

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**

**National Aerospace University named after N.Ye. Zhukovsky  
«Kharkiv Aviation Institute»**

**APPROVED**

by scientific council  
of National Aerospace University named  
after N.Ye. Zhukovsky

«Kharkiv Aviation Institute»

«23» May 2016, Minutes № 8

**EDUCATIONAL-SCIENTIFIC PROGRAM**

**POWER ENGINEERING**

**Level of higher education – third (educational-scientific)**

**by specialty 142 Power Engineering**

**of area of expertise 14 Electrical Engineering**

**Qualification: Philosophy Doctor in power engineering**

( with the changes that had been introduced according to:  
decision of Scientific council of “KhAI”, Minutes № 9, 20 March 2019;  
decision of Scientific council of “KhAI”, Minutes № 12, 24 June 2020;  
decision of scientific-methodical council 1 (SMC 1), Minutes № 1, 01 September 2020;  
decision of Scientific council of “KhAI”, Minutes № 9 , 28 April 2021)

Educational-scientific program  
enters into force

since « 01 » September 2022

Rector of National Aerospace  
University named after N.Ye.  
Zhukovsky

«Kharkov Aviation Institute»

\_\_\_\_\_ M. Nechyporuk  
Order № 178, 29 April 2022

**Kharkiv 2021**

## PREFACE

Educational-scientific program (ESP) «Power engineering» of third (educational-scientific) level of preparation of philosophy doctor by specialty 142 «Power Engineering» has been updated due to:

- content of description of the educational-scientific program updating (decision of Scientific council of “KhAI”, Minutes # 9, 20 March 2019);
- content of description of the educational-scientific program updating (decision of Scientific council of “KhAI”, Minutes # 12, 24 June 2020);
- National qualifications framework updating (Cabinet of Ministers of Ukraine decision, 25 June 2020, # 519) (approved by a decision of scientific-methodical council 1 (SMC 1), Minutes # 1, 01 September 2020);
- content of description of the educational-scientific program updating (decision of Scientific council of “KhAI”, Minutes # 9, 28 April 2021).

The educational-scientific program «Power Engineering» has been updated by the group of development and maintenance of ESP of National Aerospace University named after N.Ye. Zhukovsky «Kharkiv Aviation Institute» composed of:

- |   |   |       |                |
|---|---|-------|----------------|
| 1 | Head – Doctor of Sc., Professor, Head of (guarantor) Aircraft Engine Design department of ESP             | _____ | S. Yepifanov   |
| 2 | Members of group: Doctor of Sc., Assoc. Professor, Senior Researcher of Aircraft Engine Design department | _____ | D. Dolmatov    |
| 3 | – Doctor of Sc., Assoc. Professor, professor of Aircraft Engine Theory department                         | _____ | V. Gerasimenko |

**NEGOTIATION SHEET**

of educational-scientific program «Power Engineering»

Vice-rector for scientific work of National Aerospace University named after N. Ye. Zhukovsky «Kharkiv Aviation Institute»	_____	V. Pavlikov
Acting Head of scientific society of students, post-graduates, doctoral students and young scientists	_____	S. Zhila
Head of educational-methodical department	_____	M. Romanov
Head of Post-graduate and Doctoral department	_____	V. Selevko
Guarantor of ESP	_____	S. Yepifanov

**PROPOSALS AND FEEDBACKS OF EMPLOYERS**  
for the educational-scientific program «Power Engineering» are get from:

1. SE "ZAPOROZHYZHE MACHINE-BUILDING ENTERPRIZE "PROGRESS"  
NAMED AFTER ACADIMICIAN O. IVCHENKO

Signed by: Director of SE "Ivchenko-Progress", General Designer, Academician of  
Engineering Academy of Ukraine, Doctor of science

Igor Kravchenko

2. SC "MOTOR SICH"

Signed by: Chief Designer

Konstantin Podgorsky

3. NATIONAL TECHNICAL UNIVERSITY «KHARKIV POLYTECHNICAL  
INSTITUTE»

Signed by: Head of department «Internal Combustion Engines»,

Vladimir Pylyov

## INTRODUCTION

According to Law of Ukraine on amendments for improvement of educational activity in higher education area № 392-IX, 18 December, 2019, and article 1 «Main terms and definitions» of the Law of Ukraine «On higher education», 01 July, 2014 № 1556-VII (with corrections), the educational-scientific program is a single set of educational components (educational disciplines, individual tasks, practices, checking actions, etc.), which are aimed to reach the results of education from the Programme; that gives the right to get the determined educational or educational and professional qualification.

The educational-scientific program determines requirements to the educational level of individuals that can begin studying by this program, list of educational disciplines and logical consequence of their learning, number of ECTS credits, which are required for execution of this program, and expected results of education (competences), which must have the applicant of the corresponding level of higher education.

**The educational-scientific program is used for:**

- education planning;
- individual plans of post-graduate students forming;
- syllabuses of educational disciplines forming;
- information base determining for diagnosing means forming;
- educational-scientific program accreditation;
- quality control for training specialists;
- post-graduates review under the educational-scientific program;
- diagnosing means development for quality of higher education;
- vocational orientation of competitors.

