

<b>Programme specification (Master's degree)</b> <b>163 «Biomedical engineering»</b> <b>with specialization “Biomedical engineering”</b>		
Higher education /program level	FQ-EHEA – the second cycle, EQF LLL – level 7, HPK – level 7 / Master's degree	
Full name of qualification	Biomedical engineer-researcher	
Programme official name	Specialty educational program 163 «Biomedical engineering» field of knowledge 16 «Chemical and bioengineering»	
Diploma type and number of credits according to the program	Master's Diploma (Single Honors) , 90 credits CKTC	
Higher educational establishment	Ternopil I.Pulu'y national technical university	
Accreditation institution	National agency of higher education quality assurance	
<b>A.</b>	<b>Programme purpose</b>	
	General and professional competences forming and development in the field of biomedical engineering aimed at student's acquiring knowledge and comprehension to solve problems of complex systems analysis and synthesis of complex biotechnical and medical apparatuses and systems based on the latest medical, information and computer technologies using modern achievements of fundamental and engineering sciences	
<b>B.</b>	<b>Programme characteristics</b>	
1	Subject-matter discipline	16 “Chemical and bioengineering”
2	Subject-matter discipline description	<p><b>Study and (or) activity objects:</b></p> <ul style="list-style-type: none"> <li>- medical industry enterprises;</li> <li>- medical establishments;</li> <li>- rehabilitation, sport and recreational complexes, laboratories, departments of life-sustaining treatment, intensive therapy, anesthesiology and surgical departments;</li> <li>-diagnostic-healthcare laboratories and medical institutions departments dealing with medical laboratory equipment use, medical imaging equipment and isotropic materials;</li> <li>- structural subdivisions of medical, scientific, educational establishments.</li> </ul> <p><b>Study goals:</b> be competent in the field of development, design, production, maintenance and service of biological and medical instruments and systems; development of design-engineering documentation, teaching methods for further teacher-training activity, estimation of correspondence to technical regulations, standards of biosecurity and biosafety: biological and medical engineering, biomedical products and biomaterials of medical use and artificial organs, biological and medical technologies, and also the proper software and IT for biology, medicine and medical and biological instrument-making.</p> <p><b>Theoretical content:</b> modern medical technologies, modern techniques, methods and facilities of development, design, maintenance, certification and standardization of medical and biological instruments and systems.</p> <p><b>Methods and techniques:</b> medical and biological research methods, methods of biomedical signals and images processing, biomedical instruments and systems design; methods of biomedical instruments and systems maintenance, certification and standardization; software</p>

		and IT for biology, medicine and medical instrument-making; biological and medical technologies <b>Instruments and equipment:</b> biological and medical equipment, biomedical products and biomaterials of medical use, software.
3	Programme status	Educational-professional
4	Peculiar and distinctive features	Regular renewal that allows taking into consideration the tendencies of medical, engineering and information technologies development. It is mobile according to the program of academic mobility « Double Diploma»
<b>C.</b>	<b>Graduate rights</b>	
1	Graduate academic rights	Possibility of study on the program of the third (educational-scientific) level of higher education
2	Employment	<b>Main positions according to ДК 003:2010:</b> Biomedical engineer-researcher; Biomedical engineer; Junior researcher; Lecturer of a university or a higher educational establishment. <b>Main positions according to International Standard Classification of Occupations 2008 (ISCO-08):</b> – 2149 Engineer, biomedical; – 2131 Researcher, biomedical
<b>D.</b>	<b>Teaching techniques and rating system</b>	
1	Teaching techniques and methods	Teaching process involves both traditional techniques and new technologies. Traditional methods: lectures, tutorials, practical and laboratory classes; new technologies: student-focused study, self-study, distance study using other modern teaching techniques etc.
2	Rating system	Tests, presentations, reports of laboratory works and internship programs, course (projects) papers, control papers, oral and written exams, diploma thesis.
<b>E.</b>	<b>Programme competence</b>	
1	Integral	Ability to solve complex tasks and problems in specific field of professional activity or in the study process aimed at conducting research and/or making innovations and is characterized by complex and uncertain conditions
2	General competence	<b>System competence</b> (combination of realization, comprehension and knowledge )
		3K1. Ability to generate new ideas (creativity)
		3K2. Ability to develop and manage projects
		3K3. Ability to apply knowledge in practical activity
		3K4. Ability to conduct research at proper level
		3K5. Ability to adapt and work under unfamiliar conditions
		3K6. Ability to work either independently or in team
		3K7. Ability to motivate people and move to the common goal
		3K8. Ability to evaluate and provide quality of work
	3K9. Determination and persistence in setting tasks and taking responsibilities	

