

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
«IGOR SIKORSKY KYIV POLYTECHNIC INSTITUTE»**

APPROVED

Academic Council of Igor Sikorsky Kyiv
Polytechnic Institute
(protocol № 6 from 07.09.2020)

Chairman of the Academic Council
Mihajlo ILCHENKO

**THERMAL POWER ENGINEERING
EDUCATIONAL AND SCIENTIFIC PROGRAM
third (educational and scientific) level
of higher education**

in the specialty	144 Thermal Power Engineering
areas of knowledge	14 Electrical Engineering
qualification	doctor of philosophy from thermal power engineering

Put into effect by the Rector's Order
Igor Sikorsky Kyiv Polytechnic Institute
From 17.09.2020 № 1/282

Kyiv – 2020

PREAMBLE

DEVELOPED by the project team:

Project team leader:

Chernousenko Olga - Head of the Department of Thermal Power Plants of Thermal and Nuclear Power Plants TEF, Doctor of Technical Sciences, Professor

Члени проектної групи:

- Abdulin Mihajlo - Associate Professor of the Department of Thermal Power Plants of Thermal and Nuclear Power Plants TEF, Doctor of Technical Sciences, Associate Professor*
- Lebed Natalia - Associate Professor of the Department of Nuclear Power Plants and Engineering Thermophysics TEF, Ph.D., Associate Professor*
- Peshko Vitaliy - senior lecturer Department of Thermal Power Plants of Thermal and Nuclear Power Plants TEF, Ph.D.*
- Pobirovsky Yuriy - Associate Professor of the Department of Thermal Power Plants of Thermal and Nuclear Power Plants of TEF, Ph.D.*
- Semenyako Alexander - Senior Lecturer of the Department of Nuclear Power Plants and Engineering Thermophysics TEF, Ph.D.*
- Siriy Oleksandr - Associate Professor of the Department of Thermal Power Plants of Thermal and Nuclear Power Plants TEF, Ph.D., Associate Professor*
- Solomakha Andrey - Associate Professor of the Department of Theoretical and Industrial Thermal Engineering TEF, Ph.D., Associate Professor*
- Kesova Lyubov - Professor of the Department of Thermal Power Plants of Thermal and Nuclear Power Plants TEF, Doctor of Technical Sciences, Professor*
- Furtat Irina - Associate Professor of the Department of Theoretical and Industrial Teptotechnics TEF, Ph.D., Associate Professor;*
- Shklyar Viktor - Associate Professor of the Department of Heat Engineering and Energy Saving IEE, Ph.D., Associate Professor*
- Head of the Department of Nuclear Power Plants and Engineering Thermophysics TEF, Tuz Valery, Ph.D., Professor*
- Head of the Department of Theoretical and Industrial Heat Engineering TEF Varlamov Gennady, Doctor of Technical Sciences, Professor*
- Head of the Department of Heat Engineering and Energy Saving IEE Deshko Valeriy, Doctor of Technical Sciences, Professor*

AGREED:

Scientific and methodical commission of KPI named after Igor Sikorsky, specialty 144 "Heat Power Engineering"

Chairman of the NMCU Olga CHERNOUSENKO

(Protocol № 4 from 31.08.2020)

Methodical council of KPI named after Igor Sikorsky

Chairman of the Methodical Council Yuriy YAKYMENKO

(Protocol № 1 from 03.09.2020)

INCLUDED:

1. Methodical recommendations of the higher education sector of the Scientific and Methodological Council of the Ministry of Science and Education of Ukraine (Minutes of February 6, 2020 №7 <https://mon.gov.ua/ua/osvita/visha-osvita/naukovo-metodichna-rada-ministerstva-osviti-i-nauki-ukrayini/metodichni-rekomendaciyi-vo>)
2. Comments and suggestions of stakeholders based on the results of public discussion:
 - scientific and pedagogical staff of the Department of Thermal Power Plants of Thermal and Nuclear Power Plants TEF, the Department of Nuclear Power Plants and Engineering Thermophysics, the Department of Theoretical and Industrial Thermal Engineering TEF, the Department of Thermal Engineering and Energy Saving IEE;
 - applicants for higher education who study in educational programs of the specialty 144 Heat Power Engineering;
 - specialists of the educational and methodical department of KPI named after Igor Sikorsky;
 - specialists in the field of heat energy (reviews and letters of support are attached).

