Programme specification (Bachelor)
«SOFTWARE ENGINEERING»

1 – General information	
Higher educational establishment	Ternopil I.Pulu'y national technical university
Full name of qualification	**Bachelor** (Bachelor-expert in Software Development and Testing)
Programme official name	Software Engineering
Diploma type and number of credits	Bachelor's Diploma (Single Honours) , 240 credits ECTS, duration of study – 2-4 years
Accreditation	Accreditation commission of Ukraine (National agency of higher education quality assurance)
Cycle/Level	
Requirements	Full general secondary education or professional training
Language of study	Ukrainian
Basic concepts and their definitions	Basic concepts and their definitions are used in the programme according to the higher education standards on the specialism "Software engineering"
2 – Programme purpose	
	Provide theoretical knowledge and practical skills necesssary for successful performance of professional duties on specialism "Software engineering" and prepare students for further study on the chosen specialty
3 – Programme characreristics	
Subject-matter discipline	"Software engineering" - cycle of general training: cycle of professional training: cycle of professional training
Programme orientation	Educational-professional programme. It is based on generally accepted statements and results in software developments and testing; it is oriented on actual specializations for further possible professional and scientific carrier: software design, including requirements analysis, modelling, software design and architecture choice, perfect code writing, verification, testing, software evolution, software projects management and work in programmers teams
Programme focus and specialization. Peculiar and distinctive features.	Special education and professional training in the field of software engineering. ***Key words:*** *Requirements Analysis, Verification, Validation, Requirement, User Requirements, Software Construction, needs, Software Engineering, Software, Software Requirements,*

	Software Product, Software Design, Architectural Design, Top-Level Design , Software Detailed Design , System Requirements, Specification, User Requirements Specification, concept <of operation>, System Requirements, Software Requirements Specification – SRS, Software Testing, Requirements Management, Software Engineering Management, Functional Requirements
4 – Employment and further study	
Employment	Jobs in state and private sectors of IT- companies of Ternopil region, Ukraine and EU in different spheres, namely: software projects programming and management; computer networks administrating; Web-programming, software testing, development of automated and intelligent systems and scientific research support (R&D), scientific-pedagogical activity
Further study	All Master's programs in the field of software systems design and engineering, informatics and computing engineering, and also Master's program in the specialty "Software engineering"
5 – Teaching and rating	
Teaching and study	Educational process involves lectures, including those with multimedia and other technical facilities use; laboratory works; practical classes; individual classes; self-study using textbooks, manuals, lectures notes and Internet; tutorials, course papers and projects; Bachelor's diploma writing
Rating	Current tests and questionaires, laboratory reports; oral presentations; final tests on each module; rector's test; exams in the written or oral form; course papers and projects estimation; Bachelor's diploma defence.
6 – Programme competence	
Integral competence	Possessing sound knowledge and practical skills in complex software systems design, mastering methods of software engineering and computing, object-oriented technologies of design and programming. Ability to solve complex specific tasks and practical problems in the professional activity in the field of software development and testing or in the studying process, involving modern methods and technologies use in top-level software products development, using: object-oriented principles of design and programming (*C/C++, Java/J2EE, C#/.Net*), hardware and development (*Visual Studio, Eclipse, NetBeans*), databases, interplatform use. The focus is made on software design theory and practical experience, including requirements

	analysis, modeling, software design and architecture choice, perfect code writing, verification, testing, software evolution, software projects management and work in teams of programmers.
General competence	1) basic knowledge of fundamental subjects enough to master general professional disciplines;
	2) knowledge of main conceptions of philosophy, psychology, pedagogics assisting general culture development and personal socialization, inclination to ethic valuables, knowledge of national history, economy and law, comprehension of causal-consequential links of society development and a skill of their use in professional and social activity;
	3) main knowledge of modern standards and processes of software quality management;
	4) mastering the fundamentals of system analysis methods and technologies ;
	5) keeping to professional ethics of software engineering;
	6) ability to speak at least two languages;
	7) ability to convince his/her colleagues in the right decision he/she has made, a skill of his/her position substantiating;
	8) ability to use hardware capabilities;
	9) ability to use network software systems capabilities;
	10) ability to use operation, office systems capabilities;
	11) ability to find, set and solve problems, to make substantiated decisions;
	12) ability to act on the ethics positions (reasons);
	13) ability of information from different sources search, processing and analysis, conduct investigations at proper level;
	14) ability to organize work according to life security and labor protection requirements, a skill of following them in professional activity;
	15) ability to provide and estimate quality of work;
	16) ability to work in interdisciplinary team;
	17) ability to work both in team and by himself/herself, motivate people and move to common aim;
	18) ability to conduct business negotiations with partners;
	19) ability to speak and write mother tongue;
	20) be eager to protect environment.
Special (professional) competence	1) basic notions of software modeling fundamentals, models types, main conceptions of UML;

