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 KPI
(protocol No___ from _____)
Chairman of the Academic Council
_____ Mykhailo ILCHENKO

MANUFACTURING ENGINEERING

Manufacturing engineering

EDUCATIONAL AND SCIENTIFIC PROGRAM

second (master's) level of higher education

Specialty	**131 Applied mechanics**
Field of knowledge	**13 Mechanical engineering**
Qualification	**Master in Applied Mechanics**

Introduced from 2021/2022 academic year
by order of the rector
of Igor Sikorsky KPI
_____ No_____

Kyiv – 2021

PREAMBLE

DEVELOPED by the project team:

Head of the project team
Yurii Petrakov – Ph.D., Professor, Head of the Head of the Manufacturing Engineering Department

Project team members:
Volodymyr Korenkov – Ph.D., Associate Professor of the Manufacturing Engineering Department
Maksym Gladsky – Ph.D., Associate Professor of the Manufacturing Engineering Department
Sergiy Sohan – Ph.D., Professor of the Manufacturing Engineering Department

The head of the Manufacturing Engineering Department is responsible for the preparation of higher education applicants under the educational program

AGREED:

Scientific and Methodical Commission of the University in specialty 131 Applied Mechanics (protocol No ___ of "___" _____ 20____)

Chairman of SMCU 131

_____ Mykola BOBYR

Methodical Council of Igor Sikorsky KPI

Chairman of the Methodical Council _____ Yurii Yakymenko
(protocol No ___ of ____ _____ 20___)

CONSIDERED:

Feedbacks, reviews, stakeholders' suggestions, recommendations of professional associations, etc.

Recommendations for updating the educational and scientific program in connection:
- with the redistribution of ECTS credits between the components of the educational and scientific program;
- with the change of the National Qualifications Framework (Resolution of the Cabinet of Ministers of Ukraine of June 25, 2020, No. 519).
- in accordance with the Order HOH/18/2021 of 01.02.2021 "On the organization and planning of the educational process for the 2021-2022 academic year"

The educational program was discussed after receiving all wishes and proposals. Approved at the extended meeting of the Manufacturing Engineering Department (protocol No. 6 of January 18, 2021)

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1. EDUCATIONAL PROGRAM PROFILE
specialty 131 Applied mechanics

1 – General information	
Full name of the HEI and institute / faculty	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Institute of Mechanical Engineering
Degree of higher education and name of qualification in original language	Master's degree Qualification – Master in Applied Mechanics
The official name of the educational program	Manufacturing Engineering
Diploma type and amount of educational program	Master's degree, single, 120 credits, term of study: 1 year, 9 months
Availability of accreditation	Certificate of accreditation of specialty НД 1192625, valid until 01.07.2023
NQF level/ Level of higher education	NQF of Ukraine – level 7, QF-EHEA – second cycle, EQF-LLL – level 7.
Prerequisites	Availability of bachelor's degree
Language of instruction	Ukrainian
The term of the educational program	To the next accreditation
Internet address of the permanent placement of the educational program	http://mmi.kpi.ua/op http://osvita.kpi.ua
2 – The purpose of the educational program	
Training a specialist who is able to solve complex problems and problems in the field of applied mechanics and mechanical engineering and carry out innovative professional activities in the conditions of sustainable innovative scientific and technical development of society and the formation of high adaptability of higher education applicants in the context of labor market transformation through interaction with employers and other stakeholders. To create conditions for comprehensive professional, intellectual, social and creative development of the individual at the highest levels of excellence in the educational and scientific environment in accordance with the development strategy of Igor Sikorsky KPI for 2020-2025 [https://kpi.ua/2020-2025-strategy].	
3 – Characteristics of the educational program	
Subject Area	- *object of activity:* constructions, machines, equipment, mechanical, biomechanical and mehatronic systems and complexes, processes of their design, manufacture, research and operation; - *training goals:* professional engineering activities in the field of design, production, operation and scientific research of technical systems, machines and equipment, robotic means and complexes, development of technologies of machine-building production, teaching activities; - *theoretical content of the subject area:* laws of mechanics and their applied applications, theoretical principles of design, analysis and optimization of design and technologies of machines production, basics of organizing and conducting research of mechanical properties of materials, dynamics of machines and processes, mechanics of liquids and gases, machine parts and structures, modeling and forecasting of operational