**The educational-scientific program takes into account** requirements of the Law of Ukraine amending improvement of educational activity in the higher education area № 392-IX, 18 December 2019, the Law of Ukraine «On higher education», 01 July 2014 №1556-VII (with corrections), Cabinet of Ministers of Ukraine Decision «On approving of the Order of philosophy doctor and doctor of science candidates training in institutions of higher education (scientific institutions)», 23 March, 2016, № 261 (with corrections), Cabinet of Ministers of Ukraine Decision «On approving of the National qualifications framework», 23 November 2011, № 1341 (with corrections) and establishes:

- volume and terms of post-graduates education;
- general competencies;
- specific (professional) competencies;
- program educational outcomes;
- list and volume of educational components for learning competencies of the educational-scientific program;

**Users of the educational-scientific program:**

- post-graduate students of National Aerospace University named after N.Ye. Zhukovsky «Kharkiv Aviation Institute»;
- research and teaching staff that train post-graduates according to the educational-scientific program;
- Examination Board for specialty 142 «Power Engineering»;
- admission committee of National Aerospace University named after N.Ye. Zhukovsky «Kharkiv Aviation Institute»;
- employers for getting information for academic and professional profile of candidates.

The educational-scientific program «Power Engineering» is applicable to departments of the University that are involved into education of philosophy doctors on the specialty 142 «Power Engineering».

**1 PROFILE OF EDUCATIONAL-SCIENTIFIC PROGRAM «POWER ENGINEERING»  
FOR PHILOSOPHY DOCTORS EDUCATION  
ON SPECIALTY 142 «POWER ENGINEERING»**

<b>1 – General information</b>	
<b>Full name of higher education institution and structural division</b>	National Aerospace University «Kharkiv Aviation Institute», Postgraduate and Doctoral Department
<b>Area of knowledge, specialty</b>	14 – Electrical Engineering 142 – Power Engineering
<b>Level of higher education</b>	Doctor of Philosophy
<b>Qualification in the diploma</b>	Preparation and protection of scientific achievements – National Aerospace University Named after N. Ye. Zhukovsky «Kharkiv Aviation Institute» Qualification: Doctor of Philosophy in Power Engineering Higher education degree – Doctor of Philosophy Area of knowledge 14 «Electrical Engineering» Specialty 142 «Power Engineering»
<b>Official name of the educational-scientific program</b>	Power Engineering
<b>Type of the diploma and volume of the educational-scientific program</b>	Doctor of Philosophy, single, the volume of the educational component of the educational and scientific program – 60 ECTS credits, term of study – 4 years
<b>Form of education</b>	Full-time / part-time
<b>Availability of accreditation</b>	The educational-scientific program has been implemented in 2016 and accredited in 2021.
<b>Cycle/level</b>	National Qualification Framework of Ukraine – 8 level, FQ-EHEA – third cycle, EQF-LLL – 8 level
<b>Educational qualification</b>	Doctor of Philosophy in Power Engineering
<b>Prerequisites</b>	Availability of Magister’s level or equal educational-qualification level
<b>Language(s) of education</b>	Ukrainian, English
<b>Duration of the educational-scientific program</b>	Up to implementation of the new educational-scientific program
<b>Internet-address of permanent displacement of the description of the educational-scientific program</b>	<a href="https://khai.edu.ua/education/osvitni-programi-i-komponenti/osvitni-programi-phd/">https://khai.edu.ua/education/osvitni-programi-i-komponenti/osvitni-programi-phd/</a>
<b>2 – Goal of the educational-scientific program</b>	
Training of highly qualified, competitive, integrated in European and world scientific-educational space specialist of the philosophy doctor’s level in area of Electric Engineering for the specialty 142 «Power Engineering», which is able for independent scientific-research, scientific-organizational, pedagogical-organizational and practical activity in aviation, cosmonautics, mechanical engineering, in related industries, and pedagogical activity in the higher education institutions.	
<b>3 – Characteristics of the educational-scientific program</b>	
<b>Subject area (area of knowledge, specialty, specialization)</b>	<p><b>Area of knowledge:</b> 14 – Electrical Engineering</p> <p><b>Specialty:</b> 142 – Power Engineering</p> <p><b>Object of activity:</b> methods of numerical and experimental researches, technologies of designing and maintenance of engines, power plants and other objects of power engineering in order to solve actual problems of aerospace industry.</p> <p><b>Goals of education:</b> teaching of highly qualified specialists that are able for organization of numerical and experimental researches to solve actual problems in area of power engineering.</p>

