3. Educational programme.

Computer science (Bachelor's degree). Director of the educational programme - P.G. Demidov, Phd. in Technical Sciences, Associate Professor, Associate Professor of the Department of Computer Sciences and Information Systems

3.1. Profile of the educational programme "Computer Science" in the Field of Study F3 "Computer Science"

1- GENERAL INFORMATION	
Full name of the institution of higher education and structural subdivision	State University of Trade and Economics Faculty of Information Technologies Department of Computer Science and Information Systems
Higher education degree and the name of the qualification in the language of the original	**The First (Bachelor) Degree of higher education: Qualification – Bachelor in Computer Science**
Subject area	**F Information Technologies**
Field of Study	**F3 Computer Science**
The name of the educational programme	Computer Science
Restrictions on forms of education	No restrictions
Compliance with the standard of higher education of the Ministry of Education and Science of Ukraine	The programme is in compliance with the standard of higher education of the Ministry of Education and Science of Ukraine (Order № 962 off 10.07.2019)
Type of diploma and volume of educational programme	Bachelor's degree diploma, unit-based. The volume of educational programme – 90 ECTS credits, Normative study period: 3 years 10 months
Availability of accreditation	Certificate of accreditation of the educational programme No. 1903. The date of issuance is 30.06.2021, valid by 01.07.2026.
Cycle / Level of higher education	NQF of Ukraine - 6th level FQ for EHEA –the first cycle EQF for LLL – 6th level

Prerequisites for the educational program enrolment	Full secondary education
Language (s) of teaching	Ukrainian, English
The duration of the educational programme	Until the approval of the new edition of the educational and professional program
Internet address of the permanent placing of the educational programme	https://knute.edu.ua/

2- THE PURPOSE OF THE EDUCATIONAL PROGRAMME

Training of highly qualified specialists who have mastered modern achievements in the field of computer science, have theoretical knowledge and are able to formulate and solve practical problems in complex systems of various nature using fundamental and applied methods of computer science and technology, which makes it possible to effectively solve problems in their professional activities. To provide high-quality education in the field of information technology, competitive in the labour market, to prepare students with a special interest in computer science issues, ready for master's studies.

3- CHARACTERISTICS OF THE EDUCATIONAL PROGRAMME

Subject area

Object(s) of study and/or activity:

- mathematical, informational, simulation models of real phenomena, objects, systems and processes, subject areas, data and knowledge representation;
- methods and technologies for obtaining, storing, processing, transmitting and using information, data mining and decision-making;
- theory, analysis, development, performance evaluation, implementation of algorithms, high-performance computing, including parallel computing and big data.

Learning goals: training of specialists capable of conducting theoretical and experimental research in the field of computer science; applying mathematical methods and algorithmic principles in modelling, designing, developing and maintaining information technologies; developing, implementing and maintaining intelligent systems for analysing and processing data of organisational, technical, natural and socio-economic systems.

Theoretical content of the subject area: modern models, methods, algorithms, technologies, processes and methods of obtaining, representing, processing, analysing, transmitting, storing data in information systems.

Methods, techniques and technologies: mathematical models, methods and algorithms for solving theoretical and applied problems arising in the development of IT; modern technologies and programming platforms; methods of collecting, analysing and consolidating distributed information; technologies and methods of designing, developing and ensuring the quality of IT components; computer graphics and data

visualisation technologies; knowledge engineering technologies, CASE technologies for modelling and designing IT.

Tools and equipment: distributed computing systems; computer networks; mobile and cloud technologies, database management systems, operating systems.

Orientation of the educational programme

Educational and professional, fundamental, applied.

The main focus of the educational programme

Higher education in the field of information technology, speciality 'Computer Science'. The main emphasis of the educational programme is based on well-known scientific and practical modern achievements in the field of information technology and is focused on training specialists capable of solving complex problems related to modelling, design, development, software implementation and support of computer systems and technologies, including those based on distributed server systems and using intelligent mechanisms for data analysis and processing.

Keywords: programming, algorithmisation, modelling, computer data processing, computer systems and technologies, Machine Learning, Big Data Processing, C#, C++, Python, Java Script, computer networks, distributed server systems, distributed and parallel computing, fuzzy models and networks, computational intelligence methods.

