MINISTRY of EDUCATION and SCIENCE of UKRAINE

Ternopil Ivan Puluj National Technical University

EDUCATIONAL PROGRAM

«Mechanical engineering and welding technologies»

of the first (Bachelor's) level of higher education

on specialty 131 «Mechanical Engineering»

branch of knowledge 13 Mechanical Engineering

Qualification: Bachelor in Mechanical Engineering

Approved by the Academic Council

(Protocol № 11 of «12» 11 2020)

Educational program is launched 01.09 2021

Rector of the TNTU _____

Protocol № 4/7-904 of 01 12 2020

Ternopil 2020

Letter of Approval

of educational-professional program

Discussed and approved on the Mechanical Engineering Technology Department Meeting

Protocol of 21.10.2020 № 3

Acting Head of the Department _____ Okipnyi I.B.
(signature)

Discussed and approved by the scientific-methods commission of the Faculty of Engineering of Machines, Structures and Technologies.

Discussed and approved by the Academic Council of the Faculty of Engineering of Machines, Structures and Technologies.

Protocol of 21.10.2020 № 2

Head of the Faculty Academic Council _____ Leshchuk R.Y.
(signature)

PREFACE

The educational program (EP) of Bachelor's training on the specialty 131 «Mechanical Engineering» is a regulatory document summarizing the education contents, goals of educational and professional training, where the role of a professional in the national economy structure is specified, and involving both the competencies determining the specific features of Bachelor's training on the specialty 131 «Mechanical Engineering» and the learning outcomes describing the acquired knowledge, abilities and skills of the graduates after successful completing of the educational program. The competencies are correlated and correspond to the descriptors of the National Framework of Qualifications.

The educational program was developed by the Ternopil Ivan Puluj National Technical University according to the current standard of higher education on specialty 131 «Mechanical Engineering», branch of knowledge 13 «Mechanical engineering»

The Program was developed by the work project group consisting of:

1. Pylypets M.I. – D.Sc. in Engineering, Professor, Prof. of the Mechanical Engineering Technology Department – Head of the Program.
2. Vasylkiv V.V. – D.Sc. in Engineering, Professor, Prof. of the Mechanical Engineering Technology Department
3. Diachun A.Y. – Ph.D. in Engineering Science, Associate Prof. of the Mechanical Engineering Technology Department.

Reviews of external stakeholders:

1. Karavanskyi O. I. – head of the PJSC «Ternopilgas».
2. Kasperskyi A. B. – head of the material support bureau of the LLC CE «Vatra».

Bachelor's Training Program in Specialty 131 "Mechanical Engineering"

General information	
Full name of higher educational establishment and a structural subdivision	Ternopil Ivan Puluj national technical university Mechanical Engineering Technology Department
Full name of qualification	Bachelor of Science. Mechanical Engineering
Program official name	Educational program of the specialty 131 «Mechanical Engineering», branch of knowledge 13 «Mechanical engineering»
Diploma type and number of credits according to the program	Bachelor's Diploma (Single Honours), - based on Complete general secondary education – 240 credits ECTS / 4 years of study; - based on the degree «Junior Bachelor» (of educational-qualification level «Junior Specialist») the higher educational establishment is entitled to recognize and to credit 120 credits ECTS of the previous educational program of Junior Bachelor (Junior Specialist) training (2 years of study).
Accreditation	Accreditation commission of Ukraine (National agency of higher education quality assurance), Certificate of accreditation НД №2087401. Valid to 01.07.2024
Cycle/level	FQ-EHEA – first cycle, EQF LLL – 6th level, HPK – 6th level
Requirements	Certificate of complete general secondary education, Junior Bachelor diploma (Junior Specialist) of the relevant specialty. The entrance requirements are specified by «Admission Rules of the Ternopil Ivan Puluj national technical university» approved by the University academic council.
Language(s) of instruction	Ukrainian
Educational program validity	Valid to 01.07.2024
Permanent Internet address of educational program description	http://tntu.edu.ua/storage/pages/00000484/op131b.pdf
Purpose of the educational program	
Training of specialists able to solve complex specialized assignments and practical problems in applied mechanics characterized by complex and uncertain conditions.	
Characteristics of the educational program	
Subject area	Branch of knowledge – 13 Mechanical engineering Specialty – 131 Mechanical Engineering
Educational program orientation	Educational-professional
Main focus of the educational program and specialization	The focus on ability of writing theoretical and calculation - experimental papers with elements of scientific research, to solve tasks of applied mechanics- tasks of dynamics, strength, durability, resistance, rational optimization, operational life, survivability, reliability and safety of machines, structures, buildings, plants, units, equipment, devices, instruments and

