research activities using innovative approaches and technologies
KN 18	Knowledge of the legal and regulatory framework that determines the implementation of activities in the field of energy management and energy efficiency, methodology and techniques, classical and innovative learning technologies in higher education
KN 19	Knowledge of modern methods of construction and calculation of systems of production, distribution and use of fuel and energy resources
KN 20	Knowledge of methods of preparing energy balances, methods of identification and construction of models of technology processes, modern principles of energy consumption management taking into account systems of tariffs for electric and thermal energy
KN 21	Knowledge of the basic principles of operation, regulations, current standards and specifications, instructions and other regulations of the electricity market

KN 22	Knowledge of possibilities of application of modern achievements in the fields of electric power and heat supply in production and technological activity, effective methods and ways of optimization of parameters of technological modes, requirements of labor protection
SKILLS	
SK 1	Ability to find ways of improving energy efficiency at industrial, commercial and utility facilities
SK 2	Ability to reproduce the processes of energy consumption of industrial, commercial and utility facilities through their computer modelling
SK 3	Ability to prepare action plans and projects to improve energy efficiency of industrial, commercial and utility facilities
SK 4	Ability to analyse energy consumption processes in electrical, electrical and electromechanical equipment and related assemblies and systems
SK 5	Ability to account for legal and economic aspects of research and innovation
SK 6	Ability to present research materials at international scientific conferences and seminars on topical issues in energy management and energy efficiency
SK 7	Ability to justify the choice of direction and methods of research taking into account topical issues in the field of energy management and energy efficiency
SK 8	Ability to plan and conduct research in the field of energy management and energy efficiency
SK 9	Ability to combine different forms of research and practical activities in order to bridge the gap between theory and practice, scientific advances and their practical implementation
SK 10	Ability to communicate freely orally and in writing in the native as well as foreign languages on topics of modern scientific and technical issues of energy management and energy efficiency
SK 11	Ability to identify problems and constraints related to ensuring environmental protection, sustainable development, human health and safety, and risk assessments in the field of energy management and energy efficiency
SK 12	Ability to identify the main factors and technical issues that may hinder the introduction of modern methods of energy management of industrial, commercial and utility facilities
SK 13	Ability to identify problems facing society and which can be solved by using and adhering to the principles of sustainable development of society
SK 14	Ability to seek resource support for additional training, research and innovation
SK 15	Ability to choose methods of mathematical and physical modelling of energy consumption processes of industrial, commercial and utility facilities
SK 16	Ability to organize and manage the cognitive activity of students, to form in students critical thinking and the ability to carry out educational activities with all its components

SK 17	Ability to prepare terms of reference for new energy-efficient electrical installations, advanced technologies, modernization and reconstruction of power facilities, as well as for their control systems; to select and substantiate the application of effective schemes and parameters of electricity and heat distribution systems
SK 18	Ability to conduct a comparative analysis of power supply schemes and compare the efficiency of equipment of traditional and renewable energy
SK 19	Ability to create effective means of energy management, taking into account the peculiarities of existing and future of energy tariff schemes, to conduct relevant research using modern software
SK 20	Ability to control the modes of operation of technological and electric power equipment and implement measures to improve energy efficiency of its operation, control the level of capacity utilization, ensure the rhythmic execution of technological process operations, develop new and implement existing energy efficient technologies
SK 21	Ability to conduct marketing analysis of processes occurring in energy markets and to form proposals for the development of new services and goods for the energy market

8 – Resourcing of programme implementation	
Staffing	In accordance with the personnel requirements for ensuring the implementation of educational activities for the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine of 30.12.2015 No. 1187, according to the wording of the resolution of the Cabinet of Ministers of Ukraine dated 10.05.2018 No. 347.
Logistics	In accordance with the technical requirements for the logistical support of educational activities for the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine of 30.12.2015 No. 1187, according to the wording of the resolution of the Cabinet of Ministers of Ukraine dated 10.05.2018 No. 347. Use of equipment: educational facilities with multimedia projectors, computer equipment with appropriate software, laboratory equipment for academic (teaching, research, scientific) activities.
Information and teaching/learning materials	In accordance with the technical requirements for the instructional and information support of educational activities for the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine of 30.12.2015 No. 1187, according to the wording of the resolution of the Cabinet of Ministers of Ukraine dated 10.05.2018 No. 347. Use of the Scientific and Technical Library of Igor