	<p><b>Theoretical content of the subject area:</b> theoretical bases of working processes, design of engines and power plants of all types; systems and accessories; criteria of estimation and methods of ensuring service life, reliability, fault tolerance, viability; application bases of development and implementation of intelligent information technologies for designing, testing, development and maintenance monitoring of engines and power plants, as a ground for the required competences acquisition.</p> <p><b>Methods, techniques and technologies:</b> general methods of scientific knowledge. Methods of mathematical modelling of working processes, thermal and stress-strain state, objects of power engineering quality ensuring at designing, testing, manufacturing and maintenance. Methods of scientific researches and pedagogical activity organization.</p> <p><b>Instruments and equipment:</b> computers, packaged applications for analysis of working processes, thermal and strain-stress state, experimental equipment, laboratory test equipment, mockups of engines and aggregates.</p>
<b>Orientation of the educational program</b>	Teaching of philosophy doctors on power engineering.
<b>Main focus of the educational-scientific program (specialization)</b>	Teaching of philosophy doctors, which involves studying of the bases of scientific-research work in area of electrical engineering, and competences acquisition for modern models, methods, algorithms, information technologies, processes and methods of designing and experimental researching of engines, power plants and other objects of power engineering, which are able for independent scientific-research, scientific-organizational and practical activity in the above-mentioned area, and educational activity in higher education institutions.
<b>Features of the scientific-research program</b>	<p>The program ensures studying of theoretical bases of aerospace engines and power plants, acquisition of corresponding knowledge and competences in classical and modern advances in designing, manufacturing and maintenance of the objects of power engineering, deep knowledge in models, methods and algorithms of numerical analysis for designing and development of engines and power plants, and technology of testing, manufacturing and maintenance. Specialists are prepared, which are able for application of the acquired knowledge in mathematical bases, principles of gas-dynamic and loading processes modelling, algorithmic principles in designing, development of engineering systems; for comparative analysis of design of engines, power plants and their systems. Skills are improved for using modern application software packages, structural and object-oriented approaches to individual creative activity and decision support system.</p> <p>Scientific and pedagogical school has been established in National Aerospace University “KhAI”, highly-qualified scientific and pedagogical personal has been prepared for the educational-scientific program implementation for philosophy doctors teaching in aerospace area.</p>
<b>4 – Ability of graduates for employment and further education</b>	
<b>Ability for employment</b>	<p>Workplaces in scientific, institutional management and educational areas, on teaching and other posts in universities; in public administration; in analytical and information institutions; in scientific and research institutions, in business, etc.</p> <p>According to National Qualification Framework of Ukraine ДК 003:2010 professional activity of graduates is as follows:</p> <ul style="list-style-type: none"> <li>- 2145.2 – professionals in engineering mechanics;</li> <li>- 2149.1 – scientific workers (another areas of engineering);</li> <li>- 2149.2 – engineers (another areas of engineering);</li> <li>- 231 – teachers of universities and higher education institutions;</li> <li>- 2310.1 associated professor;</li> <li>- 2310.1 doctoral candidate</li> </ul>
<b>Further studying</b>	The graduates can continue education by another scientific degree of higher education at scientific level of higher education for Doctor of science, and advanced training.

<b>5 – Teaching and assessment of results</b>	
<b>Teaching and education</b>	Teaching is implemented in form of lectures, laboratory works, seminars, practical works, consultations with teachers, individual work. It is problem-oriented and aimed for development of critical and creative thinking, education through laboratory practice, dual (in scientific component), distant (when required) education, making independent scientific research in form of dissertation.
<b>Estimation</b>	Current and final checking of knowledge (check and individual tasks, testing), credits and examinations (oral and written), presentations, intermediate checking in view of year report for the individual plan, approbation of researches results at scientific conferences, publications of scientific results, public defense of the thesis. During all term of education, the post-graduate student makes report about execution of individual plan twice a year at meeting of department, at scientific council of faculty, and every year is certified by scientific advisor according to the schedule of the educational process.
<b>6 – Program competences</b>	
<b>Integral competence</b>	Ability for solving complex problems in area of professional and/or research and innovation activity in power engineering, which involves fundamental re-thinking of actual and creation of new integrated knowledge and/or professional practice.
<b>General competences</b>	GC01. Ability for abstract thinking, analysis and synthesis. GC02. Ability for searching, processing and analysis of information from different sources. GC03. Ability for working in international context. GC04. Ability for projects development and control.
<b>Special (professional) competences</b>	PC01. Ability for making original researches, reaching scientific results, which create the new knowledge in power engineering and touching interdisciplinary directions and may be published in leading scientific editions for electric engineering and related industries. PC02. Ability for oral and writing presentation and discussion of scientific researches results and/or innovation developments in Ukrainian and foreign languages, deep understanding of foreign texts in the area of researches. PC03. Ability for implementing of modern information technologies, databases, and other electronic resources, specialized software in scientific and educational activity. PC04. Ability for scientific-pedagogical activity in higher education area. PC05. Ability for formulation and solving of problems of research character in scientific cognition, estimating and ensuring quality of researches. PC06. Ability for initiating, developing and implementing complex innovation projects in power engineering and interdisciplinary projects, their presentation at international conferences, symposiums. PC07. Ability for upholding ethical standards of researches, and rules of academic honesty in scientific researches and scientific-pedagogical activity. PC08. Ability for forming of systematical scientific outlook, professional ethics, and general cultural outlook. PC09. Ability for producing new ideas and solving complex problems of scientific cognition, and for implementation of modern methodologies, methods and instruments of pedagogical and scientific activity in power engineering.
<b>7 – Program results of education</b>	
<b>Program results of education</b>	PRE01. Have progressive conceptual and methodological knowledge in power engineering and on bounds of subject areas, and research skills that are enough for making scientific and applied researches at a global level in the respective area, getting new knowledge and/or making innovations. PRE02. Present and discuss freely results of researches with specialists and not specialists results of researches, scientific and applied problems of power