Peculiarities of the programme

The peculiarity of the educational program "Computer Science" is its content, which takes into account modern trends in the field of information technology and provides in-depth study of modern achievements in the field of intelligent data processing mechanisms, machine learning, artificial intelligence, computer vision technologies, aimed at developing modern models, methods, algorithms, data processing technologies in intelligent management systems. The qualification works explore the subject area related to the development of computer systems in various areas of trade and economic activity, including those based on intelligent data processing mechanisms. The presence of a variable component of professionally oriented disciplines for computer science; practical training in government institutions, enterprises and organizations.

4- SUITABILITY OF GRADUATES FOR EMPLOYMENT AND FURTHER EDUCATION

Suitability for employment

Graduates of this educational and professional program in the specialty "Computer Science" according to the National Classifier of Occupations DK 003:2010 can be employed in positions with the following professional title:

213 Professionals in the field of computing (computerization);
2131 Professionals in the field of computer systems;
2131.2 Computer systems developers;
2131.2 System administrator.
2132.2 Computer program developers;
2132.2 Software engineer
2132.2 Database programmer
2132.2 Application programmer
3121.2 Information technology specialist;

3121.2 Computer program development specialist; 3121.2 Software development and testing specialist.
Further training
The right to continue their studies at the second (master's) level of higher education. Acquisition of additional qualifications in the system of postgraduate education.
5- TEACHING AND ASSESSMENT
Teaching and learning
Problem-based learning, self-study, learning through practical training. A balanced combination of classroom classes (lectures, laboratory classes, practical classes, independent work with information sources, teacher consultations), distance learning and independent work based on problem-based, interactive and self-study learning.
Assessment
Current control, written exams, defence of term papers, defence of qualification work. Assessment is carried out in accordance with the Regulations on Assessment of Undergraduate and Postgraduate Students‘ Learning Outcomes at SUTE and the Regulations on the Organisation of the Students’ Educational Process.

6- PROGRAMME COMPETENCIES	
Integral competence	
The ability to solve complex specialised tasks and practical problems in the field of computer science or in the process of studying, which involves the application of theories and methods of information technology and is characterised by complexity and uncertainty of conditions.	
General competences (GC)	
GC1	Ability to think abstractly, analyse and synthesise.
GC2	Ability to apply knowledge in practical situations.
GC3	Knowledge and understanding of the subject area and understanding of professional activities.
GC4	Ability to communicate in the state language both orally and in writing.
GC5	Ability to communicate in a foreign language.
GC6	Ability to learn and master modern knowledge.
GC7	Ability to search, process and analyse information from various sources.
GC8	Ability to generate new ideas (creativity).
GC9	Ability to work in a team.
GC10	Ability to be critical and self-critical.
GC11	Ability to make informed decisions.
GC12	Ability to assess and ensure the quality of work performed.
GC13	Ability to act on ethical considerations.
GC14	Ability to exercise one's rights and responsibilities as a member of society, to understand the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine.

GC15	Ability to preserve and enhance moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technology, to use various types and forms of physical activity for active recreation and healthy lifestyle.
GC16	Ability to make decisions and act in accordance with the principle of inadmissibility of corruption and any other manifestations of dishonesty.
Special (professional, subject area) competences (SC)	
SC1	Ability to mathematically formulate and study continuous and discrete mathematical models, justify the choice of methods and approaches for solving theoretical and applied problems in the field of computer science, analysis and interpretation.
SC2	Ability to identify statistical patterns of non-deterministic phenomena, apply computational intelligence methods, including statistical, neural network and fuzzy data processing, machine learning and genetic programming methods, etc.
SC3	Ability to think logically, build logical conclusions, use formal languages and models of algorithmic computing, design, develop and analyse algorithms, evaluate their effectiveness and complexity, solvability and intractability of algorithmic problems for adequate modelling of subject areas and creation of software and information systems.
SC4	Ability to use modern methods of mathematical modelling of objects, processes and phenomena, develop models and algorithms for numerical solution of mathematical modelling problems, take into account errors in approximate numerical solution of professional problems.
SC5	Ability to carry out a formal description of the tasks of researching operations in organisational, technical and socio-economic systems for various purposes, determine their optimal solutions, build models of optimal management taking into account changes in the economic situation, optimise management processes in systems of various purposes and hierarchy levels.
SC6	Ability to think systematically, apply the methodology of system analysis to study complex problems of different nature, methods of formalising and solving systemic problems with conflicting goals, uncertainties and risks.
SC7	Ability to apply the theoretical and practical foundations of modelling methodology and technology to study the characteristics and behaviour of complex objects and systems, conduct computational experiments with processing and analysis of results.
SC8	Ability to design and develop software using various programming paradigms: generalised, object-oriented, functional, logical, with appropriate models, methods and algorithms of computing, data structures and control mechanisms.
SC9	Ability to implement a multi-tiered computing model based on client-server architecture, including databases, knowledge and data warehouses, to perform