	properties of technical systems; - *methods, methodologies and technologies:* analytical and numerical methods of design and calculation of machines and structures, mathematical and computer modeling of machines and mechanisms; methods and technologies of full-scale and virtual technological experiment; information technologies in engineering research, design and production; - *tools and equipment*: machine tools, tools, technological and control devices, control and measuring information systems, hardware and software of research machine and robotic systems.
Orientation of the educational program	Educational and scientific
The main focus of the educational program	Special education in the field of applied mechanics, manufacturing engineering, control of CNC machines, technologies for manufacturing parts and assembly units of machines. Keywords: manufacturing engineering, production processes, manufacturing process planning, automation of design in mechanical engineering, automated systems in mechanical engineering.
Features of the program:	Features of the program are determined by the peculiarities of the subject sphere, namely: it is aimed at training specialists in applied mechanics in the field of design, production and operation of technical systems, machines and equipment, robotics and complexes, development of technologies for engineering industries. Also, the training model is based on the innovative component of solving promising scientific and technical problems in the field of applied mechanics and mechanical engineering in the conditions of sustainable innovative scientific and technical development of society and the formation of high adaptability of higher education applicants in the context of transformation of the labor market through interaction with employers.
4 – The suitability of graduates for employment and further education	
Employment suitability	The specialist is able to perform professional work according to the classifier of professions ДК 003:2010
Further education	The ability to continue education at the third (educational and scientific) level of higher education. They can acquire additional qualifications in the postgraduate education system.
5 – Teaching and evaluation	
Teaching and learning	Cognitive learning style, which is based on various methods and technologies of learning. 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, the use of information and communication technologies (e-learning, online lectures, OCW, distance courses) on individual educational components.
Evaluation	Assessment of students' knowledge is carried out in accordance with the

	Regulations on the system of evaluation of the results of study in the Igor Sikorsky KPI for all types of classroom and extracurricular work (current, calendar, semester control). Rating system of evaluation, oral and written examinations, final tests, separate evaluation of coursework, testing, semester certifications, thesis defense
6 – Program competencies	
Integral competence	The ability to solve complex tasks and problems in applied mechanics or in the learning process, which involves research and / or implementation of innovations and is characterized by uncertainty of conditions and requirements.
General Competencies (GC)	
GC 1	Ability to identify, set and solve problems.
GC 2	Ability to use information and communication technologies
GC 3	Ability to generate new ideas (creativity)
GC 4	Ability to develop and manage projects
GC 5	Ability to communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge / types of economic activity)
GC 6	Ability to learn and master modern knowledge
GC 7	Ability to conduct research at the appropriate level.
Special (professional) competencies of the specialty (PC)	
PC 1	Ability to apply appropriate methods and resources of modern engineering to find optimal solutions for a wide range of engineering problems using modern approaches, forecasting methods, information technologies and taking into account existing restrictions and apply appropriate scientific and technical methods, information technologies and applied computer software to solve engineering and scientific problems in applied mechanics, search for the optimal solution under the conditions of incomplete information and conflicting requirements
PC 2	The ability to describe, classify and model a wide range of technical objects and processes based on deep knowledge and understanding of theories and practices of mechanical engineering, as well as knowledge of related sciences.
PC 3	Ability to work independently and function effectively as a group leader
PC 4	The ability to clearly and unambiguously communicate their own conclusions, knowledge and explanations to specialists and non-specialists, including in the process of teaching
PC 5	The ability to plan and perform experimental and theoretical research on applied mechanics and related interdisciplinary problems
PC 6	Ability to design machining operations and manufacturing processes for machine parts of different classes, including with the use of automated design systems
PC 7	Ability to conduct research of processes, apply appropriate mathematical methods and applied computer software to solve engineering and scientific problems, develop methods of conducting experiments
PC 8	Ability to apply knowledge about the latest methods and methodologies of design and research of structures and machines
PC 9	Ability to develop mathematical models of certain types of cutting processes and to implement the cutting process control, to solve optimization problems in scientific and applied research
7 – Program learning outcomes	