	2) basic notions of modern psychological principles of man-machine interaction, aids of man-machine interface development;
	3) software verification and validation;
	4) mastering fundamentals of software design;
	5) mastering fundamentals of object-oriented programming methods and technologies;
	6) ability to analyze, design and prototype man-machine interface;
	7) ability to provide programs and data security against unauthorized operation;
	8) ability to apply and develop recoverable components;
	9) ability to analyze requirements, to develop software requirements specification, perform their verification and validation;
	10) ability of modeling different aspects of the system, for which software is being developed;
	11) ability to take part in database design and implementation;
	12) ability to design architecture components of software products;
	13) ability to solve mathematical, physical and economical problems by means of proper applications development;
	14) ability to develop data algorithms and structures for software products;
	15) ability to develop users demands specifications to software;
	16) ability to execute records (manuals) for software projects;
	17) modern notions of information models and systems, relational and distributed databases, query languages to databases;
	18) modern notions of engineering requirements to software;
	19) modern notions of software structure and architecture, methods of software design;
	20) typical processes of software engineering, ability to introduce and manage them
7 – Programme learning outcomes	
Knowledge	- to be well-trained in mathematics, and also to be well-trained in theory, methods and algorithms of IT to use mathematical apparatus at applied and scientific tasks solving in the field of information systems and technologies; - sound training in the field of programming, possessing algorithmic thinking, mastering software engineering methods to introduce software taking into account the requirements on its

	quality, reliability, production characteristics; - knowledge of standards, methods and aids of life cycle management of information systems, IT products and services; mastering the software development technology according to customer requirements and restrictions; - basic knowledge in the field of computer engineering enough to comprehend the fundamental principles of hardware organization and functioning of modern systems of information processing, main characteristics, capabilities and spheres of usage of multipurpose computing systems; - ability to design in the professional activity, a skill to build and use models for describing objects and processes, to make their analysis.
Skills	- be well-trained to develop new mathematical models, effective algorithms and methods of information systems and technologies functions implementation in applied fields, including artificial intelligence methods and systems development; - knowledge of standards, methods and aids of life cycle management of information systems, IT products and services; - mastering the software development technology according to customer requirements and restrictions; - a skill in using IT standards and specifications which determine the capabilities, dynamics, protocols of interaction, and also other characteristics of IT systems, products and services; - a skill in using hardware of modern systems of information processing, multipurpose computing systems; - a skill in projects development on information systems and technologies creation and implementation, necessary project documents, procedures and aids of their life cycle management.
Communication	- ability to communicate, including oral and written communication in Ukrainian and one of foreign languages (English, German, French); - ability to use various methods, namely IT, for effective communication at social and professional levels.
Independence and responsibility	- be able to adopt to new situations and make decisions; - be able to realize the importance of study during all life and to advance the obtained professional knowledge and to gain new ones; - ability to be responsible in his/her work and achieve the aim keeping to professional ethics requirements; - ability to comprehend the fundamentals of life security and labor protection requirements.
8 – Resources supporting of the programme implementation	

Staffing features	More than 73% of teaching staff involved in profession-oriented courses are awarded with the Degree in specialty
Material and equipment features	Educational processes is supported by all necessary equipment which meets modern requirements of information component rise in teaching and testing. All classrooms of the software engineering department are computerized that allows to increase the efficiency of training specialists and guarantee the early computer equipment mastering. Modern material and equipment use, specialized laboratories (laboratory of object-oriented programming and software engineering, software design, verification and testing laboratory, program management, embedded systems and STMicroelectronics technologies laboratory, laboratory of software projects management (joined laboratory of TNTU and French software company Open Group), university classrooms.
Information and methodological support features	The essential component of educational process is e-learning (virtual education environment) carried out through the Centre of e-learning and Center of IT of TNTU, a number of IT-labs and programmes of leading world software companies (Academy CISCO, Microsoft IT Academy, SUN Microsystems IT Academy etc.) and author's developments of the staff
9 – Programme main components	
List of educational components (disciplines, internship programs, course and qualification papers)	Compliance matrices of the Programme competence with the courses and curricula are given in the Appendices.
10 – Academic mobility (is subject to the statement КМУ № 579 „About approval of Statement concerning right for academic mobility enjoyment order" of August 12, 2015)	
National credit mobility	Based on mutual agreements between TNTU and technical universities of Ukraine
International credit mobility	As part of program EC Erasmus+ based on mutual agreements between TNTU and educational establishments of countries-partners.
Teaching foreigners	Possible after Ukrainian language course