	<p>engineering in the state and foreign language, attract results of researches in scientific publications in the leading international scientific issues.</p> <p>PRE03. Formulate and check hypotheses; use foolproof evidences for grounding conclusions, in particular, results of theoretical analysis, experimental researches (surveys, observations, ...) and mathematical or numerical simulation, actual literature data.</p> <p>PRE04. Develop, design, modernize complex objects of power engineering, form requirements to them, analyze adequacy of designing method.</p> <p>PRE05. Design and execute experimental and/or theoretical researches in power engineering and related interdisciplinary directions using modern instruments, make critical analysis of results of own researches and researches of other scientists in a context of all complex knowledge for the researched problem.</p> <p>PRE06. Apply methods of experiment designing using instrumental tools (measuring devices) and process results of researches, estimate adequacy of results.</p> <p>PRE07. Develop and implement scientific and/or innovation engineering projects, which enable redefining actual and create new all-wise knowledge and/or professional practice and solve significant scientific and technological problems of power engineering with adherence to norms of academic ethics and taking into account social, economical, ecological and legal aspects.</p> <p>PRE08. Understand general principles and methods of power engineering, methodology of scientific researches, implement them in own researches in power engineering and educational practice.</p> <p>PRE09. Study, generalize and implement into the educational process innovations of power engineering.</p> <p>PRE10. Search and critically analyze information, conceptualize and realize scientific projects in power engineering.</p> <p>PRE11. Control content, schedule, cost, quality, risks, human resources and communications of scientific-research projects in aerospace industry according to requirements of international standards.</p> <p>PRE12. Know modern approaches and tools for simulation of working processes in the researched objects and processes of control, including aerospace industry; be able to create new, modernize and develop models of systems and elements of power engineering objects.</p> <p>PRE13. Know main reasons of a strength life-time depletion of power engineering equipment, be able to determine service life of main parts and form systems of maintenance life-time monitoring.</p> <p>PRE14. Know bases of philosophy, modern trends, directions and regularities of domestic and world science in conditions of globalization, and be able to apply them to scientific and research professional activity in different areas, including aerospace industry.</p>
<b>8 – Resourcing of the educational-scientific program implementation</b>	
<b>Staffing</b>	<p>Scientific and pedagogical workers, which are involved into teaching of professional-oriented disciplines, have scientific degree and/or academic rank and meet staff requirements (Cabinet of Ministers of Ukraine Decision «About affirmation of the License conditions of educational activity of higher education institutions», 30 December 2015, № 1187 (with corrections made according to Cabinet of Ministers of Ukraine Decision № 347, 10 May 2018)).</p>
<b>Logistic support</b>	<p>Education is carried out in laboratories, computer classes, auditoriums and rooms of National Aerospace University “Kharkov Aviation Institute”.</p> <p>It meets technological requirements for logistic support of educational activity according to actual law of Ukraine (Cabinet of Ministers of Ukraine Decision «About affirmation of the License conditions of educational activity of higher education institutions», 30 December 2015, № 1187 (with corrections made according to Cabinet of Ministers of Ukraine Decision № 347, 10 May 2018)).</p>

<b>Information and educational-methodical support</b>	<p>Characteristics of information and educational-methodical support:</p> <ul style="list-style-type: none"> <li>– using of web- and mobile technologies in scientific researches;</li> <li>– using of artificial intellect and machine learning in scientific researches;</li> <li>– using of cloud calculations in scientific researches;</li> <li>– using of virtual reality in scientific researches;</li> <li>– using of intelligent and distant education.</li> </ul> <p>Meets technological requirements for educational-methodical and information support of educational activity in higher education area according to actual law of Ukraine (Cabinet of Ministers of Ukraine Decision «About affirmation of the License conditions of educational activity of higher education institutions», 30 December 2015, № 1187 (with corrections made according to Cabinet of Ministers of Ukraine Decision № 347, 10 May 2018).</p>
<b>9 – Academic mobility</b>	
<b>National credit mobility</b>	<p>It is based on two-side contracts between National Aerospace University “KhAI” and companies of Ukraine (State Design Bureau «Southern» named after Academician M.K. Yangel (Contract № 4/1, 11 June 2020); Zaporozhye Machine-Building Design Bureau Progress State Enterprise named after Academician A.G. Ivchenko (Contract № 2/1, 31 August 2015); Gas Turbine Research &amp; Production Complex Zorya-Mashproekt (№ 2/6, 29 March 2016); Stock Company «Motor Sich» (№ 247212–Д (VIII), 31 January 2016); JSC “Ukrainian Energy Machines” (Turboatom) (№ 2/10, 27 September 2017); SE «Antonov» (№ 1/2, 1 August 2018); SC «FED» (№ 2/8, 11 January 2016); SE Kharkov Machine-Building Enterprise «FED» (№ 2/7, 19 February 2016).</p>
<b>International credit mobility</b>	<p>It is based on two-side agreements between National Aerospace University “KhAI” and educational institutions of countries-partners: University Trento (Italy), Program of mobility Erasmus + ; Kharbin Polytechnic University, International Summer School «China Discovery Program»; International Summer School in Beijing University of Aviation and Astronautics (BUAA), Beijing, China; International Summer School for Teachers in Nanjing University of Aviation and Astronautics (NUAA), Nanjing, China; Shenyang Aerospace University, Shenyang, China; Short-term internship for teachers; Scholarship programs of German Service for Academic Exchanges DAAD; internship of scientific workers and teachers, exchange of applicants, scientific collaboration; Istanbul Technical University, Nanchang Hangkong University.</p>
<b>Education of foreign applicants of higher education</b>	<p>Education of foreign students if carried out using State language or English. If the education is carried out in State language then in some cases the decision may be made about delivering of one or more disciplines by foreign languages, with ensuring knowledge of the corresponding discipline in the State language.</p>