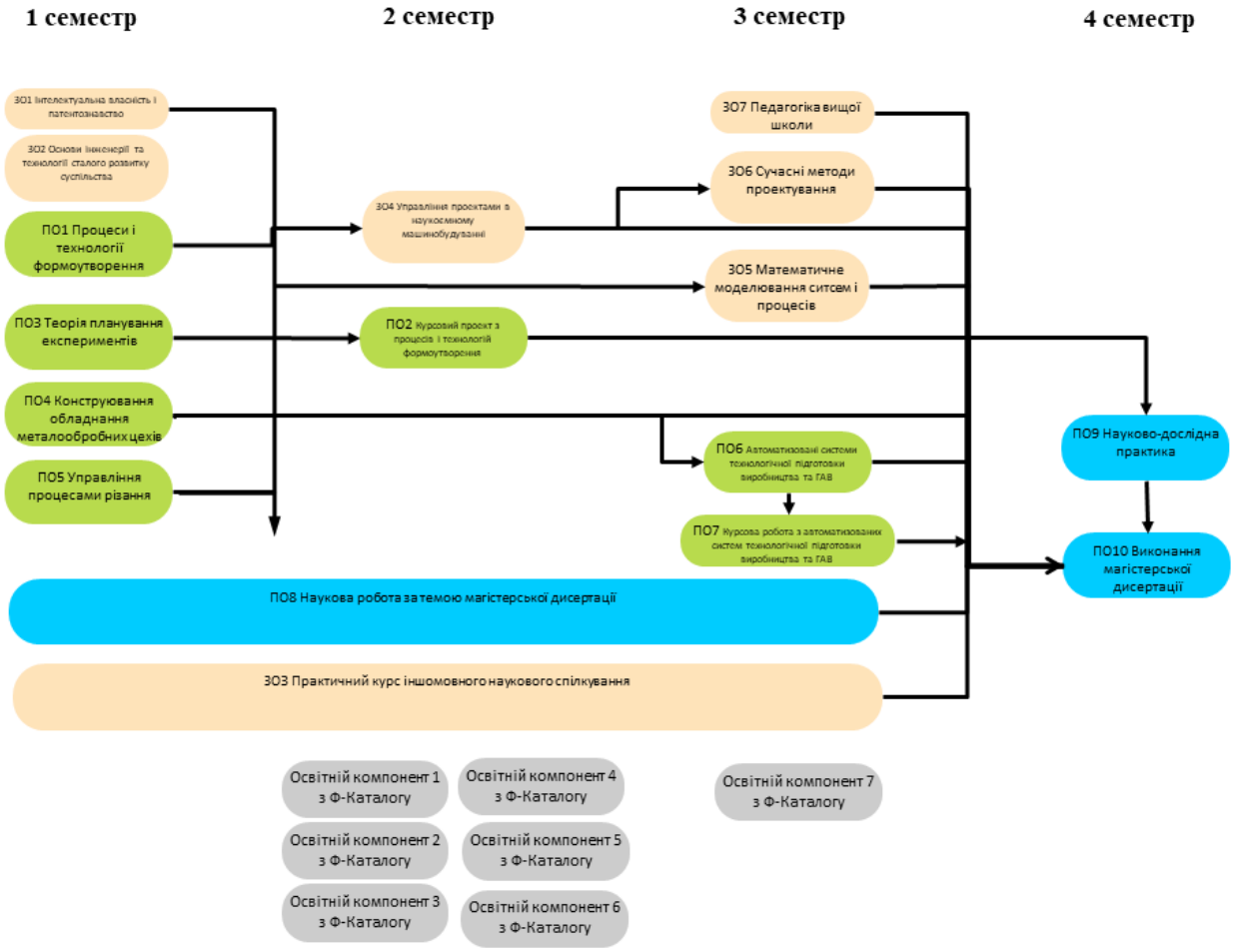
LO 1	To develop and put new types of products on production, in particular, to perform research and development work and / or to develop a process plan for its manufacture
LO 2	Apply automation systems for research, design work, technological training and engineering analysis in mechanical engineering
LO 3	Perform geometric modeling, static and dynamic analysis of structures, mechanisms, materials and processes at the design stage using modern computer systems, justify your own interpretation of the results obtained on the basis of modern ideas of mechanical engineering and related fields of knowledge
LO 4	Use modern methods of determining optimal parameters of technical systems by means of system analysis, mathematical and computer modeling, in particular under conditions of incomplete and contradictory information
LO 5	Independently set and solve problems of an innovative nature, argue and protect the results obtained and decisions made
LO 6	Develop, implement and evaluate innovative projects taking into account engineering, legal, environmental and social aspects
LO 7	Present the results of research and projects clearly and unambiguously, to convey their own conclusions, arguments and explanations in the state and foreign languages orally and in writing to colleagues, educational applicants and representatives of other professional groups of different levels
LO 8	Learn and master modern knowledge, technologies, tools and methods, in particular through independent work with professional literature, participation in scientific, technical and educational events
LO 9	Organize the work of the group in the implementation of tasks, complex projects, research, understand the work of others, give clear instructions
LO 10	Find the necessary information in scientific and technical literature, electronic databases and other sources, evaluate and analyze this information
LO 11	Plan and carry out experimental and theoretical research in the field of applied mechanics, analyze their results, justify conclusions
LO 12	To develop effective processes of forming surfaces of parts, focused on the use of CNC machines, assembly processes, their technological support.
LO 13	To develop equipment and technical means to ensure the functioning of flexible automated industries, the layout of production systems for the manufacture of parts and assembly of machines.
LO 14	Perform deformation modeling in technological systems, analytical processing of experimental data, search for optimal design and technological solutions.
LO 15	Conduct experimental and computer research using methods of experiment planning and mathematical modeling.
8 – Resource support of the program implementation	
Personnel support	In accordance with 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 December 30, 2015 No. 1187, as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine No. 347 of 10.05.2018.
Logistical support	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 of December 30, 2015 No. 1187, as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine No. 347 of 10.05.2018.