ONP was discussed after receiving all the wishes and suggestions from students, graduates and employers and approved at a meeting of the scientific and methodological commission of KPI named after Igor Sikorsky in the specialty 144 "Heat Power" (protocol № 4 from "31" August 2020).

1. PROFILE OF THE EDUCATIONAL PROGRAM

1 - General information	
Complete IHE and institute / faculty	National Technical University Of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute», Faculty of Heat and Power Engineering
Higher education degree and title of qualification in the original language	Degree of higher education - Doctor of Philosophy Educational qualification - Doctor of Philosophy in Thermal Power Engineering
The official name of the educational program	Thermal power engineering
Type of diploma and scope of educational program	Doctor of Philosophy. Normative training period 4 years. Educational component 50 credits ECTS. The scientific component involves conducting your own research and design of its results in the form of a dissertation.
Availability of accreditation	Accreditation is expected in 2021
Cycle / level of HE	NQF of Ukraine - level 8 QF-EHEA - the third cycle EQF-LLL - level 8
Prerequisites	Having a master's degree
Language (s) of instruction	Ukrainian
Term of the educational program	Until the next accreditation
Internet address of the educational program (pointed to the pages)	https://osvita.kpi.ua/144_ONPD_TE http://tes.kpi.ua/?page_id=1445 http://aesiitf.kpi.ua/?page_id=5394 http://tpt.tef.kpi.ua/ru/study/osvitni-programi http://te.kpi.ua/admission-phd
2 - The purpose of the educational program	
<p>Training of highly qualified, competitive, integrated into the European and world scientific and technical space specialists of the degree of Doctor of Philosophy in Heat Power Engineering, capable of independent research, research and innovation, organizational and managerial, pedagogical activity in the field of 144 "Heat Power Engineering" and related institutions of higher education, through the internationalization of the educational process in terms of sustainable innovative scientific and technological development and is implemented through:</p> <ul style="list-style-type: none"> - harmonious and multidimensional education of future highly qualified technicians, able to comprehensively and systematically analyze problems in heat and related industries, aware of the nature of surrounding processes and phenomena, to provide and conduct intercultural communication; - formation of high adaptability of higher education seekers in the conditions of labor market transformation through interaction with employers and other stakeholders. <p>The purpose of the educational program corresponds to the development strategy of KPI. Igor Sikorsky "for 2020-2025 on the formation of the society of the future on the basis of the concept of sustainable development.</p>	
3 - Characteristics of the educational program	
Subject area	<i>Object of activity:</i> processes of production, transformation, transfer

	<p>and use of thermal energy of fuels, renewable sources and heat carriers in power plants; development of methods of calculation, intensification of heat and mass transfer; scientific, technical and technological problems of creation and operation of thermal and nuclear power plants, auxiliary power systems and equipment.</p> <p><i>Theoretical content of the subject area:</i> fundamental and applied research, analysis, design, innovative approaches to solving complex problems in the field of electrical engineering; scientific concepts of energy transformation, principles of heat and mass transfer, thermodynamics and tangential principles of strength, hydro-gas dynamics, mechanics of structural materials.</p> <p><i>Methods, techniques and technologies:</i> general scientific methods of cognition and research, methods of obtaining, transmitting, efficient and ecological use of energy, design, operation, control, monitoring, and energy audit, energy management, organization of scientific and production processes with quality control; methods of physical and mathematical modeling and data processing.</p> <p><i>Tools and equipment:</i> means of technological, instrumental, metrological, diagnostic and organizational support of production processes, information and communication equipment, means of automation and control of heat energy.</p>
Orientation of the educational program	Educational - scientific
The main focus of the educational program	<p>Special education in the field of knowledge 14 Electrical engineering in the specialty 144 Heat power engineering</p> <p>Acquisition of educational qualification for scientific-innovative and scientific-pedagogical professional activity in the field of electrical engineering and energy. The program aims to develop such competencies of higher education students that enable their comprehensive professional, intellectual, social and creative development, taking into account new realities and current challenges for engineering, research and innovation (including international) activities. Graduates have the opportunity to acquire knowledge in related fields, to master modern computer tools for process design and modeling and other educational components through the possibility of forming a flexible individual learning trajectory.</p> <p>Keywords: heat power engineering, heat power plants, thermophysics, energy saving, heat exchange processes, heat technological equipment</p>
Features of the program	<p>The implementation of the program involves the involvement of classroom practitioners, industry experts, representatives of employers.</p> <p>Some special courses are taught in English</p>
4 - Suitability of graduates for employment and further study	
Suitability for employment	<p>The specialist is prepared to work in the heat and power industry according to the National Classifier of Ukraine: Classifier of professions DK 003: 2010.</p> <p>Specialist by qualification level of works: 2149.1 Researcher (engineering branch), 2310.2 Teacher of higher educational institution</p>