## 2 COMPONENTS OF THE EDUCATIONAL-SCIENTIFIC PROGRAM «POWE ENGINEERING» AND THEIR LOGICAL SEQUENCE

### 2.1 List of components

Code of ESPC	Components of educational-scientific program (educational disciplines, projects/works, practices)	Number of credits (semester)	Form of final examinations
<b>Mandatory components of the program</b>			
MC1	Processing and analysis of results of scientific researches using Information Technologies	5(1)	exam
MC2	Control of scientific projects	5(2)	exam
MC3	Pedagogical training	4(4)	credit
MC4	Philosophy**	5(3)	exam
MC5	Didactics of higher school	5(3)	exam
MC6	Foreign language scientific communications	6(1,2)	exam
MC7	Scientific problems of working processes improving of the power engineering objects	7,5(1)	exam
MC8	Scientific problems of ensuring reliability, strength and service life of power engineering objects	7,5(2)	exam
<b>Total volume of mandatory components:</b>		<b>45</b>	
<b>Selective components of the program*</b>			
SC1	Selective component of List 2	5(3)	exam
SC2	Selective component of List 3	5(4)	exam
SC3	Selective component of List 3	5(4)	exam
<b>Total volume of selective components:</b>		<b>15</b>	
<b>TOTAL VOLUME OF THE EDUCATIONAL-SCIENTIFIC PROGRAM</b>		<b>60</b>	

**List 2.** Selective components for the topic of the dissertation work.

**List 3.** Selective components of free choice.

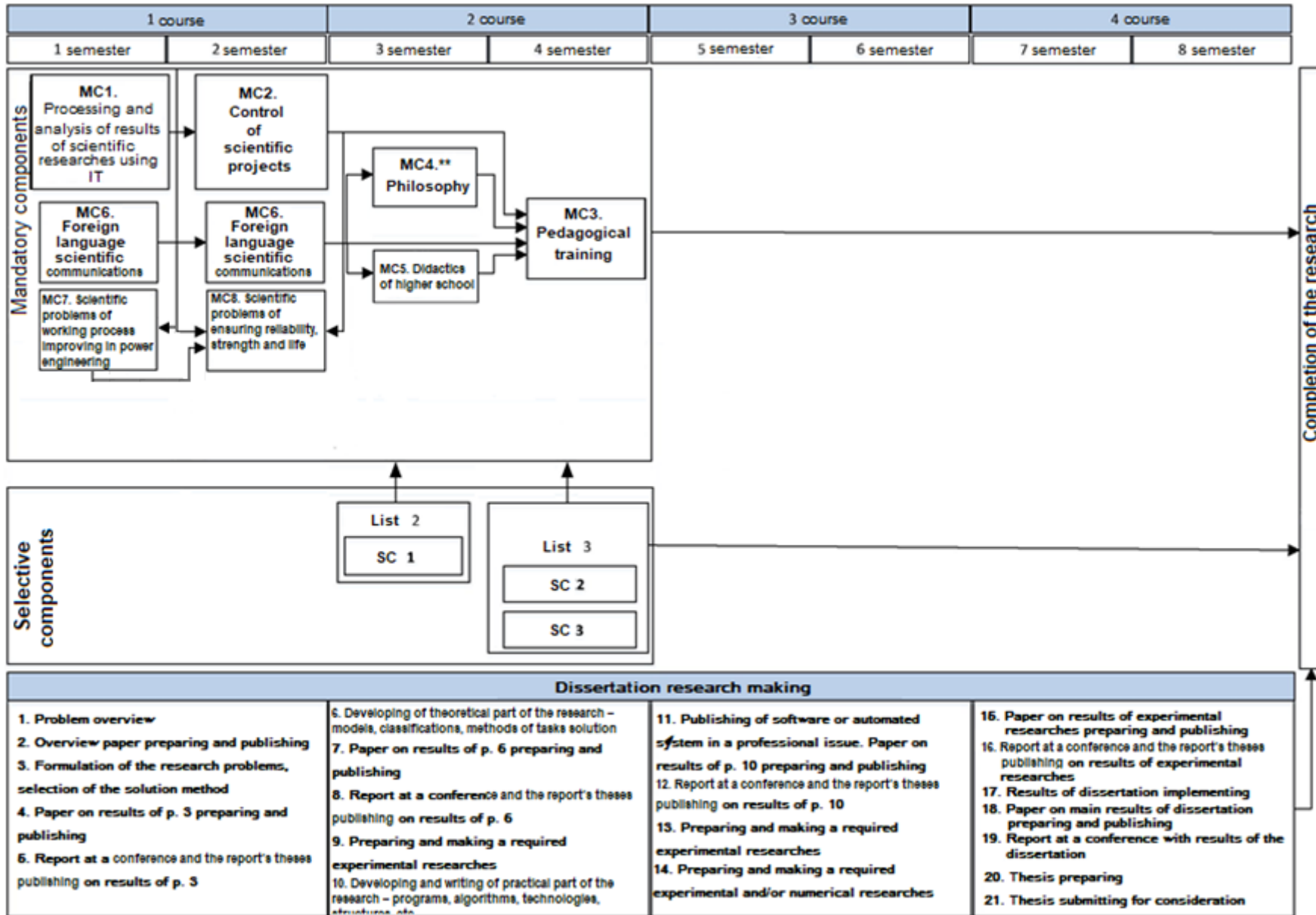
\* post-graduate student selects the components from the above lists (at III and IV semesters – by one 5-credit discipline from List 2; IV semester – one 5-credit discipline from List 3), he has a rule of academic mobility for a selection of a discipline with other levels of education. The selective components and their content are presented on site <https://khai.edu.ua/ua/nauka/aspirantura-ta-doktorantura/> in Chapter «Selective components of the educational-scientific program».

