UNIVERSITY GOCE DELCEV - STIP

STUDY PROGRAM

COMPUTER ENGINEERING AND TECHNOLOGIES

First cycle 4 years studies

FACULTY OF INFORMATICS

UNIVERSITY GOCE DELCEV

STIP, 2023 YEAR

1a. Qualifications that indicate completion of first cycle (240 ECTS) is awarded to the person who meets the following descriptors of qualifications:

Knowledge and understanding	- Knowledge and understanding of the scientific field of study, applying methodologies appropriate to solve complex problems, in a systematically creative way, which provides a basis or opportunity for originality in the development and application of autonomous ideas in the context of analysis and research. - Ability to find and support arguments within the fields of computer science and technologies. - Applies theoretical knowledge and practical techniques in resolving software and hardware problems based on different criteria, such as performance, complexity, correctness and security. - Ability to use extended and in-depth knowledge. - High level of professional competence and qualification in one or more specific scientific fields. - Possess knowledge of one or more subject areas (such as mathematics, electrical engineering, electronics, computer science) that in the given scientific fields are based on quality international research and correspond to the real situation. - Understanding the general areas of information and communication technologies, concepts of programming languages and algorithms, databases, computer architecture, computer networks and operating systems.
Applying knowledge and understanding	- Ability to critically, independently and creatively solve problems with a certain originality in new or unknown environments and in a multidisciplinary context related to computer engineering and technologies. - Demonstrate skills in the design, implementation and verification of software solutions of varying complexity.

	- Use mathematical fundamentals, knowledge of algorithms and computer science theory in the process of modeling and design of computer-based systems, processes, components or programs. - Demonstrate knowledge of various programming languages and rule with at least one senior programming language. - Use the principles of design to create relational databases, multimedia applications, Internet software solutions, and more.
Appraisal ability	- Demonstrate the ability to collect, evaluate, analyze, interpret and use data and information; - Ability to evaluate, analyze, categorize and differentiate problems, and to identify and define computational requirements needed for solving those problems; - Ability to validate, verify and test appropriate solutions for a given problem; - Ability to assess the feasibility and effort required to build a given software solution.
Communication skills	- Demonstrate the ability to communicate effectively, by connecting concepts, problems and solutions in the field of computer science; - Ability to work effectively independently or as a team member, even in a case of interdisciplinary teams; - Ability to present, debate and communicate opinions and results of the research with argumentation; - Demonstrate skills for taking personal responsibility when communicating in the area in which they work.
Skills of learning	- They easily adapt to mastering a new programming language, new programming environment, or new software tool; - Demonstrate an awareness of new technologies and the ability to evaluate and use modern software

	development tools or new software engineering methodologies; - Ability to learn through appropriate practice, and to generate new ideas by creative thinking; - Ability to identify their own needs for further education and independent action in order to independently acquire new knowledge and skills.

1b. Specific qualification descriptors determining the results of the first cycle of four-year studies with 240 ECTS, study program in Computer Engineering and Technologies, Faculty of Informatics, University Goce Delcev - Stip, in accordance with the National Qualifications Framework Regulation ("Official Gazette of the Republic of Macedonia" No.154/2010) and the Law for the National Framework of qualifications ("Official Gazette of the Republic of Macedonia" No.137/2013 and 30/2016)

Knowledge and understanding	- Knowledge and understanding of computer systems concepts, systems hardware and software design, and processes for constructing or analyzing systems; - Knowledge of modeling and designing hardware and software components of computer systems, with critical evaluation and testing of different solutions; - They are able to apply theory, practices and tools for design, implementation, maintenance and evaluation of computer systems and components; - Special knowledge of various programming paradigms and languages, data structures, algorithms, databases, network protocols, etc.; - Knowledge of mathematical foundation of computer science and engineering, information theory, digital signal processing, etc.; - Critical and self-critical skills in evaluating various assumptions, approaches, procedures and results related to engineering problems; - Respect for the professional opinions and ethical views of others.