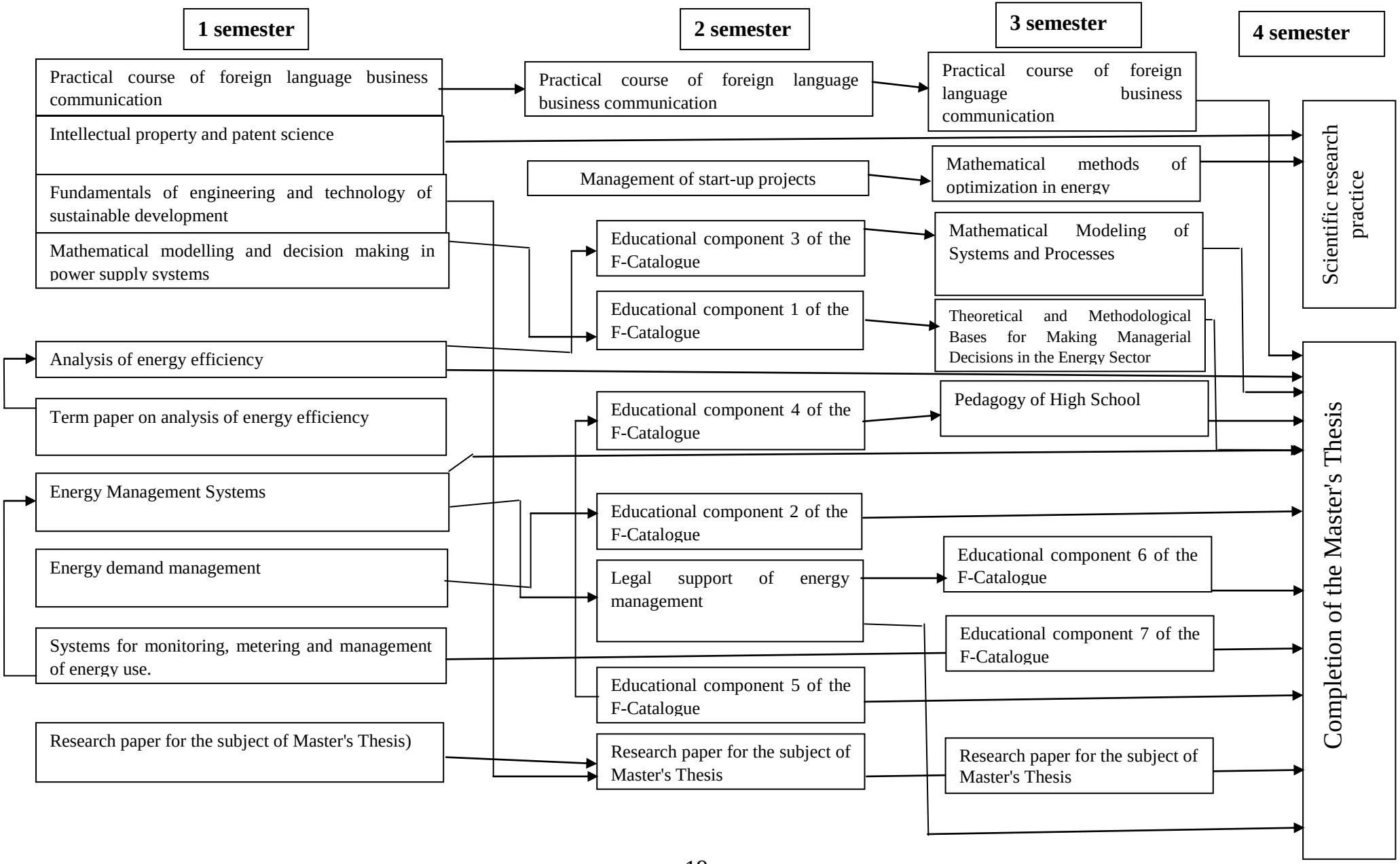
	Sikorsky KPI
9 – Academic mobility	
National credit mobility	Ability to conclude agreements on academic mobility, double graduation, etc.
International credit mobility	Ability to conclude agreements on international academic mobility (Erasmus + K1, CATAMARAN), on participating in double degree programmes, on long-term international projects that involve the inclusion of students training, etc.
Training of foreign applicants for higher education	Teaching in English