		3K10.	Ability to study and to get modern education
		<b>Tools competence</b> (cognitive, methodological, technological and linguistic abilities)	
		3K11.	Ability of time planning and managing
		3K12.	Ability of abstract thinking, analysis and synthesis
		3K13.	Skills of information and communication technologies use
		3K14.	Ability of information from different sources search, processing and analysis
		3K15.	Ability to find, set and solve problems
		3K16.	Ability to make reasonable decisions
		3K17.	Ability to speak a foreign language at a professional level
		<b>Interpersonal competence</b> (social interaction and cooperation)	
		3K18.	Ability to be critical and self-critical
		3K19.	Ability to work in international context
		3K20.	Ability to act on the ethics position (reasons)
3	<b>Professional competence</b>	CK1.	A skill in using modern systems of scientific-technical information, conduct patent search and file patent documents
		CK2.	Be able of scientific substantiation of teaching and educating principles choice, solving different pedagogic tasks dealing with high school problems, characterizing different psychological- pedagogical communication models in high school, analyzing their pedagogic activity results.
		CK3.	Ability to make proximate-economic analysis of economic efficiency indices of scientific research and/or new medical equipment
		CK4.	Ability to see problems and estimate biomedical engineering development prospects
		CK5.	Be able to provide engineering support of medical technologies
		CK6.	A skill in organization and making medical experiments aimed at main medical-biological vital signs of human body identification
		CK7.	Ability to study biological objects on bio signals, develop and improve methods and aids of diagnostics and treatment
		CK8.	Be able to use computer equipment to examine human body state
		CK9.	A skill in developing biotechnical systems design (medical equipment, artificial organs etc.) using computer technologies
		CK10.	Ability to develop, study, improve and operate telemedicine systems
		CK11.	Ability to solve scientific-engineering problems on experiments and observations results processing using methods of medical statistics and bio objects introscopy
		CK12.	Be able to develop systems and software for biomedical information processing and visualization

		CK13.	Be able to develop and apply numerical analysis methods and software to solve problems of research, design, production and operation of new engineering objects and technologies in biomedical engineering
		CK14.	Ability to plan, organize and conduct theoretical and experimental research in the field of biomedical engineering
		CK15.	Ability to develop, study, improve and operate mobile medical devices and implants, their software to solve applied and fundamental problems of biomedical engineering
		CK16.	Ability to study, develop, improve, optimize and model artificial intelligence systems in medicine
<b>F</b>	<b>Programme learning outcomes</b>		
	PH1.	Ability to generate original ideas, to avoid traditional thinking schemes, to solve problems quickly	
	PH2.	Skill in current project monitoring using operational data under cooperation in working groups on mutual IT project conditions, using proper software and hardware	
	PH3.	Skill to apply knowledge in practice	
	PH4.	Ability to carry out experimental research and use research skills on professional theme.	
	PH5.	Skill to adapt to new situations	
	PH6.	Skill to work both in team and by himself/herself	
	PH7.	Skill to be responsible in work and to gain his/her ends	
	PH8.	Be able to bear responsibility for one's actions and to be responsible in working environment	
	PH9.	Ability to learn applying new approaches	
	PH10.	Skill in time planning and managing	
	PH11.	Skill to apply knowledge and comprehension to solve problems of analysis and synthesis in the systems specific for chosen field	
	PH12.	Skill in communicating with colleagues, academic society at international level to implement an innovative project or solve a scientific problem	
	PH13.	Skill to apply information and communication technologies to solve different research and professional tasks	
	PH14.	Skill of information search in different sources for professional problems solving	
	PH15.	Skill to adapt to new situations, to make reasonable decisions and estimate their results	
	PH16.	Skill of criticism perception, self-criticism, be self-critical to his/her actions, and criticize the results of work	
	PH17.	Skill of public, business and scientific communication	
	PH18.	Skill to follow the code of professional ethics, moral norms and valuables in behavior, keep to etiquette rules	
	PH19.	Skill in working with standard-normative acts and patent documents at application on industrial property object preparing and executing (invention, useful model, industrial pattern, logo for goods and services), and also licenses to use inventions	

PH20.	Ability to keep to ethics norms and author's right whilst scientific research conducting, their results presentation and in scientific-pedagogical activity.
PH21.	Skill in applying main tendencies of theory and practice development of engineering decisions feasibility report, main statements of specifications and techniques to determine economic efficiency of scientific research and/or new medical equipment
PH22.	Skill in building efficient models, algorithms and methods of formal and comprehensive forecast in science and engineering to solve biomedical engineering problems
PH23.	Skill in developing an improving methods and aids of support, introduction, engineering support of existing and latest medical technologies, hardware in medicine, engineering infrastructure, quality and safety management in medical establishments.
PH24.	Skill in introducing into medicine modern methods of complex and functional examination according to certain task, external conditions of an experiment, hardware and medical staff qualification
PH25.	Skill in improving methods and aids of bio signals selection, processing and interpretation for biological objects study, development and improvement of diagnostics and treatment methods and facilities
PH26.	Skill in choosing proper signal estimation method to diagnose its source state, signal classification and decision-making method, hardware and software to build computer systems of medical diagnostics and estimate its tactics-engineering and technical-economic efficiency
PH27.	Skill in applying practical methods, methodological aspects, computer-aided design logic whilst bioengineering systems design (medical equipment, artificial organs etc.)
PH28.	Skill in using modern information and telecommunication technologies for remote diagnostics and treatment, medical consulting, emergency assistance, proficiency enhancement of medical workers .
PH29.	Skill in applying mathematical-statistical methods and methods of bio object medical introscopy and its visualization whilst development and operation of computer medical systems and complexes
PH30.	Skill in analyzing and developing the structure of biomedical information visualization systems and their software to provide efficient visual diagnostics
PH31.	Skill in researching, developing and improving methods and facilities of mathematical and computer-aided modeling, computational methods aimed at use whilst comprehensive study and engineering objects and systems development or new modeling and calculation hardware or hardware-software development in biomedical engineering
PH32.	Skill in planning and practical implementation of independent original scientific research of scientific novelty, theoretical and practical value which assists solving scientific-technical problems in biomedical engineering
PH33.	Knowledge of technologies and tools of mobile medical devices and implants design, their software on different mobile information systems (platforms)
PH34.	Knowledge of modern construction principles of mathematical, software, linguistic, engineering and information support of artificial intelligence systems in medicine