Further training	Continuing education in doctoral studies and / or participation in postdoctoral programs
5 - Teaching and assessment	
Teaching and learning	<p>Student-centered learning, self-study, problem-oriented learning, learning through laboratory practice.</p> <p>All participants in the educational process are provided with timely and understandable information on the goals, content and program learning outcomes, the procedure and evaluation criteria within the individual educational components.</p> <p>General learning style - task-oriented. Teaching is carried out in the form of: lectures, seminars, practical classes, laboratory classes in small groups (up to 8 people), independent work with the possibility of consultation with the teacher, individual classes, application of information and communication technologies for individual educational components, blended learning technology, practice and excursions; conducting research; performing a doctoral dissertation; holding regular conferences, seminars, colloquia, access to the use of laboratories, equipment, etc.</p>
Assessment	Current and semester control in the form of reports, presentations, essays, written and oral examinations and defense of qualification work are evaluated in accordance with the defined criteria of the Rating system.
6 - Program competencies	
Integral competence	Ability to solve complex problems in the field of professional and / or research and innovation activities in the field of heat energy, which involves a deep rethinking of existing and the creation of new holistic knowledge and / or professional practice.
General Competences (GC)	
GC1	Ability to abstract thinking, analysis and synthesis.
GC2	Ability to work in an international context
GC3	Ability to develop and manage projects.
Professional competencies of the specialty (PC)	
PC1	Ability to perform original research, achieve scientific results that create new knowledge in the field of heat and related interdisciplinary areas and can be published in leading scientific journals in heat and related fields.
PC2	Ability to orally and in writing present and discuss the results of research and / or innovative developments in Ukrainian and English, a deep understanding of English-language scientific texts in the field of heat research.
PC3	Ability to carry out scientific and pedagogical activities in higher education in thermal energy.
PC4	Ability to identify, pose and solve research problems in the field of heat, evaluate and ensure the quality of research.
PC5	Ability to initiate, develop and implement complex innovative projects in the heat industry and related interdisciplinary projects, leadership in their implementation.
PC6	Ability to understand modern problems of scientific and technical development of energy, to know modern technologies of energy and resource saving.