	their components; using information technologies, modern systems of computer mathematics, technologies of final element analysis, high computer technologies, computer-aided software, computer-aided design system, engineering analysis and computer engineering software; projects management, marketing; organization of work of scientific, design and industrial subdivisions engaged in new equipment and technologies development and design.
Program features	Integration of general-technical and special technical training in professional activity in production engineering, design, operation and repair services of production enterprises, workshops, shop floors providing a wide range of machinery production, operation and servicing.
4 – Graduates suitability for employment and further education	
Suitability for employment	Mechanician, production mechanician, shop floor mechanician, mechanician of equipment repair, tool technician, technician-designer (mechanics), technician-technologist (mechanics), technician-designer, electromecahnical technician, technician in adjustment and tests, technician in production automation.
Further education	It is possible to study on the program of second cycle FQ-EHEA, of level 7 EQF-LLL and of level 8 HPK and to get some extra qualifications within post-graduate education system.
Teaching and Assessment	
Teaching and study	Passive (explanatory-illustrative); active (problem, game, interactive, project, information-computer self-developing)- according to dominating techniques and ways of teaching. Group and integrative study – according to forms of organization. Positional and context study, collaboration technology – according to pedagogical cooperation orientation.
Assessment	Students' progress in study is estimated according to 4-mark ("excellent", "good", "satisfactory", "unsatisfactory") and verbal ("passed", "not passed") systems. Kinds of control: current, theme, random, final, self-control. Forms of control: oral and written questioning, tests, design projects, term papers and projects, laboratory reports, presentations, reports on internship programs and scientific-research papers, certification exam etc.
Program competencies	
Integral competence	Ability in solving complex specialized tasks and practical problem in the field of applied mechanics or in the process of study characterized by complex and uncertain conditions and

	involves the use of certain theories and methods of mechanical engineering.
General competencies (GC)	GC1. Ability of abstract thinking, analysis and synthesis. GC2. Knowledge and understanding the subject area and professional activity. GC3. Be able to see, set and solve problems. GC4. Ability in applying theoretical knowledge in practice. GC5. Ability of team work. GC6. Be persistent in performing the responsibilities and duties. GC7. Be able to study and acquire new knowledge. GC8. Be able to speak a foreign language. GC9. Be able to apply information and communication technologies. GC10. Have skills of safe activity. GC11. Be able to act as a responsible and conscious person. GC12. Be able to search, process and analyze information from different sources. GC13. Be able to assess and assure the quality of the work done. GC14. Be able to implement rights and duties as a member of society; comprehension of value of civil (free democratic) society and the necessity of its sustainable development, the supremacy of law, human rights and freedoms in Ukraine. GC15. Be able to store and add moral, cultural, scientific values and achievements of society due to the understanding of history and laws of development of the subject area, its place in the general system of knowledge about nature and society and in the development of the society, engineering and technologies, apply different kinds and forms of physical activity for active rest and healthy lifestyle.
Special (professional, subject area) competencies (SC)	SC1. Ability in analyzing materials, structures and processes based on the laws, theories and methods of mathematics, natural sciences and applied mechanics. SC2. Ability in estimating the parameters of materials, structures and processes workability under operation conditions and find proper solutions to assure the specified level of structures and processes reliability, including under some uncertain conditions. SC3. Ability in conducting technological and technical-economical assessment of efficiency of new technologies and hardware use. SC4. Ability in efficient choosing the technological equipment, sets of technical complexes, have basic ideas of their operation procedures. SC5. Ability in using analytical and numerical mathematical methods to solve problems of applied mechanics, namely to make calculations on durability, strength, resistance, rigidity under static and dynamic loading conditions aimed at machine parts and design reliability assessment. SC6. Be able to make technical measurements, obtain, analyze and

	critically assess the results of measurements. SC7. Be able to use computer-aided design systems (CAD), manufacture (CAM), engineering research (CAE) specialized applied software to solve engineering problems on applied mechanics. SC8. Ability of spacious thinking and spacious objects, structures and mechanisms reproduction as projection drawings and 3D geometrical models. SC9. Be able to present the results of his/her engineering activity keeping to generally accepted norms and standards. SC10. Be able to describe and classify a wide range of technical objects and processes based on deep knowledge and comprehension of the main mechanical theories and practices as well as on the basic knowledge of related sciences.
Learning outcomes	
	PH1) Choose and use proper mathematical methods for the problems of applied mechanics solving; PH2) Use knowledge of theoretical principles of fluids mechanics, heat engineering, and electrical engineering to solve professional assignments; PH3) Make calculations on machine parts strength, fatigue limit, resistance, durability, rigidity; PH4) Estimate machine parts and design reliability under static and dynamic loading conditions ; PH5) Create geometrical models of machine parts, structures and mechanisms as spacious objects and projection images, and arrange their results as technical and working drawings; PH6) Create and theoretically substantiate the structures of machines, mechanisms and their components on the basis of applied mechanics methods, general principles of design, theory of interchangeability, standard techniques of machine parts calculation; PH7) Apply regulatory and reference data to monitor the technical documents, products and technologies meeting the standards, specification and other regulatory documents; PH8) Know and understand the fundamentals of IT, programming, use applied software in practice to make engineering calculations, to process information and results of experimental research; PH9) Know and understand related branches (fluids mechanics, heat engineering, electrical engineering, electronics) and be able to find interdisciplinary links of applied mechanics at the level necessary to meet the other requirements of educational program; PH10) Know the structures, techniques of choice and calculation, principles of service and maintenance of machine tool and robotic equipment drives; PH11) Understand the operating principles of computer-aided control systems of production machinery, namely microprocessor, choose and use the most efficient automated facilities; PH12) Skills of practical use of computer-aided design systems (CAD), manufacture (CAM), engineering research (CAE); PH13) Estimate the technical-economic efficiency of production;