Applying knowledge and understanding	- Demonstrate skills in the design, implementation and verification of computer systems and components of varying complexity; - Ability to apply effectively principles for designing computer systems and networks by identifying security risks; - Ability to apply principles of communications and digital signal processing; - Demonstrate knowledge of various data structures, algorithms and their complexity; - Demonstrate knowledge of various programming languages and programming paradigms, various forms of computing, computer architectures and microprocessor systems; - Ability to effectively use computer systems and software tools; - Use the principles of design to create relational databases, multimedia applications, Internet software solutions, and more.
Appraisal ability	- Demonstrate the ability to obtain, evaluate, analyze, interpret and use data and information; - Ability to evaluate, analyze, categorize and differentiate problems, and to identify and define computational requirements needed for solving those problems; - Ability to identify, analyze and reconcile conflicting project objectives, and to find compromises between cost, duration, knowledge and existing systems and organization; - Ability to evaluate and select scientific theories, concepts, methodologies, tools and general skills from the subject areas and set new analyzes, research and solutions on a scientific basis; - Can make a difference and have an attitude for personal, social and ethical responsibilities in the assessment and application of acquired knowledge.

Communication skills	- Demonstrate the ability to communicate effectively verbally and in writing, connecting computer engineering problems and solutions, and critically evaluate the presentations of others; - Ability to work effectively independently or as a member of a development team; - Ability to present, debate and communicate professional knowledge, opinions and results of the research with experts and non-experts, clearly, unambiguously and with argumentation; - Ability to manage their own professional development, working hours and organizational skills.
Skills of learning	- They easily adapt to new computer technologies, new programming environment, new programming paradigm or new form of computing. - Demonstrate an awareness of new technologies and the ability to evaluate and use modern software development tools; - Demonstrate skills to use ICT technologies for distance and electronic learning; - Understand the need and have the ability for constant professional development, through the use of professional and scientific literature, professional trainings, continuation of formal education, membership in professional organizations, etc.

8. Years and semesters of study program duration

The study program in Computer engineering and technologies will be implemented over a period of 4 (four) years, 8 (eight) semesters.

According to the Statute of the University Goce Delcev - Stip, the due date for the planned activities in the study program is two times longer than the prescribed duration of the studies i.e. until the end of the academic year in which the due date of the same academic year expires.

9. ECTS credits that the student acquires

The students with the completion of the academic studies of 4 years first cycle of study program of Computer engineering and technologies, organized by the Faculty of Informatics,

University "Goce Delcev" in Stip, acquires 240 ECTS.

11. Terms for enrolment

Candidates need to have Passed "the state graduation exam" or "the international graduate exam" or have had finished four-year high-school studies according to the regulations which were into force before the state graduation exam was introduced and according to the conditions in the open call for students which is approved by the Government of Republic of North Macedonia.
Foreign nationals admitted to the studies under the same conditions as nationals of the Republic of North Macedonia, but may, in accordance with decisions of the competent authorities or in accordance with the decisions of the University, they are required to pay part or full participation in the study. Admission meets the person who completed education abroad according to the appropriate degree program. The appropriateness of the study program is evaluated according to established procedures of the University in accordance with state authorities.
Competition despite the conditions and criteria for admission include the number of students, enforcement procedures, deadlines for applications, taking and recording.

23. Professional or scientific title which the student obtains after completion of the study program in Computer engineering and technologies.