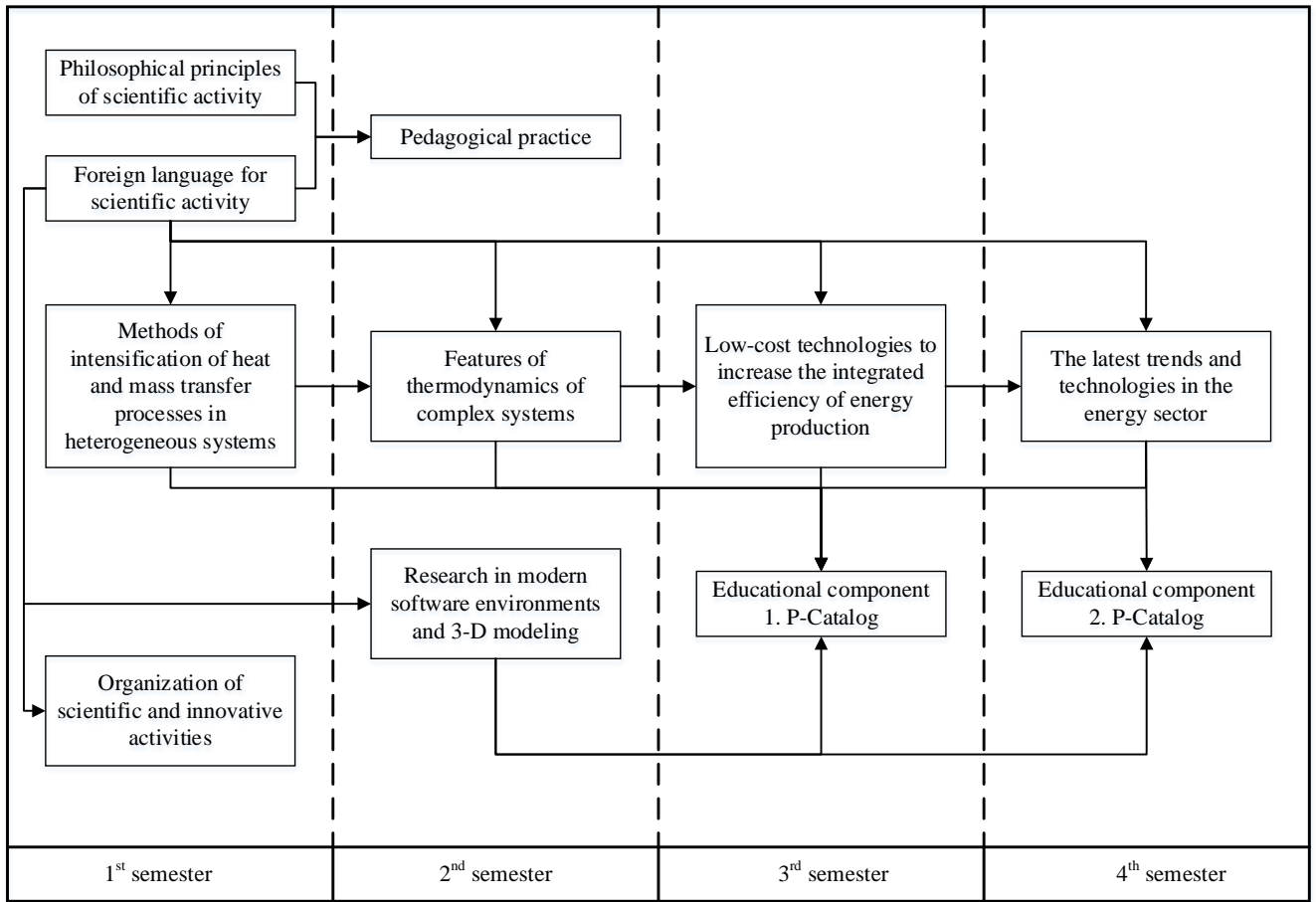
7 - Program learning outcomes	
PLO1	Have advanced conceptual and methodological knowledge in heat and cross-border industries, as well as research skills sufficient to conduct scientific and applied research at the level of the latest world achievements in heat, gain new knowledge and / or innovate.
PLO2	Freely present and discuss with specialists and non-specialists the results of research, scientific and applied problems of heat energy in the state and foreign languages, qualified to reflect the results of research in scientific publications in leading international scientific journals.
PLO3	Formulate and test hypotheses; use appropriate evidence to substantiate the conclusions, in particular, the results of theoretical analysis, experimental research (surveys, observations, etc.) and mathematical and / or computer modeling, available literature data.
PLO4	Develop and research conceptual, mathematical and computer models of processes and systems, effectively use them to gain new knowledge and / or create innovative products in thermal energy and related interdisciplinary areas.
PLO5	Plan and perform experimental and / or theoretical research in thermal power and related interdisciplinary areas using modern tools, critically analyze the results of their own research and the results of other researchers in the context of the whole set of modern knowledge on the research problem.
PLO6	Develop and implement scientific and / or innovative engineering projects that provide an opportunity to rethink existing and create new holistic knowledge and / or professional practice and solve significant scientific and technological problems of heat energy in compliance with academic ethics and social, economic, environmental and legal aspects.
PLO7	Apply modern tools and technologies for searching, processing and analyzing information, in particular, statistical methods of data analysis of large volumes and / or complex structures, specialized databases and information systems.
PLO8	Ability to create methodological support, organize and conduct teaching of professionally-oriented disciplines at a level that meets the requirements of higher education.
8 - Resource support for program 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 dated 30.12.2015 № 1187 (current) in the wording dated 23.05.2018. №347.
Logistics	In accordance with the technological requirements for material and technical support of educational activities of the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 (current) in the wording dated 23.05.2018. №347.
Information and educational and methodical support	In accordance with the technological requirements for educational and methodological and informational support of educational activities of the relevant level of HE, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 (current) in the wording dated 23.05.2018. №347.
9 - Academic mobility	
National credit	Possibility of concluding agreements on academic mobility and double

mobility	diplomacy.
International credit mobility	Agreement on International Academic Mobility (Erasmus + K1) with Middle Eastern Technical University (Ankara, Turkey) Agreement on International Academic Mobility (Erasmus + K1) with the Polytechnic University (Valencia, Kingdom of Spain) Agreement between KPI them. Igor Sikorsky and the VISHWANIKETAN Institute FROM 01.12.2006 (India)
Training of foreign applicants for higher education	For foreign citizens, education is provided in Ukrainian