2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAMME

Course	Components of the curriculum (academic disciplines, term papers, practices, qualifying paper)	Number of course credits	Form of final control
1. MANDATORY educational components			
1.1. General training cycle			
GM1	Intellectual property and patent science	3	pass-fail exam
GM2	Fundamentals of engineering and technology of sustainable development	2	pass-fail exam
GM3	Practical course of foreign language business communication	4,5	pass-fail exam
GM4	Management of start-up projects	3	pass-fail exam
GM 5	Pedagogy of High School	2	pass-fail exam
GM 6	Mathematical methods of optimization in energy	4	examination
GM 7	Mathematical Modeling of Systems and Processes	4	examination
1.2. Professional training cycle			
PM1	Mathematical modelling and decision making in power supply systems	4	examination
PM2	Analysis of energy efficiency	4,5	examination
PM3	Term paper on analysis of energy efficiency	1	pass-fail exam
PM4	Energy Management Systems	4	examination
PM5	Energy demand management	4	pass-fail exam
PM6	Systems for monitoring, metering and management of energy use.	4	pass-fail exam
PM7	Legal support of energy management	4,5	pass-fail exam
PM 8	Theoretical and Methodological Bases for Making Managerial Decisions in the Energy Sector	4,5	examination
Research (scientific) component			
PM 9	Research paper for the subject of Master's Thesis	10	pass-fail exam
PM 10	Scientific research practice	9	pass-fail exam
PM 11	Completion of the Master's Thesis	17	thesis defence
2. SELECTIVE educational components			
2.1. Professional training cycle			
PS1	Educational component 1 of the F-Catalogue	5	examination

PS2	Educational component 2 of the F-Catalogue	5	examination
PS3	Educational component 3 of the F-Catalogue	4	pass-fail exam
PS4	Educational component 4 of the F-Catalogue	4	pass-fail exam
PS5	Educational component 5 of the F-Catalogue	5	examination
PS6	Educational component 6 of the F-Catalogue	4	pass-fail exam
PS7	Educational component 7 of the F-Catalogue	4	pass-fail exam
The total amount of **mandatory components**:		89	
The total amount of **sample components**:		31	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAMME		**120**	

3. LOGIC DIAGRAM OF THE EDUCATIONAL PROGRAM



4. FORM OF CERTIFICATION OF APPLICANTS FOR HIGHER EDUCATION

Certification of applicants for higher education under the educational professional programme "Energy Management and Energy Efficient Technologies" speciality 141 Power Engineering, Electrical Engineering and Electromechanical Engineering is carried out in the form of public defence (presentation) of qualification paper and results in issuing a standard document on awarding a master's degree with the qualification: “Master of Power Engineering, Electrical Engineering and Electromechanical Engineering" in the educational and professional programme "Energy Management and Energy Efficient Technologies".

The qualification paper is checked for plagiarism and after the defence is kept in the repository of the University STL for free access.

Certification is carried out openly and publicly.