	PH14) Provide the efficient choice of the technological equipment, sets of technical complexes ; PH15) Take onto account the main factors of technology-related impact on the environment and the main methods of environmental protection, labor safety and life and safety issues while decisions making; PH16) Be able to speak and write fluently on professional issues in state and a foreign languages, including the knowledge of special terminology and skills of interpersonal communication.
Program implementation resources	
Staff assistance	Students of the "Bachelor" educational level are trained by the Doctors of Sciences, Professors, Ph.D., Associate Professors, Senior Lecturers and Assistants. The teachers involved into the Bachelor's degree Programs work on the following directions of activity: teaching, teaching-methodical, scientific-research, educational and job-oriented. To increase the level of teaching-educational process the methodical seminars are conducting where the important problems of methodology, teaching methods are discussed.
Materials and facilities	Materials and technical base of the TNTU enables to satisfy the educational process requirements on the proper level. The laboratories of the Department are equipped with all necessary devices and facilities to train students of the "Bachelor" educational level.
Information support and teaching – learning materials	The teaching process is based on 100% teaching-instruction materials providing of seminars, practical and laboratory classes, self-study process of students in all disciplines. The students are 100% provided with the textbooks. Every year the scientific-technical library collection of the Ternopil Ivan Puluj national technical university is increased due to special literature and periodicals according to the directions of the departments work. The total area of the library is 881,8 m^2 (including reading halls), there are 16 rooms, namely: 1 reading hall for 196 seats; 1 electronic reading hall for 20 seats; 2 rooms for literature borrowing; 6 library stacks. The library collections include more than 219304 documents, among them: teaching – 164129, scientific – 39199. There is also a patent stock in the library enabling to carry out a search in the last 25 years. Some automated seats, an electronic catalogue, an electronic library stock (more than 5 thousand items) have been created in the library. There is the Internet access to the electronic libraries of Ukraine and the world. Information support of the educational process and scientific-research activity is provided by the patent department, the information center, the Center of information technologies, university publishing house due to monographies, textbooks, teaching materials and other literature copying. The library development has been paid great attention to in order to provide completely the educational and scientific process since the library is playing in traditional role of the readers' provider with books and other printed materials, making Internet-resources and e-materials accessible.

	The publications can be made in the institutional repository that proves the scientific activity support, increases the rating in the scientific society, provides the free access to the research results, increases the citation index, protects the author's rights, improves the quality of scientific communication. By December 30, 2018 the institutional repository ELARTU has included 24 054 publications. In 2010 the Ternopil Ivan Puluj national technical university joined the project ElibUkr «Electronic library of Ukraine». This project implementation enables the information basis required for the university staff educational and scientific-research activities and the information exchange proper mechanisms functioning, support and improvement to integrate Ukrainian scientists to the international global academic community. All literature search can be accessible via the e-catalogue containing 99 548 entries by 2018. There is an electronic reading hall with free access to the Internet. The library reading hall serves as a hybrid reading hall: one can borrow books and use free Internet (it's a WI-FI hotspot). The e-textbooks of the Center of educational literature, World eBookLibrary (more than 2 mln. Of e-books) and the largest in the world publishing house of academic literature EBSCO-Publishing have been made accessible from the university network. The access is possible via the library site to the world and Ukrainian scientific information resources of open access (more than 80 data bases have been described in total, among them 12 databases of dissertations). In 2018 according to the Order of the MES of Ukraine №1286 of 19.09.2017, according to the signed agreement with the State scientific-technical library of Ukraine (SSTL of Ukraine), the data bases of scientific periodicals Scopus and Web of Science were made accessible in the TNTU scientific-technical library. There is an access in the university to the Ukrainian e-textbooks of the Center of educational literature (CELonline) including 1240 items of textbooks and workbooks as well as some test period of access to data bases of scientific periodicals (among the latest ones are the German publishing house of academic literature «EBSCO-Publishing», «Walter de Gruyter», «Global Patents Reference Center», «IOP»). A number of conferences on library processes automation, seminars on publications topics in the institutional repository ELARTU and e-learning are often held in the TNTU library.
Academic mobility	
National credit mobility	National credit mobility within the framework of agreements of scientific-educational relationships to meet the requirements of education and science development singed by TNTU and the Institute of electric welding named after Y.O. Paton of the NAS of Ukraine, National technical university «KPI», Khmelnytskyy national university, Zaporizhzhya national university, Dnipro state technical university and others.