\*\* post-graduate student selects the component from the list, which is presented on the site: <http://surl.li/rkcm>

### 2.2 Structural-logical diagram of the educational-scientific program

Structural-logical diagram of the educational-scientific program shows the consequence of studying their components and two parts – educational and scientific. The scientific part of the program includes conducting of own research under the guidance of scientific adviser and presentation of results in a form of dissertation. Educational and scientific parts of the educational-scientific program are presented as the individual plan of the educational-scientific work of the post-graduate student and are the part of the educational plan of the graduate school. The integral part of the scientific component of the educational-scientific program is preparing and publication of scientific papers, making reports at scientific conferences, seminars, etc.

## STRUCTURAL-LOGICAL CHART OF THE EDUCATIONAL-SCIENTIFIC PROGRAM



### 2.3 Mandatory components and their content in the structure of the training plan of the ESP by semesters

NN	Code of the component	Name of the component	Goal and task of the component	Componces forming		Program results of education
				general	professional	
1	2	3	4	5	6	7
1.	MC1	Processing and analysis of results of scientific researches using Information Technologies	<p><b>Goal</b> – learn processing, analysis, estimation and verification of information, results of experimental researches in scientific activity, know the most modern mathematical methods and information technologies, know prediction and decision making in complex systems of different nature (information, economical, financial, social, political, technical, organizational, ecological, etc.) in undetermined conditions based on systematic methodology and on a bound of subject areas.</p> <p><b>Task</b> – train professionals that are able for development and implementation of the projects, including own researches, which enable rethinking of actual and create a new integral knowledge in professional area for prediction of the behavior, designing, control upon complex systems, and for designing decision making systems based on systematic methodology and on a bound of subject areas.</p>	GC01 GC02 GC03 GC04	PC01 PC02 PC03 PC05 PC07 PC09	PRE01 PRE02 PRE03 PRE05 PRE06 PRE08 PRE09 PRE10 PRE11 PRE13
2.	MC2	Control of scientific projects	<p><b>Goal</b> – acquisition of modern methods of control of scientific projects and programs, estimating of their results; acquiring knowledge about basic principles, categories, models and instruments of control, fund-raising and other resources (human, material, information, etc.), which the institution cannot ensure independently and which are required for realization of the project or for the activity as a whole; acquiring knowledge of intellectual property control for determining the dominant object in perspective planning of enterprise (installation) activity.</p> <p><b>Task</b> – Training scientific workers that can develop, plan, implement and finish scientific and technical projects and programs; training specialists for command working, controlling of communications in the project, controlling of financial flows and human resources in the project in changing environment.</p>	GC01 GC02 GC03 GC04	PC01 PC02 PC05 PC06 PC07 PC09	PRE01 PRE02 PRE03 PRE04 PRE06 PRE07 PRE08 PRE09 PRE10 PRE11 PRE12 PRE13 PRE14
3.	MC3	Pedagogical training	<p><b>Goal</b> – acquisition and practical use of regularities and principles of education for methods and technologies of training highly qualified specialists in higher school.</p> <p><b>Task</b> – teaching professional knowledge and skills for using pedagogical technologies in higher education institutions; be able to make a mandatory documentation (teacher’s individual plan, educational plan, syllabus, register,</p>	GC01 GC02 GC03	PC03 PC04 PC07 PC08 PC09	PRE02 PRE03 PRE05 PRE07 PRE08

			report, etc.); establishment by means of practice of regularities and principles of teaching methods and technologies of training highly qualified specialists in higher school.			PRE09 PRE13
4.	<b>MC4</b>	Philosophy **	<p><b>Goal</b> – forming of scientific worldview based on a system of theoretical knowledge about the world as a whole, about relation of humanity to this world in a context of ontological, gnosiological, and axiological problems, forming critical thinking and independent analysis of social events, ability in relating general philosophical problems with particular problems of theory and practice.</p> <p><b>Task</b> – acquiring of general positions of philosophy as a worldwide science; using philosophical knowledge as a methodological base for natural, engineering, and humanitarian sciences; acknowledge of the impact of thinkers of different philosophical schools and directions of different epochs and national traditions, particularly Ukrainian philosophy; studying of methods of knowledge, functioning of knowledge in modern information society; features of relations between science and engineering and social and cultural problems; forming of high norms and principles of professional ethics and moral qualities and respect to traditions, which are based on universal human values; understanding of the responsibility for execution of social duties regarding further life of humanity.</p>	GC01 GC02 GC03	PC01 PC05 PC07 PC08 PC09	PRE01 PRE03 PRE04 PRE07 PRE10 PRE12 PRE14
5.	<b>MC5</b>	Didactics of higher school	<p><b>Goal</b> – knowing regularities and principles of studying, methods and technologies of teaching highly qualified specialists in the higher school.</p> <p><b>Task</b> – studying of the bases of didactics, driving forces at studying psychology and pedagogics of higher school; ability in analyzing an estimating of specifics of the main tendencies of development of pedagogical theories of higher school; ability in understanding and using of pedagogical technologies in higher education institutions; ability to formulate a think logically, to discuss taking into account own and co-speaker's individual psychological abilities; ability for generating new ideal of educational process</p>	GC01 GC02 GC03	PC03 PC04 PC07 PC08 PC09	PRE01 PRE03 PRE04 PRE05 PRE07 PRE10 PRE12 PRE14
6.	<b>MC6</b>	Foreign language scientific communications	<p><b>Goal</b> – acquisition of such a level of knowledge and skills, which ensures the required for professionals communicative ability in areas of professional and situational communication within professional activity area.</p> <p><b>Task</b> – efficient oral and writing communication in foreign language during professional activity and presentation of scientific results: in dialogic, monologic, and writing view (referring, abstracting, business correspondence, presentation of research projects).</p>	GC02 GC03	PC01 PC02 PC04 PC06 PC09	PRE02 PRE03 PRE05 PRE10
7.	<b>MC7</b>	Scientific problems of working processes improving of the power engineering objects	<p><b>Goal</b> – studying of specific features of working processes of the power engineering objects, determining of scientific problems of their improvement and ways for their solution.</p> <p><b>Task</b> – acquisition of skills for analyzing work processes in power engineering facilities, formulation of scientific problems and ways to solve them.</p>	GC1 GC2	PC01 PC03 PC09	PRE01 PRE03 PRE04 PRE07 PRE08