	distributed processing of large data sets on clusters of standard servers to meet the computing needs of users, including cloud services.
SC10	Ability to apply methodologies, technologies and tools to manage the life cycle processes of information and software systems, information technology products and services in accordance with customer requirements.
SC11	Ability to analyse data intelligently based on computational intelligence methods, including large and poorly structured data, to process it quickly and to visualise the results of the analysis in the process of solving applied problems.
SC12	Ability to ensure the organisation of computing processes in information systems for various purposes, taking into account the architecture, configuration, performance indicators of operating systems and system software.
SC13	Ability to develop network software that operates on the basis of various topologies of structured cabling systems, uses computer systems and data networks and analyses the quality of computer networks.
SC14	Ability to apply methods and means of ensuring information security, develop and operate special software to protect information resources of critical information infrastructure.
SC15	Ability to analyse and functional modelling of business processes, build and apply functional models of organisational, economic, production and technical systems, methods of risk assessment of their design.
SC16	Ability to implement high-performance computing based on cloud services and technologies, parallel and distributed computing in the development and operation of distributed systems for parallel information processing.
7-PROGRAMME LEARNING OUTCOMES	
PLO1	To apply knowledge of the basic forms and laws of abstract and logical thinking, the basics of the methodology of scientific knowledge, forms and methods of extracting, analysing, processing and synthesising information in the subject area of computer science.
PLO2	To use modern mathematical apparatus of continuous and discrete analysis, linear algebra, analytical geometry in professional activities to solve theoretical and applied problems in the process of designing and implementing information technology objects.
PLO3	To use knowledge of the laws of random phenomena, their properties and operations on them, models of random processes and modern software environments to solve problems of statistical data processing and build predictive models.
PLO4	To use methods of computational intelligence, machine learning, neural network and fuzzy data processing, genetic and evolutionary programming to solve problems of recognition, forecasting, classification, identification of control objects, etc.

PLO5	To design, develop and analyse algorithms for solving computational and logical problems, evaluate the effectiveness and complexity of algorithms based on the use of formal models of algorithms and computable functions.
PLO6	To use methods of numerical differentiation and integration of functions, solution of ordinary differential and integral equations, features of numerical methods and possibilities of their adaptation to engineering problems, to have skills in software implementation of numerical methods.
PLO7	To understand the principles of modelling organisational and technical systems and operations; use methods of researching operations, solving single- and multi-criteria optimisation problems of linear, integer, nonlinear, stochastic programming.
PLO8	To use the methodology of system analysis of objects, processes and systems for the tasks of analysis, forecasting, management and design of dynamic processes in macroeconomic, technical, technological and financial objects.
PLO9	To develop software models of subject environments, choose a programming paradigm from the standpoint of convenience and quality of application for the implementation of methods and algorithms for solving problems in the field of computer science.
PLO10	To use tools for developing client-server applications, design conceptual, logical and physical models of databases, develop and optimise queries to them, create distributed databases, data warehouses and showcases, knowledge bases, including those on cloud services, using web programming languages.
PLO11	To possess the skills of managing the life cycle of software, products and services of information technology in accordance with the requirements and restrictions of the customer, be able to develop project documentation (feasibility study, terms of reference, business plan, agreement, contract).
PLO12	To apply methods and algorithms of computational intelligence and data mining in the tasks of classification, forecasting, cluster analysis, search for associative rules using software tools to support multidimensional data analysis based on DataMining, TextMining, WebMining technologies.
PLO13	To master system programming languages and methods of developing programs that interact with computer system components, know network technologies, computer network architectures, have practical skills in computer network administration technology and software.
PLO14	To apply knowledge of the methodology and CASE tools for designing complex systems, methods of structural analysis of systems, object-oriented design methodology in the development and study of functional models of organisational, economic and production and technical systems.
PLO15	To understand the concept of information security, the principles of secure software design, ensure the security of computer networks in conditions of incomplete and uncertainty of the source data.