The students that will complete the study program in Computer engineering and technologies, four-year first cycle study program, acquire 240 ECTS and the following academic degree:

In Macedonian: Дипломиран инженер по информатика – компјутерско инженерство и технологии, VI A (НРК)

In English: **Bachelor of Computer Engineering** - BSE (CS), VI A (NQF)

STRUCTURE OF FIRST CYCLE FOUR YEARS STUDY PROGRAMME IN COMPUTER ENGINEERING AND TECHNOLOGIES

Courses, 1 year - 1 semester

No.	Code	Courses	ECTS	Hours	Total
1.	2FI100121	Mathematics 1	8	3+2+2	240
2.	2FI100221	Fundamentals of computer programming	6	2+2+1	180
3.	2FI100421	Introduction to Informatics	6	2+2+1	180
4.	2FI100321	Fundamentals of Electrical Engineering	6	2+2+1	180
5.		Elected subject from list No.1	4	2+1+1	120
		Total ECTS	**30**	**11+9+6**	**900**

List No. 1 of elective subjects (choose one of the offered subjects)

No.	Code	Courses	ECTS	Hours	Total
1.	4FF100721	Macedonian language 1	4	2+1+1	120
2.	4FF100621	English language level A2.1	4	2+1+1	120
3.	4FF100221	German language level A1.1	4	2+1+1	120
4.	4FF100421	Italian language level A1.1	4	2+1+1	120
5.	4FF100121	Spanish language level A1.1	4	2+1+1	120
6.	4FF100521	French language level A1.1	4	2+1+1	120
7.	4FF100321	Russian language level A1.1	4	2+1+1	120

Courses, 1 year - 2 semester

No.	Code	Courses	ECTS	Hours	Total
1.	2FI101121	Mathematics 2	6	2+2+1	180
2.	2FI101221	Object-oriented Programming	6	2+2+1	180
3.	2FI101321	Computer Electronic Components	6	2+2+1	180
4.	2FI101421	Discrete Mathematics	6	2+2+1	180
5.		Elected subject from list No.2	6	2+2+1	180
6.	2SC100121	Sport and recreation			
		Total ECTS	**30**	**10+9+7**	**900**

List No. 2 of elective subjects (choose one of the offered subjects)

No.	Code	Courses	ECTS	Hours	Total
1.	4FF101423	Macedonian language 2	6	2+2+1	180
2.	4FF101123	English language level A2.2	6	2+2+1	180
3.	4FF101223	German language level A1.2	6	2+2+1	180
4.	4FF100923	Italian language level A1.2	6	2+2+1	180
5.	4FF100823	Spanish language level A1.2	6	2+2+1	180
6.	4FF101023	French language level A1.2	6	2+2+1	180
7.	4FF101323	Russian language level A1.2	6	2+2+1	180

Courses, 2 year - 3 semester

No.	Code	Courses	ECTS	Hours	Total

1.	2FI101921	Data Structures and Algorithms	8	3+2+2	240
2.	2FI102021	Software Engineering	8	3+2+2	240
3.	2FI102121	Digital Logic	6	2+2+1	180
4.		Elected subject from list No.3	4	2+1+1	120
5.		Elected subject from list No.4	4	2+1+1	120
		Total ECTS	**30**	**12+8+7**	**900**

List No. 3 of elective subjects (choose one of the offered subjects)

No.	Code	Courses	ECTS	Hours	Total
1.	2FI130121	Theory of Probability	4	2+1+1	120
2.	2FI130221	Probability and Statistics	4	2+1+1	120

List No. 4 of elective subjects (choose one of the offered subjects)

No.	Code	Courses	ECTS	Hours	Total
1.	2FI131221	Algebraic Structures	4	2+1+1	120
2.	2FI130421	Professional Skills	4	2+1+1	120

Courses, 2 year - 4 semester

No.	Code	Courses	ECTS	Hours	Total
1.	2FI102421	Operating Systems	6	2+2+1	180
2.	2FI102521	Database Systems	6	2+2+1	180
3.	2FI102621	Visual Programming	6	2+2+1	180
4.	2FI102721	Computer Networks	6	2+2+1	180
5.		Elected subject from list No.5	6	2+2+1	180
		Total ECTS	**30**	**10+9+7**	**900**

List No. 5 of elective subjects (choose one of the offered subjects)