	Use of equipment for lectures in the format of presentations, network technologies, in particular on the Sikorsky distance learning platform.
Information and educational and methodological support	In accordance with the technological requirements for educational, methodological and information support of educational activities of the corresponding level of HE approved by the Resolution of the Cabinet of Ministers of Ukraine of December 30, 2015 No. 1187, as amended in accordance with the Resolution of the Cabinet of Ministers of Ukraine No. 347 of 10.05.2018. Use of the Scientific and Technical Library of Igor Sikorsky KPI
9 – Academic mobility	
National credit mobility	The program provides for the possibility of concluding agreements on academic mobility and double diploma
International Credit Mobility	The program provides for the possibility of concluding agreements on international academic mobility (Erazmus+ K1), on dual diploma, on long-term international projects that include inclusive training of students
Education of foreign applicants of higher education	Ability to teach in Ukrainian in general training groups or in English with the provision of Ukrainian language learning as a foreign language

2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM

N/A Code	Components of the educational program (academic disciplines, practices, qualification work)	Number of loans	Summary control form
1	2	3	4
1. NORMATIVE (COMPULSORY) educational components			
1.1. General Training Cycle			
ЗО 1	Intellectual Property and Patenting	3	Credit
ЗО 2	Fundamentals of Engineering and Sustainable Development Technologies	2	Credit
ЗО 3	Practical Course of Foreign-Language Scientific Communication	4,5	Credit
ЗО 4	Project Management in High Technology Machine Industry	3	Credit
ЗО 5	Mathematical Modeling of Systems and Processes	4	Exam
ЗО 6	Modern Methods of Design	3,5	Credit
ЗО 7	Pedagogy of Higher Education	2	Credit
1.2. Cycle of professional training			
ПО 1	Processes and Technologies of Forming	6	Exam
ПО 2	Course Project on Processes and Technologies of Forming	1,5	Credit
ПО 3	Theory of Experiment Planning	5	Exam
ПО 4	Design of Metalworking Facilities Equipment	6	Exam
ПО 5	Control of Cutting Processes	4,5	Credit
ПО 6	Computer-aided Process Planning Systems and FMS	4	Exam
ПО 7	Course work in Computer-aided Process Planning Systems and FMS	1	Credit
Research component			
ПО 8	Scientific Work on the Topic of Master Thesis	10	Credit
ПО 9	Research practice	9	Credit
ПО 10	Completion of a Master's Thesis	17	Defense
2. SELECTIVE educational components			
ПВ 1	Educational component 1 F-catalog	6	Exam
ПВ 2	Educational component 2 F-catalog	4	Credit
ПВ 3	Educational component 3 F-catalog	6	Exam
ПВ 4	Educational component 4 F-catalog	4	Credit
ПВ 5	Educational component 5 F-catalog	6	Exam
ПВ 6	Educational component 6 F-catalog	4	Credit
ПВ 7	Educational component 7 F-catalog	4	Credit
Total amount of **required components**:		86	
Total amount of **selective components**:		34	
THE TOTAL AMOUNT OF THE EDUCATIONAL PROGRAM		**120**	

3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROGRAM



4. FORM OF CERTIFICATION OF HIGHER EDUCATION APPLICANTS

Certification of higher education applicants in the educational program "Manufacturing Engineering" specialty 131 Applied mechanics is carried out in the form of protection of qualification work and ends with the issuance of a document of the established sample on awarding them a master's degree with qualification: Master in Applied Mechanics. Certification is carried out openly and publicly. Qualification work is checked for plagiarism and after protection is placed in the repository of ST Library of the university for free access.

5. MATRIX OF CORRESPONDENCE OF PROGRAM COMPETENCIES TO THE COMPONENTS OF THE EDUCATIONAL AND SCIENTIFIC PROGRAM

	ЗО 1	ЗО 2	ЗО 3	ЗО 4	ЗО 5	ЗО 6	ЗО 7	ПО 1	ПО 2	ПО 3	ПО 4	ПО 5	ПО 6	ПО 7	ПО 8	ПО 9	ПО 10
GC 1		X													X		X
GC 2			X				X								X		
GC 3	X														X		X
GC 4				X													X
GC 5			X														
GC 6							X								X	X	X
GC 7					X	X											X
PC 1								X				X	X				X
PC 2												X			X		X
PC 3		X													X	X	X
PC 4		X													X		X
PC 5															X		X
PC 6								X	X				X	X			X
PC 7										X							X
PC 8											X						X
PC 9												X			X		X

6. MATRIX OF PROVIDING PROGRAM LEARNING OUTCOMES BY RELEVANT COMPONENTS OF THE EDUCATIONAL PROGRAM

	ЗО 1	ЗО 2	ЗО 3	ЗО 4	ЗО 5	ЗО 6	ЗО 7	ПО 1	ПО 2	ПО 3	ПО 4	ПО 5	ПО 6	ПО 7	ПО 8	ПО 9	ПО 10
LO 1	X							X	X	X	X	X			X		
LO 2								X	X			X					
LO 3								X	X			X			X		X
LO 4						X						X			X		X
LO 5	X	X		X											X	X	
LO 6		X		X											X	X	
LO 7			X												X	X	X
LO 8			X												X		
LO 9				X			X								X	X	X
LO 10	X														X	X	X
LO 11					X										X		
LO 12								X	X				X	X	X		
LO 13								X	X		X		X	X	X		
LO 14										X	X	X			X		
LO 15										X		X			X		