	Some individual agreements of academic mobility are possible aimed at study and research conducting at the universities and scientific institutions of Ukraine. Some leading specialists of the universities of Ukraine may be involved into the scientific work supervision of the applicants according to the individual agreement's terms. The credits received in other universities of Ukraine are validated according to the document of academic mobility.
International credit mobility	The purpose of international activity of the TNTU is to rise the efficient cooperation with HEE partners, search, study and use of the best foreign experience of scientific-research and teaching-methodical work, academic staff and students' mobility expansion, adaptation to the European and world standards with preserving the best innovations of national education, the university public image perfection in Ukraine and abroad. The main directions of the activity in the field of international cooperation are the following: • academic staff, Masters of Science, postgraduates involving into international projects participation; • cooperation with international educational institutions and agencies; • teaching for foreign student in the university; • arrangement of internships, advanced studies of academic staff and students, students' professional internship abroad; • use of international experience in teaching-methodical and cultural-educational activities; • promotion of scientific cooperation with foreign colleagues. The agreements of scientific and academic cooperation have been signed by the Ternopil Ivan Puluj national technical university and the Ukrainian free university (Germany), technical university "Wroclaw polytechnic", Rzeszow polytechnic institute, Institute of materials science of Stuttgart University, the University of Maribor (Slovenia), companies Cisco, Schneider-Electric, Microsoft, STelectronic and others. Within the signed agreements of cooperation, the joint scientific research in the field of mass transfer processes have been carried out with the scientists of Compiegne University and the University of Pierre and Marie Curie (France). Some research in the field of fracture mechanics are conducted together with the scientists of Birmingham University (Great Britain), the University of Maribor (Slovenia) and the Lulea University (Sweden). The cooperation with Ukrainian-Chinese technological park of the city Jinan (China) has been developed. Within the project Tempus Tacis JEP_26182_2005 «EU-UA Master Degree in Software Engineering» «European-Ukrainian Master Degree programme in Software» the agreed programs of Master's and Ph.D. training have been implemented, summer schools are held. Development of joint programs is one of the main directions of international cooperation development. Thus, the TNTU cooperation with foreign partners, namely double degree diplomas

	programmes creation and implementation has been the urgent one for the university. At present, there is the educational Master's program with the state university "Lublin polytechnic", Opole polytechnic and the curriculums are coming into agreement with the Lodz polytechnic (Poland). The students can receive two diplomas studying in turn at the TNTU and a HEE partner. The educational Ukrainian-German Bachelor's training programme is broadly implemented (University of Applied Sciences, t. Schmalkalden, Germany). Every year the number of students is growing who participate in internships abroad. The students have their internship in the company "Ustronyanka" (the city of Ustron), the programme "Apollo" (Germany), on the program of the union "German Association of Peasants" and by the program "Agroimpulse" (Switzerland). Before their internship, the students can improve their knowledge in Polish or German language courses. Every year the lecturers of the department participate in international conferences organized by HEE partners. Individual academic mobility is possible due to participation in the programmes of the project Erasmus + KA107 credit mobility with Svishtov Academy of Economics (Bulgaria), University of Southern Bohemia (Czech Republic). Competitive individual academic mobility is possible by the program EU Erasmus Mundus 545653-EM-1-2013-1-PL-ERA MUNDUS-EMA21 «Initiative of technical universities of Caucasus and Atlantic regions to provide high educational standards».
Foreign students training	Training is provided on standard terms or according to the individual schedule in a foreign language
Forms of attestation	
Forms of attestation	The attestation is in the form of a public defense of the Qualification paper**.**
Requirements to the Qualification paper	The Qualification paper involves the solving of a complex special task or a practical problem in the field of applied mechanics characterized by complex and uncertain conditions using theories and methods of mechanical engineering. The Qualification paper must not contain any academic plagiarism, fabrication, falsification. The Qualification paper should be released on the official site and/or in the repository of the higher education institution or its subdivision. Making the Qualification papers containing some information of restricted access available to the public must meet the requirements of the current law.
System of internal provision of higher education quality	
	According to «Standards and recommendations on quality assurance in European space of higher education», the statement and documents describing the structure of the quality assurance system (QAS), its goals and objectives, forms of