2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM

Code e / d	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	ECTS Credits	Form of final control
1. NORMATIVE COMPONENTS			
Educational disciplines for mastering general scientific (philosophical) competencies			
GO1	Philosophical principles of scientific activity	6,0	test, exam
Educational disciplines for acquiring language competencies			
GO2	Foreign language for scientific activity	6,0	test, exam
Educational disciplines for obtaining in-depth knowledge of the specialty			
GO3	Methods of intensification of heat and mass transfer processes in heterogeneous systems	4,0	exam
GO4	Features of thermodynamics of complex systems	4,0	exam
GO5	Low-cost technologies to increase the integrated efficiency of energy production	4,0	exam
GO6	The latest trends and technologies in the energy sector	4,0	exam
Educational disciplines for the acquisition of universal competencies of the researcher			
GO7	Organization of scientific and innovative activities	4,0	exam
GO8	Research in modern software environments and 3-D modeling	3,0	test
GO9	Pedagogical practice*	2,0	test
2. OPTIONAL COMPONENTS			
V1	Educational component 1. P-Catalog	6,5	exam
V2	Educational component 2. P-Catalog	6,5	exam
TOTAL of NORMATIVE educational components :		37	
TOTAL of OPTIONAL educational components :		13	
TOTAL VOLUME OF THE EDUCATIONAL COMPONENT PROGRAM		50	

3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL COMPONENT PROGRAM



4. SCIENTIFIC COMPONENT

Year of preparation	The content of the graduate student's scientific work	Forms of control (Reporting)
1st year	The choice of the topic of the graduate student's dissertation, the formation of an individual work plan of the graduate student; execution of the dissertation work under the guidance of the scientific supervisor; preparation and submission for publication of at least 1 publication on the topic of the dissertation in accordance with current requirements.	Approval by the academic council of the institute / faculty by 30.11.2020, reporting on the implementation of the individual plan of the graduate student twice a year
2nd year	Execution under the guidance of the supervisor of the dissertation; preparation and submission for publication of at least 1 publication on the topic of the dissertation in accordance with current requirements.	Reporting on the progress of the individual graduate student's plan twice a year
3rd year	Execution under the guidance of the supervisor of the dissertation; preparation and submission for publication of at least 1 publication on the topic of the dissertation in accordance with current requirements.	Reporting on the progress of the individual graduate student's plan twice a year
4th year	Completion of the dissertation, summarizing the results of publications (at least three) on the topic of the dissertation in accordance with current requirements. Submission of documents for preliminary examination of the dissertation. Graduation certification	Reporting on the progress of the individual plan of the graduate student twice a year Providing an opinion on the scientific novelty, theoretical and practical significance of the results of the dissertation. PhD thesis defense.

5. FORM OF GRADUATE CERTIFICATION OF HIGHER EDUCATION APPLICANTS

Graduation certification of applicants for higher education in the educational program heat power engineering specialty 144 heat power engineering is carried out in the form of dissertation defense and ends with the issuance of a standard document on awarding him the degree of doctor of philosophy with the qualification: doctor of philosophy in heat power engineering.

Qualification work is checked for plagiarism and after the defense is placed in the repository of STL University for free access. Graduation certification is carried out openly and publicly.

6. CORRESPONDENCE MATRIX

6.1. Matrix of correspondence of program competencies to the components of the educational component of the program

	GO1	GO2	GO3	GO4	GO5	GO6	GO7	GO8	GO9	Scientific component
GC1	+		+	+	+	+		+		
GC2		+								
GC3							+	+		+
PC1		+		+		+				+
PC2		+	+	+	+		+	+	+	
PC3						+			+	+
PC4			+	+	+			+		+
PC5			+			+	+			
PC6			+	+	+	+	+	+		

6.2. The matrix of providing program learning outcomes with the relevant components of the educational component of the program

	GO1	GO2	GO3	GO4	GO5	GO6	GO7	GO8	GO9	Scientific component
PLO1	+		+		+	+	+			+
PLO2		+		+		+	+		+	
PLO3			+	+	+				+	+
PLO4							+	+		+
PLO5				+	+			+		+
PLO6			+		+		+			+
PLO7			+		+			+		+
PLO8		+				+			+	