						PRE10 PRE12
8.	<b>MC8</b>	Scientific problems of ensuring reliability, strength and service life of power engineering objects	<p><b>Goal</b> – forming systematic understanding on complex ensuring reliability, strength and service life of the power engineering objects during designing, testing, and maintenance. Acknowledge with perspective approaches for setting, prolonging, and maintenance support of a service life.</p> <p><b>Task</b> – based on a general knowledge in reliability, strength, mechanics and models of durability of the power engineering objects, deliver methodology of their life-time designing and control in maintenance.</p>	GC1 GC2	PC01 PC03 PC09	PRE01 PRE03 PRE05 PRE13

### 3 FORM OF ATTESTATION OF HIGHER EDUCATION APPLICANTS

<b>Form of attestation</b>	Form of attestation – thesis, which is prepared for further public defense for the philosophy doctor degree
<b>Requirements to thesis</b>	<p>Scientific–research work of the applicant, which is performed within topic of thesis, is the main element of the scientific component of training by the educational-scientific program.</p> <p>The educational-scientific program provides that the applicant must prepare thesis, publish main scientific results in scientific issues, acquire theoretical knowledge, skills, and corresponding competences.</p> <p>The thesis is delivered in a view of specially prepared qualification scientific paper as a manuscript. It must be prepared by the applicant personally and contain scientific positions, new scientifically grounded theoretical and/or experimental results of researches that are made by the applicant, have significant value for the given area of knowledge and are supported by documents, which testify to individual impact of the applicant into a science and have integrated content.</p> <p>The philosophy doctor’s thesis is individual research, which proposed solution of theoretical and/or practical actual problems in area of power engineering or its combination with another areas that involves deep rethinking of actual and creation of new integral knowledge and/or professional practice, is characterized with scientific novelty, theoretical and practical significance.</p> <p>The thesis must be free of academic plagiarism, falsification and fabrication.</p> <p>The scientific-research work is performed under the guidance of scientific advisor, which is responsible for the training of the applicant and timely execution of and presentation of the thesis.</p> <p>The thesis must be displaced on site of National Aerospace University “KhAI”.</p> <p>Thesis must meet other requirements that are stipulated by the legislation.</p>

## 4 REQUIREMENTS FOR A SYSTEM OF PROVISION OF QUALITY EDUCATION

In National Aerospace University “KhAI”, the System of Provision of Quality Educational Activity and Quality Education (internal quality system) is functioning, which includes the following procedures and events:

- 1) determining principles and procedures for provision of quality higher education;
- 2) monitoring and periodical reviewing of educational programs;
- 3) annual checking of applicants, scientific-pedagogical and pedagogical staff of the higher education institution and regular public declaration of results of such testing in official site of KhAI, in information stands, and in any another method;
- 4) advanced training of pedagogical, scientific, and scientific-pedagogical workers;
- 5) ensuring the required resources for organization of educational process, including individual work of applicants by each educational-scientific program;
- 6) application of information systems for efficient control of educational process;
- 7) ensuring publicity of the information about educational programs, levels of higher education and qualifications;
- 8) respecting academic honesty by staff of the higher education institutions, including development and functioning of efficient system of detection and prevention of academic plagiarism;
- 9) another procedures and events.

All of these positions are regulated by:

- Statute of university, Chapter IX (approved by Conference of labour collective, Minutes # 2, 23 November 2016, 02066769);
- Regulations «On provision of quality educational activity in National Aerospace University “KhAI” СУЯ ХАИ-НМБ-И/011:2017 introduced 20 April 2017;
- Regulations «On development and modification of educational programs», approved by Scientific Council, Minutes # 3, 16 October 2019, Order 439a (with corrections 27 May 2020) ;
- Regulations «On advanced training and internship of pedagogical and scientific-pedagogical workers and industrial specialists at the university», introduced 01 December 2016;
- Regulations «On organization of educational process in National Aerospace university “KhAI”, introduced by: Order # 254, 28 May 2020;
- Regulations «On distant form of teaching in National Aerospace University “KhAI”», Minutes # 2 of Scientific Council of university, 23 September 2020;
- Regulations «On academic honesty in National Aerospace University “KhAI”», Minutes # 13, 20 June 2019;
- «Anti-corruption Program in National Aerospace University “KhAI”», approved by Scientific Council 18 September 2015.