PLO16.	To perform parallel and distributed computing, apply numerical methods and algorithms for parallel structures, parallel programming languages in the development and operation of parallel and distributed software.

8- RESOURCE SUPPORT FOR THE IMPLEMENTATION OF THE PROGRAMME

Personnel support

The educational programme is delivered by teachers with PhD and doctoral degrees. The participation of foreign specialists and practitioners in teaching the disciplines of the professional training cycle is possible.

Material and technical support

The basis of the material and technical support is specialized computer laboratories with modern hardware and software resources, which ensure high-quality training of masters in the educational program "Computer Science". Students are fully provided with material resources for training and conducting research. At their service:
- more than 30 thousand m2 of educational buildings;
- dormitories;
- 470 seats in the reading rooms of SUTE, including in the multimedia library of SUTE, where access to the scientometric databases SCOPUS, Web of Science is provided;
- 2000 PC workstations with Internet access + WiFi. All computer equipment is equipped with basic software, special software is installed on computers in the laboratories of the departments, necessary for conducting classes and completing tasks by students;
- a distance learning laboratory, which houses 966 educational courses;
- an electronic platform for student communication based on Microsoft Office 365, etc.

Information and educational and methodical support

The documents regulating the procedures for admission and study at SUTE are available on the official website. Programs, work programs, subject syllabi and assessment criteria for educational components are posted on the corporate distance learning platform. Open access for higher education applicants to information and educational and methodological resources through information systems for managing the educational process and other web services:
- distance learning systems MOODLE (provides independent and individual training, control), Office 365 resources;
- availability of free access to the Internet and e-mail;
- information systems "MIA: Education", "Load-schedule", management of SUTE WEB resources;
- library fund management system - almost 1.5 million titles of educational and scientific literature in the SUTE library;
- electronic document management system "OPTiMA – WorkFlow";
- corporate information environment in the form of a "personal account" of the user of the SUTE web portal.

Ensuring the publicity of information about educational programs, higher education degrees and qualifications: implementation of the SUTE information policy, publication on the official website of SUTE of information packages of ECTS, educational programs, class schedules, as well as all components of the educational process, which are subject to

publication in accordance with the Law of Ukraine "On Higher Education". Ensuring an effective system for preventing and detecting academic plagiarism in scientific works of SUTE employees, higher education applicants (checking for plagiarism of all final qualification works, publications, publication of the text of dissertation research on the official website of SUTE), compliance with the Code of Ethics of a scientist of Ukraine. The university's electronic repository provides full-text access to SUTE scientific and educational literature, manuscripts of qualification works and dissertations for obtaining scientific degrees. For the convenience of higher education applicants, the university has developed a Catalog of Academic Disciplines, according to which students have the right to choose elective educational components.
9- ACADEMIC MOBILITY
National credit mobility
National credit mobility is carried out in accordance with concluded agreements, memorandums of cooperation between SUTE and other higher education institutions (scientific institutions) of Ukraine in accordance with the legislation.
International Credit Mobility
The university has concluded cooperation agreements between SUTE and foreign higher education institutions, within the framework of which partner exchange and training of students is carried out under international programs and projects within the framework of the Erasmus+ program.
Teaching foreign applicants for higher education
Foreign higher education applicants are guaranteed all rights and freedoms, in accordance with the current legislation of Ukraine and the University Charter. Education of foreign higher education applicants is carried out on general terms with additional language training.