5 MATRIX OF CORRESPONDENCE OF PROGRAMME COMPETENCIES TO COMPONENTS OF THE EDUCATIONAL PROGRAMME

	GM 1	GM 2	GM 3	GM 4	GM 5	GM 6	GM 7	PM 1	PM 2	PM 3	PM 4	PM 5	PM 6	PM 7	PM 8	PM 9	PM 10	PM 11
GC 1		+		+	+	+	+	+	+		+	+		+	+	+		+
GC 2	+	+	+	+		+		+	+	+			+	+	+	+	+	+
GC 3		+			+						+		+		+	+		
GC 4	+				+			+	+	+	+	+	+		+	+		
GC 5		+	+													+		
GC 6		+		+		+	+	+		+		+	+		+	+		+
GC 7	+	+	+	+	+			+	+	+	+	+	+	+		+	+	+
GC 8		+		+	+	+	+							+				
GC 9		+							+	+	+	+	+	+	+	+	+	+
GC 10				+		+				+								+
PC 1							+		+	+	+	+		+	+	+	+	+
PC 2							+	+	+	+		+		+	+	+	+	+
PC 3												+		+		+	+	+
PC 4												+						+
PC 5				+				+	+	+		+					+	+
PC 6							+	+		+	+	+			+		+	+
PC 7	+					+							+				+	+
PC 8		+		+									+				+	+
PC 9		+		+							+						+	+
PC 10				+														+
PC 11								+	+	+	+							+
PC 12				+				+	+						+		+	+
PC 13								+	+				+					+
PC 14	+			+													+	+
PC 15	+		+											+		+	+	+
PC 16				+														+
PC 17						+	+	+							+		+	+
PC 18					+													
PC 19									+	+			+	+				+
PC 20											+		+				+	+
PC 21									+	+	+			+			+	+
PC 22									+		+		+					+
PC 23											+				+			+
PC 24		+	+	+					+			+		+			+	+
PC 25											+				+		+	+

6. MATRIX OF MATCHING PROGRAMME LEARNING RESULTS WITH RELEVANT COMPONENTS OF THE EDUCATIONAL PROGRAMME

	GM 1	GM 2	GM 3	GM 4	GM 5	GM 6	GM 7	PM 1	PM 2	PM 3	PM 4	PM 5	PM 6	PM 7	PM 8	PM 9	PM 10	PM 11
KN 1	+													+			+	+
KN 2	+			+					+	+				+				
KN 3	+			+	+													
KN 4		+		+														+
KN 5			+				+											
KN 6				+					+	+	+			+			+	+
KN 7						+								+				
KN 8				+										+			+	+
KN 9							+		+				+				+	+
KN 10						+	+							+		+		+
KN 11						+	+	+	+		+		+		+			+
KN 12						+	+	+	+		+		+		+		+	+
KN 13						+	+	+	+			+			+			+
KN 14							+	+	+						+		+	+
KN 15				+														+
KN 16									+	+	+		+		+		+	+
KN 17									+									+
KN 18		+			+									+			+	+
KN 19									+	+					+		+	+
KN 20								+	+	+		+	+	+				+
KN 21										+		+	+	+				+
KN 22							+	+							+		+	+
SK 1									+								+	+
SK 2							+	+	+						+		+	+
SK 3														+				+
SK 4									+	+	+				+		+	+
SK 5				+										+			+	+
SK 6	+		+													+		+
SK 7														+		+	+	+
SK 8				+												+	+	+
SK 9									+	+							+	
SK 10			+	+					+	+						+	+	+
SK 11		+		+				+						+			+	+
SK 12				+										+				+
SK 13		+		+													+	+
SK 14				+													+	+

	GM 1	GM 2	GM 3	GM 4	GM 5	GM 6	GM 7	PM 1	PM 2	PM 3	PM 4	PM 5	PM 6	PM 7	PM 8	PM 9	PM 10	PM 11
SK 15							+	+	+						+		+	+
SK 16					+										+	+	+	+
SK 17				+													+	+
SK 18				+							+		+		+		+	+
SK 19											+	+	+		+		+	+
SK 20				+					+	+								+
SK 21				+													+	+