	quality control, the persons who are responsible for the control, measures which should be taken by the control results have come into action by Ternopil Ivan Puluj national technical university. The main document is the Statement «Quality control system of Ternopil Ivan Puluj national technical university. Quality policy» (approved on the Academic council meeting, Minutes № 5 of May 22, 2018, implemented by Order № 4/7-430 of 12.06.2018), which involves the following procedures and measures: 1) determination of the principles and procedures of higher education quality assurance; 2) educational programs monitoring and updating; 3) annual assessment of higher education undergraduates, scientific-pedagogical and pedagogical staff of a higher educational institution and regular release of the assessment results on the official website of the higher educational institution, on an information board or in another way; 4) providing the career development of pedagogical, scientific and scientific-pedagogical staff; 5) necessary resources available for educational process organizing, including students' self-study on each syllabus; 6) information systems available for effective management of educational process; 7) providing the publicity of information dealing with the syllabus, higher education degrees, qualifications; 8) academic honesty assurance by the staff of higher educational institutions and the students, including creation and providing the functioning of the efficient system to prevent and find any academic plagiarism; 9) other procedures and measures. Due to the results of external audit conducted by the company DQS Gmbh, an international certificate was taken (registration number 31400225 QM15) of TNTU QCS meeting the standards requirements ISO 9001:2015 in the field of services provided in higher education, scientific, scientific-technical activity.
List of normative documents which the syllabus is based on	
	1. Standard of higher education of Ukraine [Access mode: https://mon.gov.ua/storage/app/media/vishcha-osvita/zatverdzeni%20standarty/2019/06/25/131-prikladna-mekhanika-bakalavr.pdf; 2. Law of Ukraine «About higher education» of 01.07.2014 № 1556-VII. Mode ДСКЛІТІУ: httD://zakon4.rada.gov.ua/laws/show/1556-18; 3. Law of Ukraine «On education» of 05.09.2017 № 2145-VIII. – Access mode: http://zakon5.rada.gov.Ua/laws/show/2145-19;

4. Law of Ukraine «Про ліцензування видів господарської діяльності» від 02.03.2015 № 222-V1II. [Режим доступу : htto://zakon3.rada.gov.ua/laws/show/ 222-191;
5. Resolution of the Cabinet of Ministers of Ukraine of 29.04.2015 № 266 «On Approval of the List of branches of knowledge and specialties under which the training of applicants for higher education is carried out » (with amendments);
6. Order of MES of Ukraine of June 1, 2017 № 600 (у редакції наказу Міністерства освіти і науки України від 21 грудня 2017 р. № 1648) «On Approval and Implementation of the Methodical Recommendations for the Development of Higher Education Standards»;
7. National Classifier of Ukraine: Classifier of professions ДК 003:2010. - Kyiv: Publishing House «Sotsinform», 2010.
8. National framework of qualifications – http://zakon4.rada.gov.ua/laws/show/1341-2011-п.
9. List of branches of knowledge and specialties – http://zakon4.rada.gov.ua/laws/show/266-2015-п.
Other sources:
10. Standards and recommendations on quality assurance in European space of higher education (ESG) [Access mode: httD://ihed.org.ua/ima2es/doc/04 2016 ESG 2015.pdf]:
11. International Standard Classification of Education (ISCED 2011): UNESCO Institute for Statistics [Access mode: http://www.uis.unesco.org/education/ documents/isced-2011-en.pdf];
12. ISCED Fields of Education and Training 2013 (ISCED-F 2013):UNESCO Institute for Statistics [Access mode: http://www.uis.unesco.org/Education/Documents/isced-fields-ofeducation-training-2013.pdf].
13. National education glossary: higher education [Access mode: http://ihed.org.ua/images/doc/04_2016_glossariy_Visha_osvita_2014_tempus-office.pdf];
14. Development of the system of higher education quality assurance in Ukraine: information-analytical review [Access mode: http://ihed.org.ua/images/doc/04_2016_Rozvitok_sisitemi_zabesp_yakosti_VO_UA_2015.pdf];
15. European credit transfer accumulation system. Reference book of a user [Access mode: http://ihed.org.ua/images/doc/04_2016_ECTS_Users _Guide2015_Ukrainian.pdf].
16. EQF-LLL – European Qualifications Framework for Lifelong Learning [Access mode: https://ec.europa.eu/ploteus/sites/eaceqf/files/brochexp_en.pdf];
17. QF-EHEA – Qualification Framework of the European Higher Education Area [Access mode: http://www.ehea.info/articledetails.aspx?ArticleId=67];

	TUNING (special (professional) and general competencies and examples of standards [Access mode: http://www.unideusto.org/tuningeu/].

Matrix of competencies accordance to the National framework of qualifications descriptors

Classification of competencies	Knowledge	Skills	Communication	Autonomy and responsibility
General competencies				
GC1. Ability of abstract thinking, analysis and synthesis.		+		
GC2. Knowledge and understanding the subject area and professional activity.	+	+		
GC3. Be able to see, set and solve problems.	+	+		
GC4. Ability in applying theoretical knowledge in practice.	+	+		
GC5. Ability of team work.		+	+	+
GC6. Be persistent in performing the responsibilities and duties.	+	+		+
GC7. Be able to study and acquire new knowledge.	+	+		+
GC8. Be able to speak a foreign language.	+	+	+	
GC9. Be able to apply information and communication technologies.	+	+	+	
GC10. Have skills of safe activity.	+	+		+
GC11. Be able to act as a responsible and conscious person.		+		+
GC12. Be able to search, process and analyze information from different sources.	+	+	+	
GC13. Be able to assess and assure the quality of the work done.	+	+		+
GC14. Be able to implement rights and duties as a member of society; comprehension of value of civil (free democratic) society and the necessity of its sustainable development, the supremacy of law, human rights and freedoms in Ukraine.	+	+		
GC15. Be able to store and add moral, cultural, scientific values and achievements of society due to the understanding of history and laws of development of the subject area, its place in the general system of knowledge about nature and society and in the development of the society, engineering and technologies, apply different kinds and forms of physical activity for active rest and healthy lifestyle.		+		
Special (professional, subject area) competencies				
SC1. Ability in analyzing materials, structures and processes based on the laws, theories and methods of mathematics, natural sciences and applied mechanics.	+	+		+
SC2. Ability in estimating the parameters of materials, structures and processes workability under operation conditions and find proper solutions to assure the specified level of structures and processes reliability, including under some uncertain conditions.	+	+		+
SC3. Ability in conducting technological and technical-	+	+		