No.	Code	Courses	ECTS	Hours	Total
1.	2FI102023	Computational Tools in Engineering	6	2+2+1	180
2.	2FI102123	Operational Research	6	2+2+1	180

Courses, 3 year - 5 semester

No.	Code	Courses	ECTS	Hours	Total
1.	2FI103321	Computer Architecture	8	3+2+2	240
2.	2FI103421	Internet Programming	8	3+2+2	240
3.	2FI103521	Computer Graphics and Visualization	6	2+2+1	180
4.		Elected subject from list No.6	4	2+1+1	120
5.		Elected subject from list No.6	4	2+1+1	120
		Total ECTS	**30**	**12+8+7**	**900**

List No. 6 of elective subjects (choose two of the offered subjects)

No.	Code	Courses	ECTS	Hours	Total
1.	2FI131721	Advanced Algorithms	4	2+1+1	120
2.	2FI131821	Parallel Programming	4	2+1+1	120
3.	2FI131921	Mobile and Wireless Networks	4	2+1+1	120

4.	2FI132021	Network Protocols	4	2+1+1	120

Courses, 3 year - 6 semester

No.	Code	Courses	ECTS	Hours	Total
1.	2FI103921	Microcomputer Systems	6	2+2+1	180
2.	2FI104021	ICT Project Management	6	2+2+1	180
3.	2FI104121	Information Theory	6	2+2+1	180
4.	2FI104221	Numerical Methods	6	2+2+1	180
5.		Elected subject from list No.7	6	2+2+1	180
		Total ECTS	**30**	**10+9+7**	**900**

List No. 7 of elective subjects (choose one of the offered subjects)

No.	Code	Courses	ECTS	Hours	Total
1.	2FI103323	Modern Computer Architectures	6	2+2+1	180
2.	2FI103423	Introduction to Statistical Analysis	6	2+2+1	180

Courses, 4 year - 7 semester

No.	Code	Courses	ECTS	Hours	Total
1.	2FI104821	Computer System Security	8	3+2+2	240
2.	2FI104921	Artificial Intelligence	8	3+2+2	240
3.	2FI105021	Digital Signal Processing	6	2+2+1	180
4.		Elected subject from list No.8	4	2+1+1	120
5.		Elected subject from list No.8	4	2+1+1	120
		Total ECTS	**30**	**12+8+7**	**900**

List No. 8 of elective subjects (choose two of the offered subjects)

No.	Code	Courses	ECTS	Hours	Total
1.	2FI133921	JavaScript-based Technologies	4	2+1+1	120
2.	2FI134021	Basics of Robotics	4	2+1+1	120
3.	2FI134121	Software Testing and Analysis	4	2+1+1	120
4.	2FI134221	Data Storage and Management	4	2+1+1	120

Courses, 4 year - 8 semester

No.	Code	Courses	ECTS	Hours	Total
1.	2FI105621	Introduction to Data Science	4	2+1+1	120
2.	2FI104421	Distributed Computer Systems	4	2+1+1	120
3.	2FI105721	Cloud Infrastructure and Services	4	2+1+1	120
4.		Elected subject from list No.9	4	2+1+1	120
5.		Elected subject from list No.9	4	2+1+1	120
6.		Practical work – interdisciplinary project	4	0+0+4	120
7.		Graduate Thesis	6	0+0+8	180
		Total ECTS	**30**	**10+5+17**	**900**

List No. 9 of elective subjects (choose two of the offered subjects)

No.	Code	Courses	ECTS	Hours	Total
1.	2FI135221	Embedded Computer Systems	4	2+1+1	120
2.	2FI135321	Mobile Applications Development	4	2+1+1	120
3.	2FI135421	Human-Computer Interaction	4	2+1+1	120
4.	2FI135521	Differential Equations	4	2+1+1	120

Legend: In the field weekly fund of hours, the expression (a + b + c) denotes: a-lectures; b-auditory exercises; c) laboratory exercises