**5 MATRIX OF CORRESPONDENCE  
OF PROGRAM COMPETENCES AND MANDATORY COMPONENTS  
OF THE EDUCATIONAL-SCIENTIFIC PROGRAM**

Program competences	Mandatory components of the program							
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8
GC01	+	+	+	+	+		+	+
GC02	+	+	+	+	+	+	+	+
GC03	+	+	+	+	+	+		
GC04	+	+						
PC01	+	+		+		+	+	+
PC02	+	+				+		
PC03	+		+		+		+	+
PC04			+		+	+		
PC05	+	+		+				
PC06		+				+		
PC07	+	+	+	+	+			
PC08			+	+	+			
PC09	+	+	+	+	+	+	+	+

**6 MATRIX OF CORRESPONDENCE OF PROGRAM RESULTS OF  
EDUCATION AND MANDATORY COMPONENTS OF THE  
EDUCATIONAL-SCIENTIFIC PROGRAM**

Program results of education	Mandatory components of the program							
	OK1	OK2	OK3	OK4	OK5	OK6	OK7	OK8
PRE01	+	+		+	+		+	+
PRE02	+	+	+			+		
PRE03	+	+	+	+	+	+	+	+
PRE04		+		+	+		+	
PRE05	+		+		+	+		+
PRE06	+	+						
PRE07		+	+	+	+		+	
PRE08	+	+	+				+	
PRE09	+	+	+					
PRE10	+	+		+	+	+	+	
PRE11	+	+						
PRE12		+		+	+		+	
PRE13	+	+	+					+
PRE14		+		+	+			

## 7 REGULATORY REFERENCES

The educational-scientific program «Power Engineering» is developed based on the following regulatory documents and recommendations:

- Law of Ukraine amending improvement of educational activity in the higher education area № 392-IX, 18 December 2019;
- ESG 2015 (Standards and recommendations for ensuring quality education in EHEA) – [https://ihed.org.ua/wp-content/uploads/2018/10/04\\_2016\\_ESG\\_2015.pdf](https://ihed.org.ua/wp-content/uploads/2018/10/04_2016_ESG_2015.pdf);
- EQF 2017 (European Qualification Framework) – <https://publications.europa.eu/en/publication-detail/-/publication/cee970-518f-11e7-a5ca-01aa75ed71a1/language-en>; <https://ec.europa.eu/ploteus/content/descriptors-page>;
- QF EHEA 2018 (EHEA Qualification Framework) – [http://www.ehea.info/Upload/document/ministerial\\_declarations/EHEAParis2018\\_Communique\\_AppendixIII\\_952778.pdf](http://www.ehea.info/Upload/document/ministerial_declarations/EHEAParis2018_Communique_AppendixIII_952778.pdf);
- ISCED (International Standard Qualification of Education, ISCED) 2011 – [http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en\\_0.pdf](http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en_0.pdf);
- ISCED-F (International Standard Qualification of Education – Areas, ISCED-G) 2013 – <http://uis.unesco.org/sites/default/files/documents/isced-fields-of-education-and-training-2013-en.pdf>;
- Law «On higher education» – <http://zakon4.rada.gov.ua/laws/show/1556-18>;
- Law «On education» – <http://zakon5.rada.gov.ua/laws/show/2145-19>;
- Cabinet of Ministers of Ukraine Decision «On approving of the Order of philosophy doctor and doctor of science candidates training in institutions of higher education (scientific institutions)», 23 March, 2016, № 261 (with corrections) – <https://zakon.rada.gov.ua/laws/show/261-2016-%D0%BF>;
- National Classification Framework of Ukraine: Classifier of Professions ДК 003:2010. – <https://zakon.rada.gov.ua/rada/show/va327609-10>;
- National Classification Framework of Ukraine – <https://zakon.rada.gov.ua/laws/show/1341-2011-%D0%BF#Text>;
- List of areas of knowledge and specialties, 2015 – <https://www.kmu.gov.ua/npas/248149695>;
- Presidential Decree of Ukraine «Problems of European and Euro-Atlantic Integration», 20 June 2019 № 155/2019 – <https://www.president.gov.ua/documents/1552019-26586>;
- Methodical recommendations for development of standards in higher education, approved by Order of Ministry of Education and Science of Ukraine, 01 June 2017 № 600 (in the revision of the Order of Ministry of Education and Science of Ukraine 30 April 2020 № 584), approved by Sector of Higher Education of Scientific-methodical Council of Ministry of Education and Science of Ukraine (Minutes № 7, 06 February 2020);
- Project EC TUNING (examples of results of training, competences) <http://www.unideusto.org/tuningeu>;
- National Glossary: higher education, 2014 – <http://erasmusplus.org.ua/korysna-informatsiia/korysni-materialy/category/3-materialynatsionalnoikomandy-ekspertiv-shchodo-zaprovdzhennia-instrumentiv-bolonskohoprotsesu.html?start=80>;
- Rashkevich Yu.M. Bolonya process and new paradigm of higher education: Monograph – <http://erasmusplus.org.ua/korysna-informatsiia/korysnimaterialy/category/3-materialy-natsionalnoikomandy-ekspertiv-shchodo-zaprovdzhennia-instrumentiv-bolonskohoprotsesu.html?start=80>;
- Development of educational programs: methodical recommendations – <http://erasmusplus.org.ua/korysna-informatsiia/korysni-materialy/category/3-materialynatsionalnoikomandy-ekspertiv-shchodo-zaprovdzhennia-instrumentiv-bolonskohoprotsesu.html?start=80>.