economical assessment of efficiency of new technologies and hardware use.				
SC4. Ability in efficient choosing the technological equipment, sets of technical complexes, have basic ideas of their operation procedures.	+	+		
SC5. Ability in using analytical and numerical mathematical methods to solve problems of applied mechanics, namely to make calculations on durability, strength, resistance, rigidity under static and dynamic loading conditions aimed at machine parts and design reliability assessment.	+	+		
SC6. Be able to make technical measurements, obtain, analyze and critically assess the results of measurements.	+	+		+
SC7. Be able to use computer-aided design systems (CAD), manufacture (CAM), engineering research (CAE) specialized applied software to solve engineering problems on applied mechanics.	+	+		+
SC8. Ability of spacious thinking and spacious objects, structures and mechanisms reproduction as projection drawings and 3D geometrical models.	+	+		
SC9. Be able to present the results of his/her engineering activity keeping to generally accepted norms and standards.	+	+	+	
SC10. Be able to describe and classify a wide range of technical objects and processes based on deep knowledge and comprehension of the main mechanical theories and practices as well as on the basic knowledge of related sciences.	+	+		+

List of Syllabus educational components and their logical sequence.

Code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of credits	Form of summary control
1	2	3	4
COMPULSORY COURSES of EP			
ОК 1.	Life Safety and Fundamentals of Labor Protection	**4,0**	exam
ОК 2.	Interchangeability, Standardization and Technical Measurements	**4,0**	exam
ОК 3.	Higher Mathematics	**15,0**	exam
ОК 4.	Machine Parts and Foundations of Automated Designing Course project	**8,0**	exam
ОК 5.	Electrical Engineering, Electronics and Microprocessor Equipment	**4,0**	credit test
ОК 6.	Engineering Graphics and CAD Systems	**9,0**	exam
ОК 7.	Foreign Language for Specific Purposes	**6,0**	exam
ОК 8.	Fundamentals of Programming	**6,0**	exam
ОК 9.	History and Culture of Ukraine	**5,0**	exam
ОК 10.	Liquids and Gases Mechanics, Hydraulic and Pneumatic Actuator	**4,0**	credit test
ОК 11.	Strength of Materials	**9,0**	exam
ОК 12.	Theoretical Mechanics	**5,0**	exam
ОК 13.	Foundations of Heat Engineering	**5,0**	exam
ОК 14.	Theory of Mechanisms and Machines	**4,0**	exam
ОК 15.	Technoecology and Civil Safety	**4,0**	credit test
ОК 16.	Techniques of Mechanical Engineering	**4,0**	exam
ОК 17.	Technology of Structural Materials and Material Science	**8,0**	exam
ОК 18.	Ukrainian for Specific Purposes	**5,0**	exam
ОК 19.	Physics	**12,0**	exam
ОК 20.	Physical Education*	**0,0**	
ОК 21.	Philosophy	**4,0**	exam
ОК 22.	Design, Production and Engineering of Welded Structures	**18,0**	exam
ОК 23.	Theory of Thermal Processes in Welding and Metal Working	**4,0**	exam
ОК 24.	Technologies and Equipment of Machine Building Production	**14,0**	exam
ОК 25.	Industrial Internship	**3,0**	grading tests
ОК 26.	Introductory Internship	**3,0**	grading tests
ОК 27.	Engineering and Production Practical Training	**3,0**	grading tests
The total amount of compulsory components:		**170,0**	
OPTIONAL COURSES of EP			
ВБ 1.	Bibliography and its Use in Modern Search Engines	**4,0**	credit test
ВБ 2.	Engineering Business Foreign Language	**10,0**	exam
ВБ 3.	Diagnostics and Quality Control in Machine Building Production	**3,0**	credit test
ВБ 4.	Fundamentals of Law	**3,0**	credit test
ВБ 5.	CAM and CAE Systems of Machine Building Production	**7,0**	exam
ВБ 6.	Automated and Robotic Systems	**4,0**	exam
ВБ 7.	Introduction to Specialism	**6,0**	exam
ВБ 8.	Engineering Solutions Efficiency	**4,0**	credit test

ВБ 9.	Modeling of Systems and Processes in Applied Mechanics	**3,0**	credit test
ВБ 10.	Fusion Welding Techniques, Surfacing and Spraying	**7,0**	exam
ВБ 11.	Theory of Technical Systems	**4,0**	credit test
ВБ 12.	Techniques and Equipment of Parts Machining and Pressure Welding	**8,0**	exam
	The total amount of optional components:	**61,0**	
State attestation			
ДР	**Execution and defense of bachelor's thesis**	**9,0**	
	The total amount of educational program	**240,0**	

2.2 Structure-logic scheme of EP

Brief description of logical sequence of EP components study.