3.2. The list of components of the educational programme (EP) and their logical sequence

Code n/d	Educational components of the programme	Number of credits
1	2	3
Compulsory components		
CC 1.	Introduction to computer science	6
CC 2.	Discrete Math	6
CC 3.	Law Science	6
CC 4.	Higher mathematics	6
CC 5.	Foreign language for professional purposes	24
CC 6.	Probability theory and mathematical statistics	6

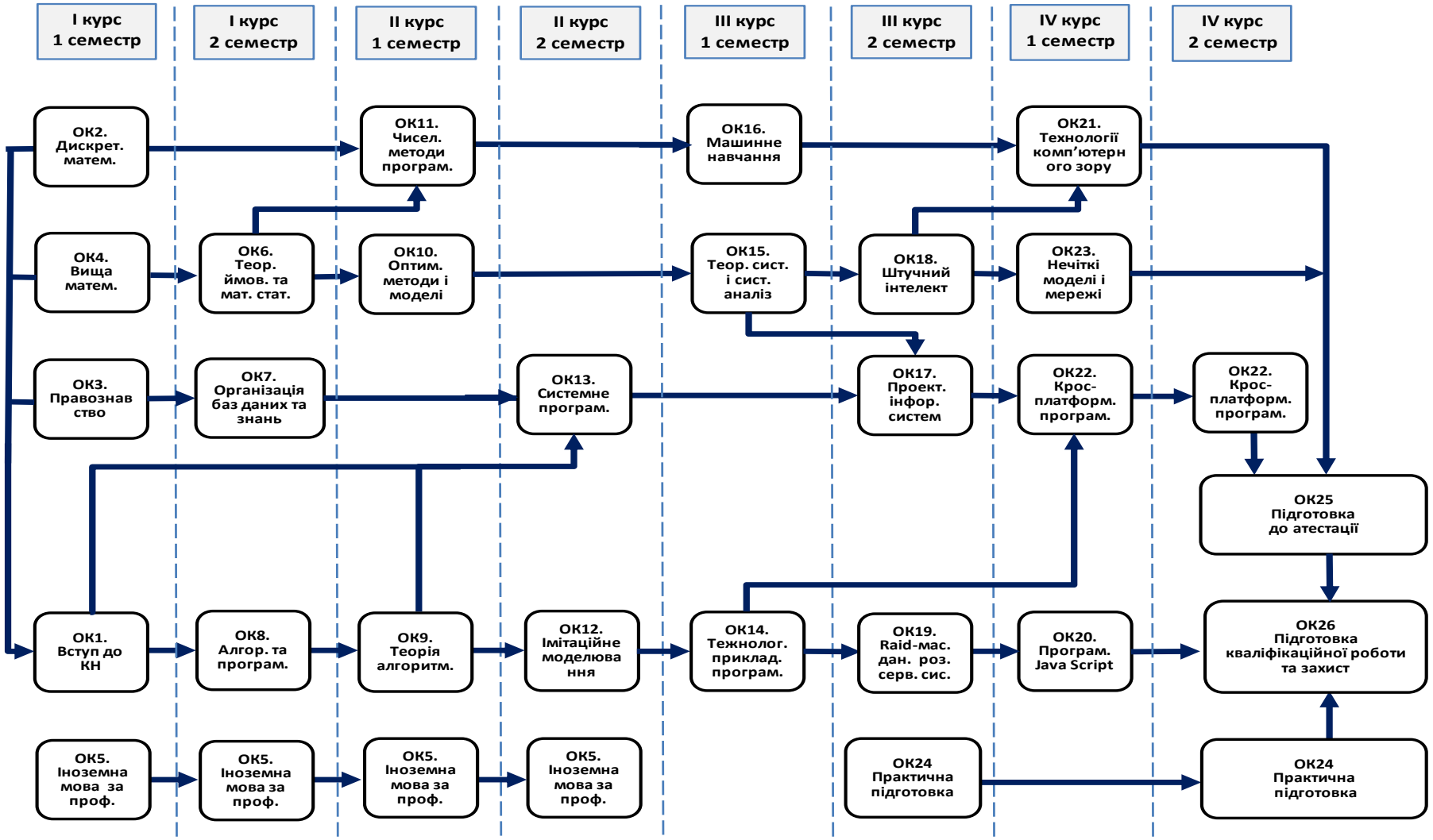
CC 7.	Organization of databases and knowledge	6
CC 8.	Algorithmization and programming	6
CC 9.	Theory of algorithms	6
CC 10.	Optimization methods and models	6
CC 11.	Numerical programming methods	6
CC 12.	Simulation modeling	6
CC 13.	System programming	6
CC 14.	Applied programming technologies	6
CC 15.	Systems theory and system analysis	6
CC 16.	Machine learning	6
CC 17.	Information systems design	6
CC 18.	Artificial Intelligence	6
CC 19.	Raid data arrays and distributed server systems	6
CC 20.	Java Script Java Script programming	6
CC 21.	Technologies of computer vision	6
CC 22.	Cross-platform programming	9
CC 23.	Fuzzy models and networks	6
CC 24	Practical training	12
CC 25	Preparation for certification	3
CC 26	Preparation of qualifying work and defence	6
Total volume of compulsory components:		**180**
Elective components of the EP		
EC 1.	Elective component 1	6
EC 2.	Elective component 2	6
EC 3.	Elective component 3	6
EC 4.	Elective component 4	6
EC 5.	Elective component 5	6
EC 6.	Elective component 6	6
EC 7.	Elective component 7	6
EC 8.	Elective component 8	6
EC 9.	Elective component 9	6
EC 10.	Elective component 10	6
The total amount of elective components:		**60**
TOTAL VOLUME OF EDUCATIONAL PROGRAMME		**240**