Structure-logic scheme of EP															
1 year of study				2 year of study				3 year of study				4 year of study			
1 term		2 term		3 term		4 term		5 term		6 term		7 term		8 term	
ЕС-7	ОК-3	ОК-3	ОК-7	ОК-3	ОК-7	ОК-2	ОК-11	ОК-1	ОК-5	ОК-22	ОК-27	ОК-24	ОК-22	ОК-24	ВБ-2
ОК-8	ОК-6	ОК-9	ОК-26	ОК-11	ОК-12	ОК-13	ОК-19	ОК-4	ОК-10	ОК-4	ВБ-5	ВБ-5	ВБ-2	ВБ-8	ВБ-3
ОК-9	ВБ-1	ОК-15	ОК-17	ОК-17	ОК-19	ОК-18	ВБ-4	ОК-14	ОК-16	ОК-24	ВБ-9	ВБ-10	ВБ-6	ОК-22	ВБ-6
ВБ-11	ОК-20	ОК-19	ОК-6	ОК-18	ОК-21	ВБ-7	ОК-25	ОК-18	ВБ-2	ВБ-2	ОК-23	ВБ-12			
		ОК-20				ВБ-2				ВБ-12				ДР	

3 Forms of attestation of the first (Bachelor's) degree of higher education

The Attestation of students majoring in 131 Applied mechanics takes place in the form of public defense of Qualification diploma paper and a standard document of the Bachelor degree and the Qualification «Bachelor of Applied mechanics» is awarded. The Attestation is open and public.

3 Matrix of program competencies accordance to educational program components

	ОК 1	ОК 2	ОК 3	ОК 4	ОК 5	ОК 6	ОК 7	ОК 8	ОК 9	ОК 10	ОК 11	ОК 12	ОК 13	ОК 14	ОК 15	ОК 16	ОК 17	ОК 18	ОК 19	ОК 20	ОК 21	ОК 22	ОК 23	ОК 24	ОК 25	ОК 26	ОК 27	ВБ 1	ВБ 2	ВБ 3	ВБ 4	ВБ 5	ВБ 6	ВБ 7	ВБ 8	ВБ 9	ВБ 10	ВБ 11	ВБ 12
GC 1			+	+		+				+	+	+		+		+						+	+	+								+	+	+	+	+	+	+	+
GC 2		+		+						+	+	+		+		+	+					+	+	+				+				+	+	+	+	+	+	+	+
GC 3		+		+	+					+	+	+	+	+	+	+						+	+	+				+				+	+	+	+	+	+	+	+
GC 4		+		+						+	+	+		+		+						+	+	+					+			+	+	+	+	+	+		+
GC 5					+		+	+					+		+			+		+									+					+						
GC 6		+		+	+					+	+	+	+	+																			+						
GC 7		+		+						+	+	+		+		+	+					+		+				+				+	+	+	+	+	+		+
GC 8							+	+									+	+			+								+											
GC 9							+	+										+			+							+	+			+	+	+	+	+	+		+
GC 10																			+					+								+		+			+		+
GC 11	+								+																						+			+	+			+	
GC 12					+		+	+					+			+	+	+			+	+		+				+	+			+	+			+	+		+
GC 13		+		+						+	+	+		+		+						+		+					+		+	+			+	+		+
GC 14	+														+										+	+					+						+		
GC 15	+				+			+					+		+				+						+	+			+		+			+				+		
SC 1		+		+	+					+	+	+	+	+								+	+	+				+	+				+		+	+		+
SC 2		+		+						+	+	+		+								+		+					+		+					+		+

	ОК 1	ОК 2	ОК 3	ОК 4	ОК 5	ОК 6	ОК 7	ОК 8	ОК 9	ОК 10	ОК 11	ОК 12	ОК 13	ОК 14	ОК 15	ОК 16	ОК 17	ОК 18	ОК 19	ОК 20	ОК 21	ОК 22	ОК 23	ОК 24	ОК 25	ОК 26	ОК 27	ВБ 1	ВБ 2	ВБ 3	ВБ 4	ВБ 5	ВБ 6	ВБ 7	ВБ 8	ВБ 9	ВБ 10	ВБ 11	ВБ 12
SC 3																+						+		+						+					+		+		+
SC 4					+																	+		+									+			+	+		+
SC 5		+		+	+					+	+	+		+								+	+													+			
SC 6		+		+	+					+	+	+		+										+						+									
SC 7		+		+						+	+	+		+																		+							
SC 8						+																+			+	+						+							
SC 9		+			+	+							+			+						+		+			+	+		+		+					+		
SC 10		+		+	+		+			+	+	+		+								+	+	+				+	+				+	+			+	+	