Higher education applicants choose elective academic disciplines through their personal account on the portal "MIA: Education". Descriptions of academic disciplines and their prerequisites are presented in the Catalog of Academic Disciplines of SUTE.

3.3. FORM OF CERTIFICATION OF HIGHER EDUCATION GRADUATES

Certification is carried out in the form of a defence of a qualification thesis. The qualification thesis must involve theoretical, system engineering or experimental research of a complex specialized task or practical problem in the field of computer science, which is characterized by complexity and uncertainty of conditions and requires the application of theories and methods of information technology. The qualification thesis must not contain academic plagiarism, falsification and fabrication. The qualification thesis must be published on the official website of the higher education institution or its structural unit, or in the repository of the higher education institution.

Structural and logical scheme of the educational programme



3.4. Matrix of correspondence of programme competences to compulsory components of the educational programme

Components / Competences	CC 1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11	CC 12	CC 13	CC 14	CC 15	CC 16	CC 17	CC 18	CC 19	CC 20	CC 21	CC 22	CC 23	CC 24	CC 25	CC 26
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	•		•														•									•
GC14	•		•																							
GC15	•		•																							
GC16			•																							
SC 1		•		•						•																•
SC 2						•								•		•		•					•			•
SC 3								•	•			•					•	•						•	•	•
SC 4								•	•	•	•	•									•				•	•
SC 5		•								•		•			•									•	•	•
SC 6															•								•			•
SC 7										•	•	•												•	•	•
SC 8	•							•	•				•	•				•		•	•	•	•		•	•
SC 9														•					•							•
SC 10													•	•			•			•				•	•	•
SC 11							•							•		•		•			•		•		•	•
SC 12	•						•						•	•			•			•		•		•		•
SC 13													•						•	•						•
SC 14														•					•							•
SC 15												•					•						•	•	•	•
SC 16														•					•		•					•

3.5. Matrix of correspondence of programme learning outcomes with corresponding compulsory components of the educational programme

Components / Programme training results	CC 1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11	CC 12	CC 13	CC 14	CC 15	CC 16	CC 17	CC 18	CC 19	CC 20	CC 21	CC 22	CC 23	CC 24	CC 25	CC 26
PLO1	•			•			•								•											•
PLO2		•		•						•							•				•					•
PLO3						•						•						•			•					•
PLO4											•			•		•		•			•		•		•	•
PLO5								•	•					•										•	•	•
PLO6		•		•						•	•															•
PLO7		•								•		•														•
PLO8									•			•			•									•		•
PLO9								•	•				•	•						•	•			•	•	•
PLO10														•			•		•			•		•		•
PLO11					•												•							•	•	•
PLO12					•				•					•		•		•			•		•		•	•
PLO13					•			•	•				•						•	•				•		•
PLO14												•		•			•							•	•	•
PLO15	•																		•					•		•
PLO16								•						•					•							•