4 Matrix of program learning outcomes accordance (PLO) to educational program components

	ОК 1	ОК 2	ОК 3	ОК 4	ОК 5	ОК 6	ОК 7	ОК 8	ОК 9	ОК 10	ОК 11	ОК 12	ОК 13	ОК 14	ОК 15	ОК 16	ОК 17	ОК 18	ОК 19	ОК 20	ОК 21	ОК 22	ОК 23	ОК 24	ОК 25	ОК 26	ОК 27	ВБ 1	ВБ 2	ВБ 3	ВБ 4	ВБ 5	ВБ 6	ВБ 7	ВБ 8	ВБ 9	ВБ 10	ВБ 11	ВБ 12
РН 1			+	+								+	+		+		+					+	+							+					+			+
РН 2				+	+		+				+	+			+								+															
РН 3				+										+		+							+													+	+		+
РН 4				+										+	+								+							+							+		+
РН 5				+		+									+										+	+	+				+	+				+			
РН 6		+		+		+						+	+	+	+	+			+				+		+	+	+	+									+	+		+
РН 7		+				+		+									+	+					+		+	+	+	+			+		+		+			+		+
РН 8						+		+																				+				+				+			
РН 9					+						+	+			+																						+		
РН 10					+																	+		+								+				+		+
РН 11					+																											+							
РН 12						+																			+	+	+				+	+							
РН 13																	+													+				+		+			
РН 14																	+					+		+								+		+		+		+
РН 15	+															+									+	+	+	+											
РН 16			+	+			+			+			+	+		+				+		+	+						+		+			+					

6 Matrix of learning outcomes accordance to competencies

Program learning outcomes	Competencies																								
	Integral	**General**																**Special (professional, subject area)**								
		GC 1	**GC 2**	**GC 3**	**GC 4**	**GC 5**	**GC 6**	**GC 7**	**GC8**	**GC9**	**GC10**	**GC 11**	**GC 12**	**GC 13**	**GC 14**	**GC 15**	**SC1**	**SC2**	**SC 3**	**SC 4**	**SC 5**	**SC 6**	**SC 7**	**SC 8**	**SC 9**	**SC 10**
PH1) Choose and use proper mathematical methods for the problems of applied mechanics solving.	+	+	+	+	+		+	+						+			+	+			+	+	+			+
PH2) Use knowledge of theoretical principles of fluids mechanics, heat engineering, and electrical engineering to solve professional assignments;	+		+				+	+						+			+									+
PH3) Make calculations on machine parts strength, fatigue limit, resistance, durability, rigidity;	+		+				+	+						+			+	+			+					
PH4) Estimate machine parts and design reliability under static and dynamic loading conditions;	+		+				+	+						+			+	+			+					+
PH5) Create geometrical models of machine parts, structures and mechanisms as spacious objects and projection images, and arrange their results as technical and working drawings;	+		+				+	+						+												
PH6) Create and theoretically substantiate the structures of machines, mechanisms and their components on the basis of applied mechanics methods, general	+		+				+	+						+												

principles of design, theory of interchangeability, standard techniques of machine parts calculation;																										
PH7) Apply regulatory and reference data to monitor the technical documents, products and technologies meeting the standards, specification and other regulatory documents;	+		+				+	+						+												
PH8) Know and understand the fundamentals of IT, programming, use applied software in practice to make engineering calculations, to process information and results of experimental research;	+		+				+	+						+												
PH9) Know and understand related branches (fluids mechanics, heat engineering, electrical engineering, electronics) and be able to find interdisciplinary links of applied mechanics at the level necessary to meet the other requirements of educational program;	+		+				+	+						+												
PH10) Know the structures, techniques of choice and calculation, principles of service and maintenance of machine tool and robotic equipment drives;	+		+				+	+						+												
PH11) Understand the operating principles of computer-aided control systems of production machinery, namely microprocessor, choose and use the most efficient automated facilities;	+		+				+	+						+												
PH12) Skills of practical use of	+		+				+	+						+												

computer-aided design systems (CAD), manufacture (CAM), engineering research (CAE);																										
PH13) Estimate the technical-economic efficiency of production;	+		+				+	+			+	+		+												
PH14) Provide the efficient choice of the technological equipment, sets of technical complexes;	+		+				+	+						+												
PH15) Take onto account the main factors of technology-related impact on the environment and the main methods of environmental protection, labor safety and life and safety issues while decisions making;	+		+				+	+			+	+		+	+	+										
PH16) Be able to speak and write fluently on professional issues in state and a foreign languages, including the knowledge of special terminology and skills of interpersonal communication;	+				+	+	+	+	+	+			+		+	+										

Head of educational program,

Doctor of Science (Engineering), Prof. of the

Mechanical Engineering Technology Department

Pylypets M.I.